COURSE STRUCTURE AND SYLLABUS

For

COMPUTER SCIENCE AND ENGINEERING

(Applicable for batches admitted from 2016-2017)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year - I Semester

S. No.	Subjects	L	T	P	Credits
1-HS	English – I	4	--	--	3
2-BS	Mathematics - I	4	--	--	3
3-BS	Mathematics – II (Mathematical Methods)	4	--	--	3
4-BS	Applied Physics	4	--	--	3
5	Computer Programming	4	--	--	3
6-ES	Engineering Drawing	4	--	--	3
7-HS	English - Communication Skills Lab - 1	--	--	3	2
8-BS	Applied / Engineering Physics Lab	--	--	3	2
9-ES	Applied / Engineering Physics – Virtual Labs – Assignments	--	--	2	--
10	Computer Programming Lab	--	--	3	2
	Total Credits				**24**

I Year - II SEMESTER

S. No.	Subjects	L	T	P	Credits
1-HS	English – II	4	--	--	3
2-BS	Mathematics - III	4	--	--	3
3-BS	Applied Chemistry	4	--	--	3
4	Object Oriented Programming through C++	4	--	--	3
5-HS	Environmental Studies	4	--	--	3
6-ES	Engineering Mechanics	4	--	--	3
7-BS	Applied / Engineering Chemistry Laboratory	--	--	3	2
8-HS	English - Communication Skills Lab – 2	--	--	3	2
9	Object Oriented Programming Lab	--	--	3	2
	Total Credits				**24**

II Year - I Semester

S. No.	Subjects	L	T	P	Credits
1-HS	Statistics with R Programming	4	--	--	3
2	Mathematical Foundations of Computer Science	4	--	--	3
3	Digital Logic Design	4	--	--	3
4	Python Programming	4	--	--	3
5	Data Structures through C++	4	--	--	3
6	Computer Graphics	4	--	--	3
7	Data Structures through C++Lab	--	--	3	2
8	Python Programming Lab	--	--	3	2
	Total Credits				**22**

II Year - II Semester

S. No.	Subjects	L	T	P	Credits
1	Software Engineering	4	--	--	3
2	Java Programming	4	--	--	3
3	Advanced Data Structures	4	--	--	3
4	Computer Organization	4	--	--	3
5	Formal Languages and Automata Theory	4	--	--	3
6	Principles of Programming Languages	4	--	--	3
7	Advanced Data Structures Lab	--	--	3	2
8	Java Programming Lab	--	--	3	2
	Total Credits				**22**

III Year - I Semester

S. No.	Subjects	L	T	P	Credits
1	Compiler Design	4	--	--	3
2	Unix Programming	4	--	--	3
3	Object Oriented Analysis and Design using UML	4	--	--	3
4	Database Management Systems	4	--	--	3
5	Operating Systems	4	--	--	3
6	Unified Modeling Lab	--	--	3	2
7	Operating System & Linux Programming Lab	--	--	3	2
8	Database Management System Lab	--	--	3	2
MC	Professional Ethics & Human Values	--	3	--	--
Total Credits					**21**

III Year - II Semester

S. No.	Subjects	L	T	P	Credits
1	Computer Networks	4	2	--	3
2	Data Warehousing and Mining	4	--	--	3
3	Design and Analysis of Algorithms	4	--	--	3
4	Software Testing Methodologies	4	--	--	3
5	**Open Elective:** i. Artificial Intelligence ii. Internet of Things iii Cyber Security iv.Digital Signal Processing v.Embbeded Systems vi. Robotics	4	--	--	3
6	Network Programming Lab	--	--	3	2
7	Software Testing Lab	--	--	3	2
8	Data Warehousing and Mining Lab	--	--	3	2
9	IPR & Patents	--	2	--	--
Total Credits					**21**

IV Year - I Semester

S. No.	Subjects	L	T	P	Credits
1	Cryptography and Network Security	4	--	--	3
2	Software Architecture & Design Patterns	4	--	--	3
3	Web Technologies	4	--	--	3
4- HS	Managerial Economics and Financial Analysis	4	--	--	3
5	**Elective-I** i. Big Data Analytics ii. Information Retrieval Systems iii. Mobile Computing	4	--	--	3
6	**Elective-II** i. Cloud Computing ii. Software Project Management iii. Scripting Languages	4	--	--	3
7	Software Architecture& Design Patterns Lab	--	--	3	2
8	Web Technologies Lab	--	--	3	2
Total Credits					**22**

IV Year - II Semester

S. No.	Subjects	L	T	P	Credits
1	Distributed Systems	4	--	--	3
2- HS	Management Science	4	--	--	3
3	Machine Learning	4	--	--	3
4	**Elective-III** i.Concurrent and Parallel Programming ii.Artificial Neural Networks iii. Operations Research	4	--	--	3
5	Seminar	--	3	--	2
6	Project	--	--	--	10
Total Credits					**24**

Total Course Credits =   48+44 + 42 + 46 = 180

SYLLABUS

ENGLISH - I

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus in primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To imporve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theorotical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronounciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students particiapte in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparision.
9. To enable the students to write techincal reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher interventionis perimitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.

5. The teacher is perimitted to use lecture method when a completely new concept is introduced in the class.

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the langauge skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats—emails,letters and reports-- are to be tested along with appropriate langauge and expressions.
4. Examinations:

I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%

(80% for the best of two and 20% for the other)

Assignments= 5%

End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B.Tech I Semester (Common for all branches)and I B.Pharma I Sem of JNTU Kakinada from the academic year 2016-17

(R-16 Regulations)

DETAILED TEXTBOOK:

ENGLISH FOR ENGINEERS AND TECHNOLOGISTS, Published by **Orient Blackswan Pvt Ltd**

NON-DETAILED TEXTBOOK:

PANORAMA: A COURSE ON READING, Published by **Oxford University Press India**

The course content along with the study material is divided into six units.

UNIT I:

1. 'Human Resources' from English for Engineers and Technologists.

OBJECTIVE:

To develop human resources to serve the society in different ways.

OUTCOME:

The lesson motivates the readers to develop their knowledge different fields and serve the society accordingly.

2. 'An Ideal Family' from Panorama: A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 2:

1. ' Transport: Problems and Solutions' from English for Engineers and Technologists.

OBJECTIVE:

To highlight road safety measures whatever be the mode of transport.

OUTCOME:

The lesson motivates the public to adopt road safety measures.

2. 'War' from 'Panorama : A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 3:

1. 'Evaluating Technology' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the advantages and disadvantages of technology.

OUTCOME:

The lesson creates an awareness in the readers that mass production is ultimately detrimental to biological survival.

2. 'The Verger' from 'Panorama : A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 4:

1. 'Alternative Sources of Energy' from English for Engineers and Technologists.

OBJECTIVE:

To bring into focus different sources of energy as alternatives to the depleting sources.

OUTCOME:

The lesson helps to choose a source of energy suitable for rural India.

2. ' The Scarecrow' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 5:

1. 'Our Living Environment' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the fact that animals must be preserved beacuase animal life is precious.

OUTCOME:

The lesson creates an awareness in the reader as to the usefulness of animals for the human society.

2. 'A Village Host to Nation' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 6:

1. ' Safety and Training' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the possibility of accidents in laboratories, industries and other places and to follow safety measures.

OUTCOME:

The lesson helps in identifying safety measures against different varieties of accidents at home and in the workplace.

2. 'Martin Luther King and Africa' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

NOTE:

   All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

OVERALL COURSE OUTCOME:

1. Using English languages, both written and spoken, competently and correctly.
2. Improving comprehension and fluency of speech.
3. Gaining confidence in using English in verbal situations.

MODEL QUESTION PAPER FOR THEORY

PART- I

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

	L	T	P	C
I Year - I Semester	**4**	**0**	**0**	**3**

MATHEMATICS-I
(Common to ALL branches of First Year B.Tech.)

Course Objectives:
1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

Course Outcomes: At the end of the Course, Student will be able to:
1. Solve linear differential equations of first, second and higher order.
2. Determine Laplace transform and inverse Laplace transform of various functions and use Laplace transforms to determine general solution to linear ODE.
3. Calculate total derivative, Jocobian and minima of functions of two variables.

UNIT I: Differential equations of first order and first degree:
Linear-Bernoulli-Exact-Reducible to exact.
Applications: Newton's Law of cooling-Law of natural growth and decay-Orthogonal trajectories- Electrical circuits- Chemical reactions.

UNIT II: Linear differential equations of higher order:
Non-homogeneous equations of higher order with constant coefficients with RHS term of the type e^{ax}, sin ax, cos ax, polynomials in x, e^{ax} V(x), xV(x)- Method of Variation of parameters.
Applications: LCR circuit, Simple Harmonic motion.

UNIT III: Laplace transforms:
Laplace transforms of standard functions-Shifting theorems - Transforms of derivatives and integrals – Unit step function –Dirac's delta function- Inverse Laplace transforms– Convolution theorem (with out proof).
Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT IV: Partial differentiation:
Introduction- Homogeneous function-Euler's theorem-Total derivative-Chain rule-Generalized Mean value theorem for single variable (without proof)-Taylor's and Mc Laurent's series expansion of functions of two variables– Functional dependence- Jacobian.
Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

UNIT V: First order Partial differential equations:
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT VI: Higher order Partial differential equations:

Solutions of Linear Partial differential equations with constant coefficients. RHS term of the type $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$. Classification of second order partial differential equations.

Text Books:

1. **B.S.Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India
2. **Micheael Greenberg,** Advanced Engineering Mathematics, 9th edition, Pearson edn
3. **Dean G. Duffy,** Advanced engineering mathematics with MATLAB, CRC Press
4. **Peter O'neil,** Advanced Engineering Mathematics, Cengage Learning.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.,** Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

L	T	P	C
4	0	0	3

MATHEMATICS-II (Mathematical Methods)
(Common to ALL branches of First Year B.Tech.)

Course Objectives:
1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes: At the end of the Course, Student will be able to:
1. Calculate a root of algebraic and transcendental equations. Explain relation between the finite difference operators.
2. Compute interpolating polynomial for the given data.
3. Solve ordinary differential equations numerically using Euler's and RK method.
4. Find Fourier series and Fourier transforms for certain functions.
5. Identify/classify and solve the different types of partial differential equations.

UNIT I: Solution of Algebraic and Transcendental Equations:
Introduction- Bisection method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations).

UNIT II: Interpolation:
Introduction- Errors in polynomial interpolation – Finite differences- Forward differences- Backward differences –Central differences – Symbolic relations and separation of symbols - Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unequal intervals - Lagrange's interpolation formula.

UNIT III: Numerical Integration and solution of Ordinary Differential equations:
Trapezoidal rule- Simpson's $1/3^{rd}$ and $3/8^{th}$ rule-Solution of ordinary differential equations by Taylor's series-Picard's method of successive approximations-Euler's method - Runge-Kutta method (second and fourth order).

UNIT IV: Fourier Series:
Introduction- Periodic functions – Fourier series of -periodic function - Dirichlet's conditions – Even and odd functions –Change of interval– Half-range sine and cosine series.

UNIT V: Applications of PDE:
Method of separation of Variables- Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

UNIT VI: Fourier Transforms:

Fourier integral theorem (without proof) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

Text Books:

1. **B.S.Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:
1. **Dean G. Duffy,** Advanced engineering mathematics with MATLAB, CRC Press
2. **V.Ravindranath and P.Vijayalakshmi,** Mathematical Methods, Himalaya Publishing House.
3. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India
4. **David Kincaid, Ward Cheney**, Numerical Analysis-Mathematics of Scientific Computing, 3rd Edition, Universities Press.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.,** Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

L	T	P	C
4	0	0	3

APPLIED PHYSICS
(CSE, ECE, EEE, IT, EIE, E.Com.E)

OBJECTIVES: *Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by JNTUniv.Kkd. that serves as a transit to understand the branch specific advanced topics. The courses are designed to:*

- *Impart Knowledge of Physical Optics phenomena like Interference, Diffraction and Polarization involving required to design instruments with higher resolution.*
- *Teach Concepts of coherent sources, its realization and utility optical instrumentation.*
- *Study the concepts regarding the bulk response of materials to the EM fields and their analytically study in the back-drop of basic quantum mechanics.*
- *Understand the physics of Semiconductors and their working mechanism for their utility in sensors.*

UNIT-I

INTERFERENCE: Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Newton's rings – construction and basic principle of Interferometers.

UNIT-II

DIFFRACTION: Fraunhofer diffraction at single slit - Cases of double slit, N-slits & Circular Aperture (Qualitative treatment only)-Grating equation - Resolving power of a grating, Telescope and Microscopes.

UNIT-III

POLARIZATION: Types of Polarization – Methods of production - Nicol Prism - Quarter wave plate and Half Wave plate – Working principle of Polarimeter (Sacharimeter).

LASERS: Characteristics– Stimulated emission – Einstein's Transition Probabilities-Pumping schemes - Ruby laser – Helium Neon laser.

UNIT-IV

ELECTROMAGNETIC FIELDS: Scalar and Vector Fields – Electric Potential-Gradient, Divergence of fields – Gauss and Stokes theorems-Propagation of EM waves through dielectric medium.

UNIT-V

QUANTUM MECHANICS: Introduction - Matter waves – Schröedinger Time Independent and Time Dependent wave equations – Particle in a box.
FREE ELECTRON THEORY: Defects of Classical free electron theory –Quantum Free electron theory - concept of Fermi Energy.

UNIT-VI

BAND THEORY OF SOLIDS: Bloch's theorem (qualitative) – Kronig – Penney model – energy bands in crystalline solids – classification of crystalline solids– effective mass of electron & concept of hole.

SEMICONDUCTOR PHYSICS: Conduction – Density of carriers in Intrinsic and Extrinsic semiconductors – Drift & Diffusion – relevance of Einstein's equation- Hall effect in semiconductors

Outcome: Construction and working details of instruments, ie., Interferometer, Diffractometer and Polarimeter are learnt. Study EM-fields and semiconductors under the concepts of Quantum mechanics paves way for their optimal utility.

Text Books:

1. A Text book of Engineering Physics – by Dr. M.N.Avadhanulu and Dr.P.G.Kshira sagar, S.Chand & Company Ltd., (2014)
2. 'Solid State Physics' by A.J.Dekker, Mc Millan Publishers (2011)
3. Engineering Physics by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

Reference Books:

1. Applied Physics by P.K.Palanisamy, Scitech publications (2014)
2. Lasers and Non-Linear optics by B.B.Laud, New Age International Publishers (2008).
3. Engineering Physics by M. Arumugam, Anuradha Publication (2014)

	L	T	P	C

I Year - I Semester

L	**T**	**P**	**C**
4	**0**	**0**	**3**

COMPUTER PROGRAMMING

Learning objectives:
Formulating algorithmic solutions to problems and implementing algorithms in C.
- Notion of Operation of a CPU, Notion of an algorithm and computational procedure, editing and executing programs in Linux.
- Understanding branching, iteration and data representation using arrays.
- Modular programming and recursive solution formulation.
- Understanding pointers and dynamic memory allocation.
- Understanding miscellaneous aspects of C.
- Comprehension of file operations.

UNIT-I:
History and Hardware - Computer Hardware, Bits and Bytes, Components, Programming Languages - Machine Language, Assembly Language, Low- and High-Level Languages, Procedural and Object-Oriented Languages, Application and System Software, The Development of C Algorithms The Software Development Process.

UNIT-II:
Introduction to C Programming- Identifiers, The main () Function, The printf () Function
Programming Style - Indentation, Comments, Data Types**,** Arithmetic Operations, Expression Types, Variables and Declarations, Negation, Operator Precedence and Associativity, Declaration Statements, Initialization.
Assignment - Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Interactive Input, Formatted Output, Format Modifiers.

UNIT -III:
Control Flow-Relational Expressions - Logical Operators:
Selection: if-else Statement, nested if, examples, Multi-way selection: switch, else-if, examples.
Repetition: Basic Loop Structures, Pretest and Posttest Loops, Counter-Controlled and Condition-Controlled Loops, The while Statement, The for Statement, Nested Loops, The do-while Statement.

UNIT-IV
Modular Programming: Function and Parameter Declarations, Returning a Value, Functions with Empty Parameter Lists, Variable Scope, Variable Storage Class, Local Variable Storage Classes, Global Variable Storage Classes, Pass by Reference, Passing Addresses to a Function, Storing Addresses, Using Addresses, Declaring and Using Pointers, Passing Addresses to a Function.
Case Study: Swapping Values, Recursion - Mathematical Recursion, Recursion versus Iteration.

UNIT-V:
Arrays & Strings
Arrays: One-DimensionalArrays, Input and Output of Array Values, Array Initialization, Arrays as Function Arguments, Two-Dimensional Arrays, LargerDimensionalArrays- Matrices
Strings: String Fundamentals, String Input and Output, String Processing, Library Functions

UNIT-VI:
Pointers, Structures, Files
Pointers: Concept of a Pointer, Initialisation of pointer variables, pointers as function arguments, passing by address, Dangling memory, address arithmetic, character pointers and functions, pointers to pointers, Dynamic memory management functions, command line arguments.
Structures: Derived types,Structuresdeclaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields.
Data Files: Declaring, Opening, and Closing File Streams, Reading from and Writing to Text Files, Random File Access

Outcomes:
- Understand the basic terminology used in computer programming
- Write, compile and debug programs in C language.
- Use different data types in a computer program.
- Design programs involving decision structures, loops and functions.
- Explain the difference between call by value and call by reference
- Understand the dynamics of memory by the use of pointers
- Use different data structures and create/update basic data files.

Text Books:
1. ANSI C Programming, Gary J. Bronson, Cengage Learning.
2. Programming in C, Bl Juneja Anita Seth, Cengage Learning.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.

Reference Books:
1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. Programming with C, Bichkar, Universities Press.
3. Programming in C, ReemaThareja, OXFORD.
4. C by Example, Noel Kalicharan, Cambridge.

	L	T	P	C
I Year - I Semester	4	0	0	3

ENGINEERING DRAWING

Objective: Engineering drawing being the principle method of communication for engineers, the objective to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

- To introduce the use and the application of drawing instruments and to make the students construct the polygons, curves and various types of scales. The student will be able to understand the need to enlarge or reduce the size of objects in representing them.
- To introduce orthographic projections and to project the points and lines parallel to one plane and inclined to other.
- To make the students draw the projections of the lines inclined to both the planes.
- To make the students draw the projections of the plane inclined to both the planes.
- To make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
- To represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

UNIT I Polygons, Construction of regular polygons using given length of a side; Ellipse, arcs of circles and Oblong methods; Scales – Vernier and Diagonal scales.

UNIT II Introduction to orthographic projections; projections of points; projections of straight lines parallel to both the planes; projections of straight lines – parallel to one plane and inclined to the other plane.

UNIT III Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclinations and traces.

UNIT IV Projections of planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT V Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

UNIT VI Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Text Books:

1. Engineering Drawing, N. D. Butt, Chariot Publications
2. Engineering Drawing, K. L. Narayana & P. Kannaiah, Scitech Publishers.
3. Engineering Graphics, P.I. Varghese, McGraw Hill Publishers

Reference Books:

1. Engineering Graphics for Degree, K. C. John, PHI Publishers
2. Engineering Drawing, Agarwal & Agarwal, Tata McGraw Hill Publishers
3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

L	T	P	C
0	0	3	2

ENGLISH - COMMUNICATION SKILLS LAB - I

PRESCRIBED LAB MANUAL FOR SEMESTER I:

'INTERACT: English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

OBJECTIVES:

To enable the students to learn through practice the communication skills of listening, speaking, reading and writing.

OUTCOME:

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

UNIT 1:

1. WHY study Spoken English?
2. Making Inqueries on the phone, thanking and responding to Thanks
   Practice work.

UNIT 2:

1. Responding to Requests and asking for Directions
   Practice work.

UNIT 3:

1. Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating
2. Apologising, Advising, Suggesting, Agreeing and Disagreeing
   Practice work.

UNIT 4:

1. Letters and Sounds
   Practice work.

UNIT 5:

1. The Sounds of English
   Practice work.

UNIT 6:

1. Pronunciation
2. Stress and Intonation
   Practice work.

Assessment Procedure: Laboratory

1. Every lab session (150 minutes) should be handled by not less than two teachers (three would be ideal) where each faculty has to conduct a speaking activity for 20/30 students.
2. The teachers are to assess each learner in the class for not less than 10 speaking activities, each one to be assessed for 10 marks or 10%. The average of 10 day-to-day activity assessments is to be calculated for 10 marks for internal assessment.

The rubric given below has to be filled in for all the students for all activities.

The rubric to assess the learners:

	Body language		Fluency & Audibility	Clarity in Speech	Neutralization of accent	Appropriate Language		Total 10 marks	Remarks
	Gestures & Postures	Eye Contact				Grammar	Vocabulary & expressions		

- **Lab Assessment: Internal (25 marks)**
  1. Day-to-Day activities: 10 marks

  2. Completing the exercises in the lab manual: 5 marks

  3. Internal test (5 marks written and 5 marks oral)

- **Lab Assessment: External (50 marks)**
  1. Written test: 20 marks (writing a dialogue, note-taking and answering questions on listening to an audio recording.

  2. Oral: Reading aloud a text or a dialogue- 10 marks

  3. Viva-Voce by the external examiner: 20 marks

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

	L	**T**	**P**	**C**
	0	**0**	**3**	**2**

APPLIED/ENGINEERING PHYSICS LAB

(Any 10 of the following listed experiments)

Objective: *Training field oriented Engineering graduates to handle instruments and their design methods to improve the accuracy of measurements.*

LIST OF EXPERIMENTS:

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.

2. Newton's rings – Radius of Curvature of Plano - Convex Lens.

3. Determination of thickness of a spacer using wedge film and parallel interference fringes.

4. Determination of Rigidity modulus of a material- Torsional Pendulum.

5. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.

6. Melde's experiment – Transverse and Longitudinal modes.

7. Verification of laws of vibrations in stretched strings – Sonometer.

8. Determination of velocity of sound – Volume Resonator.

9. L- C- R Series Resonance Circuit.

10. Study of I/V Characteristics of Semiconductor diode.

11. I/V characteristics of Zener diode.

12. Characteristics of Thermistor – Temperature Coefficients.

13. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.

14. Energy Band gap of a Semiconductor p - n junction.

15. Hall Effect in semiconductors.

16. Time constant of CR circuit.

17. Determination of wavelength of laser source using diffraction grating.

18. Determination of Young's modulus by method of single cantilever oscillations.

19. Determination of lattice constant – lattice dimensions kit.

20. Determination of Planck's constant using photocell.

21. Determination of surface tension of liquid by capillary rise method.

Outcome: *Physics lab curriculum gives fundamental understanding of design of an instrument with targeted accuracy for physical measurements*

	L	T	P	C
I Year - I Semester	**0**	**0**	**2**	**0**

APPLIED/ENGINEERING PHYSICS - VIRTUAL LABS – ASSIGNMENTS
(Constitutes 5% marks of 30marks of Internal-component)

Objective: *Training Engineering students to prepare a technical document and improving their writing skills.*

LIST OF EXPERIMENTS
1. Hall Effect
2. Crystal Structure
3. Hysteresis
4. Brewster's angle
5. Magnetic Levitation / SQUID
6. Numerical Aperture of Optical fiber
7. Photoelectric Effect
8. Simple Harmonic Motion
9. Damped Harmonic Motion
10. LASER – Beam Divergence and Spot size
11. B-H curve
12. Michelson's interferometer
13. Black body radiation

URL: www.vlab.co.in

Outcome: *Physics Virtual laboratory curriculum in the form of assignment ensures an engineering graduate to prepare a /technical/mini-project/ experimental report with scientific temper.*

	L	T	P	C
I Year - I Semester

L	T	P	C
0	0	3	2

COMPUTER PROGRAMMING LAB

OBJECTIVES:
• Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.

• Acquire knowledge about the basic concept of writing a program.

• Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.

• Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.

• Role of Functions involving the idea of modularity.

Programming

Exercise - 1 Basics
a) What is an OS Command, Familiarization of Editors - vi, Emacs
b) Using commands like mkdir, ls, cp, mv, cat, pwd, and man
c) C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers From Command line

Exercise - 2 Basic Math
a) Write a C Program to Simulate 3 Laws at Motion
b) Write a C Program to convert Celsius to Fahrenheit and vice versa

Exercise - 3 Control Flow - I
a)Write a C Program to Find Whether the Given Year is a Leap Year or not.
b)Write a C Program to Add Digits & Multiplication of a number

Exercise – 4 Control Flow - II
a)Write a C Program to Find Whether the Given Number is
      i) Prime Number
      ii) Armstrong Number
b) Write a C program to print Floyd Triangle
c) Write a C Program to print Pascal Triangle

Exercise – 5 Functions
a) Write a C Program demonstrating of parameter passing in Functions and returning values.
b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion

Exercise – 6 Control Flow - III
a) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using switch…case

b) Write a C Program to convert decimal to binary and hex (using switch call function the function)

Exercise – 7 Functions - Continued
Write a C Program to compute the values ofsin x and cos x and e^x values using Series expansion. (use factorial function)

Exercise – 8 Arrays
Demonstration of arrays
a) Search-Linear.
b) Sorting-Bubble, Selection.
c) Operations on Matrix.

Exercises - 9 Structures
a)Write a C Program to Store Information of a Movie Using Structure
b)Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
c) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function

Exercise - 10 Arrays and Pointers
a)Write a C Program to Access Elements of an Array Using Pointer
b) Write a C Program to find the sum of numbers with arrays and pointers.

Exercise – 11 Dynamic Memory Allocations
 a)   Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.

b) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function. Understand the difference between the above two programs

Exercise – 12 Strings
a) Implementation of string manipulation operations **with** library function.
        i) copy
        ii) concatenate
        iii) length
        iv) compare
b) Implementation of string manipulation operations **without** library function.
        i) copy
        ii) concatenate
        iii) length
        iv) compare

Exercise -13 Files
a)Write a C programming code to open a file and to print it contents on screen.
b)Write a C program to copy files

Exercise - 14 Files Continued
a) Write a C program merges two files and stores their contents in another file.
b) Write a C program to delete a file.

Exercise - 15

a) System Assembling, Disassembling and identification of Parts / Peripherals. b) Operating System Installation-Install Operating Systems like Windows, Linux along with necessary Device Drivers.

Exercise - 16

  a) MS-Office / Open Office

   i) Word - Formatting, Page Borders, Reviewing, Equations, symbols.   ii) Spread Sheet - organize data, usage of formula, graphs, charts.

   iii) Powerpoint - features of power point, guidelines for preparing an effective presentation.

  b) Network Configuration & Software Installation-Configuring TCP/IP, Proxy, and firewall settings. Installing application software, system software & tools.

OUTCOMES:

• Apply and practice logical ability to solve the problems.

• Understand C programming development environment, compiling, debugging, and linking and executing a program using the development environment

• Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs

• Understand and apply the in-built functions and customized functions for solving the problems.

• Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.

• Document and present the algorithms, flowcharts and programs in form of user-manuals

•Identification of various computer components, Installation of software

Note:

a) All the Programs must be executed in the Linux Environment. (Mandatory)
b) The Lab record must be a print of the LATEX (.tex) Format.

	L	T	P	C
I Year - II Semester	**4**	**0**	**0**	**3**

ENGLISH -II

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus in primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To imporve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theorotical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronounciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students particiapte in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparision.
9. To enable the students to write techincal reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher interventionis perimitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.

5. The teacher is perimitted to use lecture method when a completely new concept is introduced in the class.

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the langauge skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats— emails,letters and reports-- are to be tested along with appropriate langauge and expressions.
4. Examinations:

   I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%

   (80% for the best of two and 20% for the other)

   Assignments= 5%

   End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B.Tech II Semester (Common for all branches)and I B.Pharma II Sem of JNTU Kakinada from the academic year 2016-17 **(R-16 Regulations)**

DETAILED TEXTBOOK: ENGLISH ENCOUNTERS Published by **Maruthi Publishers**.

DETAILED NON-DETAIL:THE GREAT INDIAN SCIENTISTS Published by **Cenguage learning**

The course content along with the study material is divided into six units.

UNIT 1:

1. ' The Greatest Resource- Education' from English Encounters

OBJECTIVE:

Schumacher describes the education system by saying that it was mere training, something more than mere knowledge of facts.

OUTCOME:

The lesson underscores that the ultimate aim of Education is to enhance wisdom.

2. ' A P J Abdul Kalam' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Abdul Kalam's contributions to Indian science and the awards he received.

OUTCOME:

Abdul Kalam's simple life and service to the nation inspires the readers to follow in his footsteps.

UNIT 2:

1. ' A Dilemma' from English Encounters

OBJECTIVE: The lesson centres on the pros and cons of the development of science and technology.

OUTCOME: The lesson enables the students to promote peaceful co-existence and universal harmony among people and society.

2. 'C V Raman' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the dedicated research work of C V Raman and his achievements in Physics.

OUTCOME:

The Achievements of C V Raman are inspiring and exemplary to the readers and all scientists.

UNIT 3:

1. 'Cultural Shock': Adjustments to new Cultural Environments from English Encounters.

OBJECTIVE:

The lesson depicts of the symptoms of Cultural Shock and the aftermath consequences.

OUTCOME: The lesson imparts the students to manage different cultural shocks due to globalization.

2. 'Homi Jehangir Bhabha' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Homi Jehangir Bhabha's contributions to Indian nuclear programme as architect.

OUTCOME:

The seminal contributions of Homi Jehangir Bhabha to Indian nuclear programme provide an aspiration to the readers to serve the nation and sterngthen it.

UNIT 4:

1. 'The Lottery' from English Encounters.

OBJECTIVE:

The lesson highlights insightful commentary on cultural traditions.

OUTCOME:

The theme projects society's need to re examine its traditions when they are outdated.

2. 'Jagadish Chandra Bose' from The Great Indian Scientists.

OBJECTIVE:

The lesson gives an account of the unique discoveries and inventions of Jagadish Chandra Bose in Science.

OUTCOME: The Scientific discoveries and inventions of Jagadish Chandra Bose provide inspiration to the readers to make their own contributions to science and technology, and strengthen the nation.

UNIT 5:

1. ' The Health Threats of Climate Change' from English Encounters.

OBJECTIVE:

The essay presents several health disorders that spring out due to environmental changes

OUTCOME:

The lesson offers several inputs to protect environment for the sustainability of the future generations.

2. ' Prafulla Chandra Ray' from The Great Indian Scientists.

OBJECTIVE:

The lesson given an account of the experiments and discoveries in Pharmaceuticals of Prafulla Chandra Ray.

OUTCOME:

Prafulla Chandra Ray's scientific achievements and patriotic fervour provide inspiration to the reader.

UNIT 6:

1. ' The Chief Software Architect' from English Encounters

OBJECTIVE:

The lesson supports the developments of technology for the betterment of human life.

OUTCOME:

Pupil get inspired by eminent personalities who toiled for the present day advancement of software development.

2. ' Srinivasa Ramanujan' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the extraordinary achievements of Srinivasa Ramanujan, a great mathematician and the most romantic figure in mathematics.

OUTCOME:

The lesson provides inspiration to the readers to think and tap their innate talents.

NOTE:

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

MODEL QUESTION PAPER FOR THEORY

PART- I

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

L	**T**	**P**	**C**
4	**0**	**0**	**3**

MATHEMATICS-III
(Common to ALL branches of First Year B.Tech.)

Course Objectives:
1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes: At the end of the Course, Student will be able to:
1. Determine rank, Eigenvalues and Eigen vectors of a given matrix and solve simultaneous linear equations.
2. Solve simultaneous linear equations numerically using various matrix methods.
3. Determine double integral over a region and triple integral over a volume.
4. Calculate gradient of a scalar function, divergence and curl of a vector function. Determine line, surface and volume integrals. Apply Green, Stokes and Gauss divergence theorems to calculate line, surface and volume integrals.

UNIT I: Linear systems of equations:

Rank-Echelon form-Normal form – Solution of linear systems – Gauss elimination - Gauss Jordon- Gauss Jacobi and Gauss Seidal methods.Applications: Finding the current in electrical circuits.

UNIT II: Eigen values - Eigen vectors and Quadratic forms:

Eigen values - Eigen vectors– Properties – Cayley-Hamilton theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem- Diagonalization- Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative and semi definite - Index – Signature.
Applications: Free vibration of a two-mass system.

UNIT III: Multiple integrals:

Curve tracing: Cartesian, Polar and Parametric forms.
Multiple integrals: Double and triple integrals – Change of variables – Change of order of integration.
Applications: Finding Areas and Volumes.

UNIT IV: Special functions:

Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.
Applications: Evaluation of integrals.

UNIT V: Vector Differentiation:

Gradient- Divergence- Curl - Laplacian and second order operators -Vector identities.
Applications: Equation of continuity, potential surfaces

UNIT VI: Vector Integration:

Line integral – Work done – Potential function – Area- Surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.
Applications: Work done, Force.

Text Books:

1. **B.S.Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Greenberg,** Advanced Engineering Mathematics, 2nd edition, Pearson edn
2. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India
3. **Peter O'Neil,** Advanced Engineering Mathematics,7th edition, Cengage Learning.
4. **D.W. Jordan and T.Smith,** Mathematical Techniques, Oxford University Press.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.,** Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

	L	**T**	**P**	**C**
I Year - II Semester	**4**	**0**	**0**	**3**

APPLIED CHEMISTRY
(EEE, ECE, CSE, IT, EIE, E. Com. E.)

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Learning Objectives:
- Plastics are nowadays used in household appliances; also they are used as composites (FRP) in aerospace industries.
- Fuels as a source of energy are a basic need of any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence they are introduced.
- The basics for the construction of galvanic cells as well as some of the sensors used in instruments are introduced. Also if corrosion is to be controlled, one has to understand the mechanism of corrosion which itself is explained by electrochemical theory.
- With the increase in demand, a wide variety of materials are coming up; some of them have excellent engineering properties and a few of these materials are introduced.
- Understanding of crystal structures will help to understand the conductivity, semiconductors and superconductors. Magnetic properties are also studied.
- With the increase in demand for power and also with depleting sources of fossil fuels, the demand for alternative sources of fuels is increasing. Some of the prospective fuel sources are introduced.

UNIT I: HIGH POLYMERS AND PLASTICS
Polymerisation : Introduction- Mechanism of polymerization - Stereo regular polymers – methods of polymerization (emulsion and suspension) -Physical and mechanical properties – Plastics as engineering materials : advantages and limitations – Thermoplastics and Thermosetting plastics – Compounding and fabrication (4/5 techniques)- Preparation, properties and applications of polyethene, PVC, Bakelite Teflon and polycarbonates
Elastomers – Natural rubber- compounding and vulcanization – Synthetic rubbers : Buna S, Buna N, Thiokol and polyurethanes – Applications of elastomers.
Composite materials & Fiber reinforced plastics – Biodegradable polymers – Conducting polymers.

UNIT II: FUEL TECHNOLOGY
Fuels:- Introduction – Classification – Calorific value - HCV and LCV – Dulong's formula – Bomb calorimeter – Numerical problems – Coal —– Proximate and ultimate analysis – Significance of the analyses – Liquid fuels – Petroleum- Refining – Cracking – Synthetic petrol –Petrol knocking – Diesel knocking - Octane and Cetane ratings – Anti-knock agents – Power alcohol – Bio-diesel – Gaseous fuels – Natural gas. LPG and CNG – Combustion – Calculation of air for the combustion of a fuel – Flue gas analysis – Orsat apparatus – Numerical problems on combustion.
Explosives:- Introduction, classification, examples: RDX, TNT and ammonium nitrite - rocket fuels.

UNIT III: ELECTROCHEMICAL CELLS AND CORROSION

Galvanic cells - Reversible and irreversible cells – Single electrode potential – Electro chemical series and uses of this series- Standard electrodes (Hydrogen and Calomel electrodes) - Concentration Cells – Batteries: Dry Cell - Ni-Cd cells - Ni-Metal hydride cells - Li cells - Zinc – air cells.

Corrosion:- Definition – Theories of Corrosion (electrochemical) – Formation of galvanic cells by different metals, by concentration cells, by differential aeration and waterline corrosion – Passivity of metals – Pitting corrosion - Galvanic series – Factors which influence the rate of corrosion - Protection from corrosion – Design and material selection – Cathodic protection - Protective coatings: – Surface preparation – Metallic (cathodic and anodic) coatings - Methods of application on metals (Galvanizing, Tinning, Electroplating, Electroless plating)

UNIT IV: CHEMISTRY OF ADVANCED MATERIALS

Nano materials:- Introduction – Sol-gel method & chemical reduction method of preparation – Characterization by BET method and TEM methods - Carbon nano tubes and fullerenes: Types, preparation, properties and applications
Liquid crystals:- Introduction – Types – Applications
Superconductors :- Type-I & Type-2, properties &applications
Green synthesis:- Principles - 3or 4 methods of synthesis with examples – R_4M_4 principles

UNIT V: SOLID STATE CHEMISTRY

Types of solids - close packing of atoms and ions - BCC , FCC, structures of rock salt - cesium chloride- spinel - normal and inverse spinels,
Non-elemental *semiconducting Materials:-* Stoichiometric, controlled valency & Chalcogen photo/semiconductors, Preparation of Semiconductors - Semiconductor Devices:- p-n junction diode as rectifier – junction transistor.
Insulators (electrical and electronic applications)
Magnetic materials:- Ferro and ferri magnetism. Hall effect and its applications.

UNIT VI: NON CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES

Solar Energy: - Introduction, application of solar energy, conversion of solar energy (Thermal conversion & photo conversion) – photovoltaic cell: design, working and its importance
Non-conventional energy sources:
- (i)   Hydropower include setup a hydropower plant (schematic diagram)
- (ii)   Geothermal energy: Introduction-schematic diagram of a geothermal power plant
- (iii)   Tidal and wave power: Introduction- Design and working-movement of tides and their effect on sea level.
- (iv)   Ocean thermal energy: Introduction, closed-cycle, ocean thermal energy conversion (OTEC), open cycle OTEC, hybrid OTEC, schematic diagram and explanation.
- (v)   Biomass and biofuels

Fuel cells:- Introduction - cell representation, H_2-O_2 fuel cell: Design and working, advantages and limitations. Types of fuel cells: Alkaline fuel cell - methanol-oxygen - phosphoric acid fuel cells - molten carbonate fuel cells.

Outcomes: The advantages and limitations of plastic materials and their use in design would be understood. Fuels which are used commonly and their economics, advantages and limitations are discussed. Reasons for corrosion and some methods of corrosion control would be understood. The students would be now aware of materials like nano-materials and fullerenes and their uses. Similarly liquid crystals and superconductors are understood. The importance of green synthesis is well understood and how they are different from conventional methods is also explained. Conductance phenomenon is better understood. The students are exposed to some of the alternative fuels and their advantages and limitations.

Standard Books:
1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publicating Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

Reference Books:
1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
2. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
4. Applied Chemistry by H.D. Gesser, Springer Publishers
5. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press, IIM

	L	T	P	C

I Year - II Semester

L	T	P	C
4	0	0	3

OBJECT-ORIENTED PROGRAMMING THROUGH C++

OBJECTIVES:
- This course is designed to provide a comprehensive study of the C programming language. It stresses the strengths of C, which provide students with the means of writing efficient, maintainable and portable code. The nature of C language is emphasized in the wide variety of examples and applications. To learn and acquire art of computer programming. To know about some popular programming languages and how to choose
- Programming language for solving a problem.

UNIT-I: Introduction to C++
Difference between C and C++- Evolution of C++- The Object Oriented Technology- Disadvantage of Conventional Programming- Key Concepts of Object Oriented Programming- Advantage of OOP- Object Oriented Language.

UNIT-II: Classes and Objects &Constructors and Destructor
Classes in C++-Declaring Objects- Access Specifiers and their Scope- Defining Member Function-Overloading Member Function- Nested class, Constructors and Destructors, Introduction- Constructors and Destructor- Characteristics of Constructor and Destructor- Application with Constructor- Constructor with Arguments (parameterized Constructor- Destructors- Anonymous Objects.

UNIT-III: Operator Overloading and Type Conversion & Inheritance
The Keyword Operator- Overloading Unary Operator- Operator Return Type- Overloading Assignment Operator (=)- Rules for Overloading Operators, Inheritance, Reusability- Types of Inheritance- Virtual Base Classes- Object as a Class Member- Abstract Classes- Advantages of Inheritance-Disadvantages of Inheritance,

UNIT-IV: Pointers & Binding Polymorphisms and Virtual Functions
Pointer, Features of Pointers- Pointer Declaration- Pointer to Class- Pointer Object- The this Pointer- Pointer to Derived Classes and Base Class, Binding Polymorphisms and Virtual Functions, Introduction- Binding in C++- Virtual Functions- Rules for Virtual Function- Virtual Destructor.

UNIT-V: Generic Programming with Templates & Exception Handling

Generic Programming with Templates, Need for Templates- Definition of class Templates-Normal Function Templates- Over Loading of Template Function-Bubble Sort Using Function Templates- Difference Between Templates and Macros- Linked Lists with Templates, Exception Handling- Principles of Exception Handling- The Keywords try throw and catch- Multiple Catch Statements –Specifying Exceptions.

UNIT-VI: Overview of Standard Template Library

Overview of Standard Template Library- STL Programming Model- Containers- Sequence Containers- Associative Containers- Algorithms- Iterators- Vectors- Lists- Maps.

OUTCOMES:

- Understand the basic terminology used in computer programming
- Write, compile and debug programs in C language. Use different data types in a computer program.
- Design programs involving decision structures, loops and functions.
- Explain the difference between call by value and call by reference

Text Books:

1. A First Book of C++, Gary Bronson, Cengage Learing.
2. The Complete Reference C++, Herbert Schildt, TMH.
3. Programming in C++, Ashok N Kamathane, Pearson 2nd Edition.

Reference Books:

1. Object Oriented Programming C++, Joyce Farrell, Cengage.
2. C++ Programming: from problem analysis to program design, DS Malik, Cengage Learing.

	L	T	P	C
I Year - II Semester	**4**	**0**	**0**	**3**

ENVIRONMENTAL STUDIES

Course Learning Objectives:

The objectives of the course is to impart

- Overall understanding of the natural resources
- Basic understanding of the ecosystem and its diversity
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
- An understanding of the environmental impact of developmental activities
- Awareness on the social issues, environmental legislation and global treaties

Course Outcomes:

The student should have knowledge on

- The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources

- The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web

- The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity

- Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices

- Social issues both rural and urban environment and the possible means to combat the challenges

- The environmental legislations of India and the first global initiatives towards sustainable development.

- About environmental assessment and the stages involved in EIA and the environmental audit.

- Self Sustaining Green Campus with Environment Friendly aspect of – Energy, Water and Wastewater reuse Plantation, Rain water Harvesting, Parking Curriculum.

Syllabus:

UNIT – I Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance –Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, Carbon Credits, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT – II Natural Resources: Natural resources and associated problems

Forest resources – Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people

Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Sustainable mining of Granite, Literate, Coal, Sea and River sands.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources Vs Oil and Natural Gas Extraction.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT – III Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT – IV Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act - Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

UNIT – VI Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada

2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.

3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.

2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi

3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi

4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

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I Year - II Semester	**4**	**0**	**0**	**3**

ENIGINEERING MECHANICS

Objectives: The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, Forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

UNIT – I
Objectives: The students are to be exposed to the concepts of force and friction, direction and its application.
Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Friction: Introduction**,** limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction

UNIT II
Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorm, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium, analysis of plane trusses.

UNIT – III
Objectives : The students are to be exposed to concepts of centre of gravity.
Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures

Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

UNIT IV
Objective: The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.
Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.
Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT – V

Objectives: The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.
Kinematics: Rectilinear and Curvelinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion. **Kinetics:** Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

UNIT – VI

Objectives: The students are to be exposed to concepts of work, energy and particle motion
Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

Text Books :

1. Engg. Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications.

References:

1.   Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – Pearson Publ.
2.   Engineering Mechanics, statics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
3.   Engineering Mechanics, statics and dynamics – I.H.Shames, – Pearson Publ.
4.   Mechanics For Engineers, statics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
5.   Mechanics For Engineers, dynamics - F.P.Beer & E.R.Johnston –5th Edn Mc Graw Hill Publ.
6.   Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best & W.G. McLean, 5th Edn – Schaum's outline series - Mc Graw Hill Publ.
7.   Singer's Engineering Mechanics: Statics And Dynamics, K. Vijay Kumar Reddy, J. Suresh Kumar, Bs Publications
8.   Engineering Mechanics, Fedinand . L. Singer, Harper – Collins.
9.   Engineering Mechanics statics and dynamics , A Nelson , Mc Graw Hill publications

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I Year - II Semester

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APPLIED / ENGINEERING CHEMISTRY LABORATORY (*Common to all branches*)

1. Introduction to Chemistry laboratory – Molarity, Normality, Primary, secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis, etc.

2. Trial experiment - Determination of HCl using standard Na_2CO_3 solution.

3. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.

4. Determination of $KMnO_4$ using standard Oxalic acid solution.

5. Determination of Ferrous iron using standard $K_2Cr_2O_7$ solution.

6. Determination of Copper using standard $K_2Cr_2O_7$ solution.

7. Determination of temporary and permanent hardness of water using standard EDTA solution.

8. Determination of Copper using standard EDTA solution.

9. Determination of Iron by a Colorimetric method using thiocynate as reagent.

10. Determination of pH of the given sample solution using pH meter.

11. Conductometric titration between strong acid and strong base.

12. Conductometric titration between strong acid and weak base.

13. Potentiometric titration between strong acid and strong base.

14. Potentiometric titration between strong acid and weak base.

15. Determination of Zinc using standard EDTA solution.

16. Determination of Vitamin – C.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books
1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr. Jyotsna Cherukuris (2012) *Laboratory Manual of engineering chemistry-II,* VGS Techno Series
3. Chemistry Practical Manual, Lorven Publications
4. K. Mukkanti (2009) *Practical Engineering Chemistry,* B.S. Publication

I Year - II Semester	**ENGLISH - COMMUNICATION SKILLS LAB- II**	**L**	**T**	**P**	**C**
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PRESCRIBED LAB MANUAL FOR SEMESTER II:

'INTERACT: English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

OBJECTIVES:

To enable the students to learn demonstratively the communication skills of listening, speaking, reading and writing.

OUTCOME:

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

UNIT 1:

1. Debating
   Practice work

UNIT 2:

1. Group Discussions
   Practice work

UNIT 3:

1. Presentation Skills
   Practice work

UNIT 4:

1. Interview Skills
   Practice work

UNIT 5:

1. Email,
2. Curriculum Vitae
   Practice work

UNIT 6:

1. Idiomatic Expressions
2. Common Errors in English
   Practice work

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

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I Year - II Semester

OBJECT-ORIENTED PROGRAMMING LAB

OBJECTIVE

- To strengthen their problem solving ability by applying the characteristics of an object- oriented approach.

- To introduce object oriented concepts in C++ and Java.

Programmig:

Exercise – 1 (Basics)
Write a Simple Program on printing "Hello World" and "Hello Name" where name is the input from the user
   a) Convert any two programs that are written in C into C++
   b) Write a description of using g++ (150 Words)

Exercise – 2 (Expressions Control Flow)
 a) Write a Program that computes the simple interest and compound interest payable on principalamount(inRs.)ofloanborrowedbythecustomerfromabankforagiverperiodof time (in years) at specific rate of interest. Further determine whether the bank will benefit by charging simple interest or compound interest.

 b) WriteaProgramtocalculatethefareforthepassengerstravelinginabus. WhenaPassenger enters the bus, the conductor asks "What distance will you travel?" On knowing distance from passenger (as an approximate integer), the conductor mentions the fare to the passenger according to following criteria.

Exercise – 3 (Variables, Scope, Allocation)

  a) Write a program to implement call by value and call by reference using reference variable.

  b) Write a program to illustrate scope resolution, new and delete Operators. (Dyanamic Memory
    Allocation)

  c) Write a program to illustrate Storage classes

  d) Write a program to illustrate Enumerations

Exercises –4 (Functions)

Write a program illustrating Inline Functions

    a) Write a program illustrate function overloading. Write 2 overloading functions for power.

    b) Write a program illustrate the use of default arguments for simple interest function.

Exercise -5 (Functions –Exercise   Continued)

a) Write a program to illustrate function overloading. Write 2 overloading functions for adding two numbers

b) Write a program illustrate function template for power of a number.

c) Write a program to illustrate function template for swapping of two numbers.

Exercise -6 (Classes Objects)

Create a Distance class with:

    • feet and inches as data members

    • member function to input distance

    • member function to output distance

    • member function to add two distance objects

  a). Write a main function to create objects of DISTANCE class. Input two distances and output the sum.

  b). Write a C++ Program to illustrate the use of Constructors and Destructors (use the above program.)

c) Write a program for illustrating function overloading in adding the distance between objects (use the above problem)

d). Write a C++ program demonstrating a BankAccount with necessary methods and variables

  Exercise – 7 (Access)

  Write a program for illustratingAccess Specifiers public, private, protected

  a) Write a program implementing Friend Function

  b) Write a program to illustrate this pointer

  c) Write a Program to illustrate pointer to a class

  d)

  Exercise -8 (Operator Overloading)

  a). Write a program to Overload Unary, and Binary Operators as Member Function, and Non Member Function.

  i. Unary operator as member function

  ii. Binary operator as nonmember function

b). Write a c ++ program to implement the overloading assignment = operator

c).Write a case study on Overloading Operators and Overloading Functions (150 Words)

Exercise -9 (Inheritance)
 a) Write C++ Programs and incorporating various forms of Inheritance
   i) Single Inheritance
   ii) Hierarchical Inheritance
   iii) Multiple Inheritances
   iv) Multi-level inheritance
   v) Hybrid inheritance
b) Write a program to show Virtual Base Class

c) Write a case study on using virtual classes (150 Words)

Exercise-10 (Inheritance –Continued)
a) Write a Program in C++ to illustrate the order of execution of constructors and destructors in inheritance
b) Write a Program to *show* how *constructors* are invoked in *derived class*

Exercise -11 (Polymorphism)
   a) Write a program to illustrate runtime polymorphism
   b) Write a program to illustrate this pointer
   c) Write a program illustrates pure virtual function and calculate the area of different shapes by using abstract class.
   d) Write a case study on virtual functions (150 Words)

Exercise -12(Templates)
   a) Write a C++ Program to illustrate template class

   b) Write a Program to illustrate class templates with multiple parameters

   c) Write a Program to illustrate member function templates

Exercise -13 (Exception Handling)
a).Write a Program for Exception Handling Divide by zero

 b). Write a Program to rethrow an Exception

Exercise -14 (STL)
a) Write a Program to implement List and List Operations

b) Write a Program to implementVector andVector Operations

Exercise -15 (STLContinued)
a) Write a Program to implement Deque and Deque Operations

b) Write a Program to implement Map and Map Operations

OUTCOMES:

- Explain whatconstitutesanobject-oriented approachtoprogrammingandidentify potential benefits of object-oriented programming over other approaches.

- Apply an object-oriented approach to developing applications of varying complexities

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STATISTICS WITH R PROGRAMMING

OBJECTIVE:
After taking the course, students will be able to
- ➢ Use R for statistical programming, computation, graphics, and modeling,
- ➢ Write functions and use R in an efficient way,
- ➢ Fit some basic types of statistical models
- ➢ Use R in their own research,
- ➢ Be able to expand their knowledge of R on their own.

UNIT-I:
Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

UNIT-II:
R Programming Structures, Control Statements, Loops, - Looping Over Nonvector Sets,- If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quicksort Implementation-Extended Extended Example: A Binary Search Tree.

UNIT-III:
Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability-Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /out put, Accessing the Keyboard and Monitor, Reading and writer Files,

UNIT-IV:
Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function – Customizing Graphs, Saving Graphs to Files.

UNIT-V:

Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions
Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.

UNIT-VI:

Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models,
Logistic Regression, - Poisson Regression- other Generalized Linear Models-Survival Analysis,
Nonlinear Models, Splines- Decision- Random Forests,

OUTCOMES:

At the end of this course, students will be able to:
- List motivation for learning a programming language
- Access online resources for R and import new function packages into the R workspace
- Import, review, manipulate and summarize data-sets in R
- Explore data-sets to create testable hypotheses and identify appropriate statistical tests
- Perform appropriate statistical tests using R Create and edit visualizations with

TEXT BOOKS:

1) The Art of R Programming, A K Verma, Cengage Learning.

2) R for Everyone, Lander, Pearson

3) The Art of R Programming, Norman Matloff, No starch Press.

REFERENCE BOOKS:

1) R Cookbook, Paul Teetor, Oreilly.

2) R in Action, Rob Kabacoff, Manning

MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

OBJECTIVES:
- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science.

UNIT -I:

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof. Predicate Calculus:Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT -II:

Set Theory: Introduction, Operations on Binary Sets, Principle of Inclusion and Exclusion, *Relations:* Properties of Binary Relations, Relation Matrix and Digraph, Operations on Relations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams, *Functions:* Bijective Functions, Composition of Functions, Inverse Functions, Permutation Functions, Recursive Functions, Lattice and its Properties.

UNIT- III:

Algebraic Structures and Number Theory: *Algebraic Structures:*Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism, *Number Theory:*Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem)

UNIT -IV:

Combinatorics: Basic of Counting, Permutations, Permutations with Repetitions, Circular Permutations, Restricted Permutations, Combinations, Restricted Combinations, Generating Functions of Permutations and Combinations, Binomial and Multinomial Coefficients, Binomial and Multinomial Theorems, The Principles of Inclusion–Exclusion, Pigeonhole Principle and its Application.

UNIT -V:

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations

UNIT -VI:

Graph Theory: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

OUTCOMES:
- Student will be able to demonstrate skills in solving mathematical problems
- Student will be able to comprehend mathematical principles and logic
- Student will be able to demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
- Student will be able to manipulate and analyze data numerically and/or graphically using appropriate Software
- Student will be able to communicate effectively mathematical ideas/results verbally or in writing

TEXT BOOKS:
1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rdEdition, Tata McGraw Hill.
3. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

REFERENCE BOOKS:
1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P. Baker, 2nd Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, BernandKolman, Robert C. Busby, Sharon Cutler Ross, PHI.
3. Discrete Mathematics, S. K. Chakraborthy and B.K. Sarkar, Oxford, 2011.

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II Year - I Semester

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DIGITAL LOGIC DESIGN

OBJECTIVE:
- To introduce the basic tools for design with combinational and sequential digital logic and state machines.
- To learn simple digital circuits in preparation for computer engineering.

UNIT- I: Digital Systems and Binary Numbers
Digital Systems, Binary Numbers, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Complements of Numbers, Signed Binary Numbers,Arithmetic addition and subtraction

UNIT -II: Concept of Boolean algebra
Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms,

UNIT- III: Gate level Minimization
Map Method, Two-Variable K-Map, Three-Variable K-Map, Four Variable K-Maps. Products of Sum Simplification, Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation, Exclusive-OR Function

UNIT- IV:Combinational Logic
Introduction, Analysis Procedure, Design Procedure, Binary Adder–Subtractor, Decimal Adder, Binary Multiplier, Decoders, Encoders, Multiplexers, HDL Models of Combinational Circuits

UNIT- V: Synchronous Sequential Logic
Introduction to Sequential Circuits, Storage Elements: Latches, Storage Elements: Flip-Flops, Analysis of Clocked **Sequential** Circuits, Mealy and Moore Models of Finite State Machines

UNIT -VI: Registers and Counters
Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter, Ripple Counter

OUTCOMES:

A student who successfully fulfills the course requirements will have demonstrated:

- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different switching algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- An ability to define the other minimization methods for any number of variables Variable Entered Mapping (VEM) and Quine-MeCluskey (QM) Techniques and perform an algorithmic reduction of logic functions.

TEXT BOOKS:

1. Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA.
2. Fundamentals of Logic Design, 5/e, Roth, Cengage.

REFERENCE BOOKS:

1. Digital Logic and Computer Design, M.Morris Mano, PEA.
2. Digital Logic Design, Leach, Malvino, Saha, TMH.
3. Modern Digital Electronics, R.P. Jain, TMH.

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PYTHON PROGRAMMING

OBJECTIVES:

- Introduction to Scripting Language
- Exposure to various problems solving approaches of computer science

UNIT – I:
Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

UNIT – II:
Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass

UNIT – III:
Data Structures Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions.

UNIT – IV:
Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions(Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

Modules: Creating modules, import statement, from. Import statement, name spacing,

Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages

UNIT – V:
Object Oriented Programming OOP in Python: Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Datahiding,

Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions

UNIT – VI:

Brief Tour of the Standard Library - Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics

Testing: Why testing is required ?, Basic concepts of testing, Unit testing in Python, Writing Test cases, Running Tests.

OUTCOMES:
- Making Software easily right out of the box.
- Experience with an interpreted Language.
- To build software for real needs.
- Prior Introduction to testing software

TEXT BOOKS
1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Learning Python, Mark Lutz, Orielly

Reference Books:
1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage

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DATA STRUCTURES THROUGH C++

OBJECTIVES:
- To be familiar with basic techniques of object oriented principles and exception handling using C++
- To be familiar with the concepts like Inheritance, Polymorphism
- Solve problems using data structures such as linear lists, stacks, queues, hash tables
- Be familiar with advanced data structures such as balanced search trees, AVLTrees, and B Trees.

UNIT-I: ARRAYS
Abstract Data Types and the C++ Class, An Introduction to C++ Class- Data Abstraction and Encapsulation in C++- Declaring Class Objects and Invoking Member Functions- Special Class Operations- Miscellaneous Topics- ADTs and C++Classes, The Array as an Abstract Data Type, The Polynomial Abstract Data type- Polynomial Representation- Polynomial Addition. Spares Matrices, Introduction- Sparse Matrix Representation- Transposing a Matrix- Matrix Multiplication, Representation of Arrays.

UNIT-II: STACKS AND QUEUES
Templates in C++, Template Functions- Using Templates to Represent Container Classes, The Stack Abstract Data Type, The Queue Abstract Data Type, Subtyping and Inheritance in C++, Evaluation of Expressions, Expression- Postfix Notation- Infix to Postfix.

UNIT-III: LINKED LISTS
Single Linked List and Chains, Representing Chains in C++, Defining a Node in C++- Designing a Chain Class in C++- Pointer manipulation in C++- Chain Manipulation Operations, The Template Class Chain, Implementing Chains with Templates- Chain Iterators- Chain Operations- Reusing a Class, Circular Lists, Available Space Lists, Linked Stacks and Queues, Polynomials, Polynomial Representation- Adding Polynomials- Circular List Representation of Polynomials, Equivalence Classes, Sparse Matrices, Sparse Matrix Representation- Sparse Matrix Input- Deleting a Sparse Matrix, Doubly Linked Lists, Generalized Lists, Representation of Generalized Lists- Recursive Algorithms for Lists- Reference Counts, Shared and Recursive Lists

UNIT-IV: TREES
Introduction, Terminology, Representation of Trees, Binary Trees, The Abstract Data Type, Properties of Binary Tress, Binary Tree Representations, Binary Tree Traversal and Tree Iterators, Introduction, Inorder Traversal Preorder Traversal, Postorder Traversal, Thread Binary Trees, Threads, Inorder Traversal of a Threaded Binary Tree, Inserting a Node into a Threaded Binary Tree, Heaps, Priority Queues, Definition of a Max Heap, Insertion into a Max Heap, Deletion from a Max Heap, Binary Search Trees, Definition, Searching a Binary Search Tree,

Insertion into a Binary Search Tree, Deletion from a Binary Search Tree, Height of Binary Search Tree.

UNIT-V: GRAPHS
The Graph Abstract Data Type, Introduction, Definition, Graph Representation, Elementary Graph Operation, Depth First Search, Breadth First Search, Connected Components, Spanning Trees, Biconnected Components, Minimum Cost Spanning Trees, Kruskal S Algorithm, Prim s Algorithm Sollin' s   Algorithm, Shortest Paths and Transitive Closure, Single Source/All Destination: Nonnegative Edge Cost, Single Source/All Destination: General Weights, All-Pairs Shortest Path, Transitive Closure.

UNIT-VI: SORTING
Insertion Sort, Quick Sort, Merge Sort Merging, Iterative Merge Sort, Recursive Merge Sort, Heap Sort.

OUTCOMES:
- Distinguish between procedures and object oriented programming.
- Apply advanced data structure strategies for exploring complex data structures.
- Compare and contrast various data structures and design techniques in the area of Performance.
- Implement data structure algorithms through C++. • Incorporate data structures into the applications such as binary search trees, AVL and B Trees
- Implement all data structures like stacks, queues, trees, lists and graphs and compare their Performance   and trade offs

TEXT BOOKS:
1. Fundamentals of Data Structures in C++, Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, 2nd Edition, Universities Press (India) Pvt. Ltd.
2. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.
3. Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and .Mount, Wiley student edition, John Wiley and Sons.

REFERENCE BOOKS:
1. Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson
2. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
3. Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education

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COMPUTER GRAPHICS

OBJECTIVES:

- To develop, design and implement two and three dimensional graphical structures
- To enable students to acquire knowledge Multimedia compression and animations
- To learn Creation, Management and Transmission of Multimedia objects.

UNIT-I:
2D Primitives Output primitives – Line, Circle and Ellipse drawing algorithms - Attributes of output primitives – Two dimensional Geometric transformations - Two dimensional viewing – Line, Polygon, Curve and Text clipping algorithms

UNIT-II:
3D Concepts Parallel and Perspective projections - Three dimensional object representation – Polygons, Curved lines, Splines, Quadric Surfaces, - Visualization of data sets - 3Dtransformations – Viewing -Visible surface identification.

UNIT-III:
Graphics Programming Color Models – RGB, YIQ, CMY, HSV – Animations – General Computer Animation, Raster, Keyframe - Graphics programming using OPENGL – Basic graphics primitives –Drawing three dimensional objects - Drawing three dimensional scenes

UNIT- IV:
Rendering Introduction to Shading models – Flat and Smooth shading – Adding texture to faces –Adding shadows of objects – Building a camera in a program – Creating shaded objects– Rendering texture – Drawing Shadows.

UNIT- V:
FractalsFractals and Self similarity – Peano curves – Creating image by iterated functions – Mandelbrot sets – Julia Sets – Random Fractals

UNIT- VI:

Overview of Ray Tracing Intersecting rays with other primitives – Adding Surface texture –
Reflections andTransparency – Boolean operations on Objects.

OUTCOMES:

- Know and be able to describe the general software architecture of programs that use 3D computer graphics.
- Know and be able to discuss hardware system architecture for computer graphics. This Includes, but is not limited to: graphics pipeline, frame buffers, and graphic accelerators/co-processors.
- Know and be able to select among models for lighting/shading: Color, ambient light; distant and light with sources; Phong reflection model; and shading (flat, smooth, Gourand, Phong).

TEXT BOOKS:

1. Donald Hearn, Pauline Baker, Computer Graphics – C Version, second edition   Pearson Education,2004.
2. F.S. Hill, Computer Graphics using OPENGL, Second edition, Pearson Education, 2003.

REFERENCE BOOKS:

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007.

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DATASTRUCTURES THROUGH C++ LAB

OBJECTIVES:

- To develop skills to design and analyze simple linear and non linear data structures

- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem

- To Gain knowledge in practical applications of data structures

List of Experiments:

1. Implementation of Singly linked list.

2. Implementation of Doubly linked list.

3. Implementation of Multistack in a Single Array.

4. Implementation of Circular Queue

5. Implementation of Binary Search trees.

6. Implementation of Hash table.

7. Implementation of Heaps.

8. Implementation of Breadth First Search Techniques.

9. Implementation of Depth First Search Techniques.

10. Implementation of Prim's Algorithm.

11. Implementation of Dijkstra's Algorithm.

12. Implementation of Kruskal's Algorithm

13. Implementation of MergeSort

14. Implementation of Quick Sort

15. Implementation of Data Searching using divide and conquer technique

OUTCOMES:

At the end of this lab session, the student will
- Be able to design and analyze the time and space efficiency of the data structure

- Be capable to identity the appropriate data structure for given problem

Have practical knowledge on the application of data structures

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II Year - I Semester

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PYTHON PROGRAMMING LAB

Exercise 1 - Basics

a) Running instructions in Interactive interpreter and a Python Script
b) Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 - Operations

a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise - 3 Control Flow

a) Write a Program for checking whether the given number is a even number or not.

b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10

c) Write a program using a for loop that loops over a sequence. What is sequence ?

d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow - Continued

a) Find the sum of all the primes below two million.
Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:

1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise - 5 - DS

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure
b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Exercise - 6 DS - Continued

a) Write a program combine_lists that combines these lists into a dictionary.

b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 7 Files

a) Write a program to print each line of a file in reverse order.
b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 8 Functions

a) Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

   Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius

   If (distance between two balls centers) <= (sum of their radii) then (they are colliding)

b) Find mean, median, mode for the given set of numbers in a list.

Exercise - 9 Functions - Continued

a) Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
b) Write a function dups to find all duplicates in the list.
c) Write a function unique to find all the unique elements of a list.

Exercise - 10 - Functions - Problem Solving

a) Write a function cumulative_product to compute cumulative product of a list of numbers.
b) Write a function reverse to reverse a list. Without using the reverse function.
c) Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 11 - Multi-D Lists

a) Write a program that defines a matrix and prints
b) Write a program to perform addition of two square matrices
c) Write a program to perform multiplication of two square matrices

Exercise - 12 - Modules

a)   Install packages requests, flask and explore them. using (pip)
b)   Write a script that imports requests and fetch content from the page. Eg. (Wiki)
c)   Write a simple script that serves a simple HTTPResponse and a simple HTML Page

Exercise - 13 OOP

a) Class variables and instance variable and illustration of the self variable
   i) Robot
   ii) ATM Machine

Exercise - 14 GUI, Graphics

1. Write a GUI for an Expression Calculator using tk
2. Write a program to implement the following figures using turtle
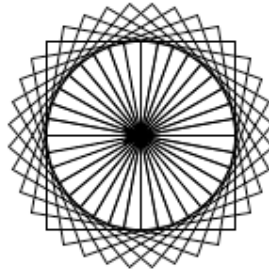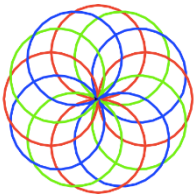
Exercise - 15 - Testing

a) Write a test-case to check the function even_numbers which return True on passing a list of all
   even numbers
b) Write a test-case to check the function reverse_string which returns the reversed string

Exercise - 16 - Advanced

a)   Build any one classical data structure.
b)   Write a program to solve knapsack problem.

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SOFTWARE ENGINEERING

OBJECTIVES
- ➤ To understand the software life cycle models.
- ➤ To understand the software requirements and SRS document.
- ➤ To understand the importance of modeling and modeling languages.
- ➤ To design and develop correct and robust software products.
- ➤ To understand the quality control and how to ensure good quality software.
- ➤ To understand the planning and estimation of software projects.
- ➤ To understand the implementation issues, validation and verification procedures.
- ➤ To understand the maintenance of software

UNIT-I:
Software and Software Engineering: The Nature of Software, The Unique Nature of WebApps, Software Engineering, Software Process, Software Engineering Practice, Software Myths.
Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Terminology, Product and Process.

UNIT-II:
Requirements Analysis And Specification: Requirements Gathering and Analysis, Software Requirement Specification (SRS), Formal System Specification.
Software Design: Overview of the Design Process, How to Characterise of a Design?, Cohesion and Coupling, Layered Arrangement of Modules, Approaches to Software Design

UNIT – III:
Function-Oriented Software Design: Overview of SA/SD Methodology, Structured Analysis, Developing the DFD Model of a System, Structured Design, Detailed Design, Design Review, over view of Object Oriented design.

User Interface Design: Characteristics of Good User Interface, Basic Concepts, Types of User Interfaces, Fundamentals of Component-based GUI Development, A User Interface Design Methodology.

UNIT – IV:
Coding And Testing: Coding, Code Review, Software Documentation, Testing, Unit Testing, Black-Box Testing, White-Box Testing, Debugging, Program Analysis Tool, Integration Testing,

Testing Object-Oriented Programs, System Testing, Some General Issues Associated with Testing

UNIT – V:
Software Reliability And Quality Management: Software Reliability, Statistical Testing, Software Quality, Software Quality Management System, ISO 9000, SEI Capability Maturity Model.

Computer Aided Software Engineering: Case and its Scope, Case Environment, Case Support in Software Life Cycle, Other Characteristics of Case Tools, Towards Second Generation CASE Tool, Architecture of a Case Environment

UNIT – VI
Software Maintenance: Software maintenance, Maintenance Process Models, Maintenance Cost, Software Configuration Management.
Software Reuse: what can be Reused? Why almost No Reuse So Far? Basic Issues in Reuse Approach, Reuse at Organization Level.

OUTCOMES
 - Define and develop a software project from requirement gathering to implementation.
 - Obtain knowledge about principles and practices of software engineering.
 - Focus on the fundamentals of modeling a software project.
 - Obtain knowledge about estimation and maintenance of software systems

TEXT BOOKS:
1. Software Engineering - Concepts and Practices: Ugrasen Suman, Cengage Learning
2. Software Engineering - A Practitioner's Approach, Roger S. Pressman, Seventh Edition McGrawHill International Edition.
3. Fundamentals of Software Engineering, Rajib Mall, Third Edition, PHI.
4. Software Engineering, Ian Sommerville, Ninth edition, Pearson education

REFERENCE BOOKS:
1. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
2. Software Engineering, A Precise Approach, PankajJalote, Wiley India,2010.
3. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
4. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.

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II Year - II Semester

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JAVA PROGRAMMING

OBJECTIVES:

- Understanding the OOP's concepts, classes and objects, threads, files, applets, swings and act.
- This course introduces computer programming using the JAVA programming language with object-oriented programming principles.
- Emphasis is placed on event-driven programming methods, including creating and manipulating objects, classes, and using Java for network level programming and middleware development

UNIT-I:

Introduction to OOP, procedural programming language and object oriented language, principles of OOP, applications of OOP, history of java, java features, JVM, program structure.

Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and associativity, primitive type conversion and casting, flow of control.

UNIT-II:

Classes and objects, class declaration, creating objects, methods, constructors and constructor overloading, garbage collector, importance of static keyword and examples, this keyword, arrays, command line arguments, nested classes.

UNIT-III:

Inheritance, types of inheritance, super keyword, final keyword, overriding and abstract class.
Interfaces, creating the packages, using packages, importance of CLASSPATH and java.lang package. Exception handling, importance of try, catch, throw, throws and finally block, user-defined exceptions, Assertions.

UNIT-IV:

Multithreading: introduction, thread life cycle, creation of threads, thread priorities, thread synchronization, communication between threads. Reading data from files and writing data to files, random access file,

UNIT-V:

Applet class, Applet structure, Applet life cycle, sample Applet programs. Event handling: event delegation model, sources of event, Event Listeners, adapter classes, inner classes.

UNIT-VI:
AWT: introduction, components and containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Container class, Layouts, Menu and Scrollbar.

OUTCOMES:
- Understand Java programming concepts and utilize Java Graphical User Interface in Program writing.
- Write, compile, execute and troubleshoot Java programming for networking concepts.
- Build Java Application for distributed environment.
- Design and Develop multi-tier applications.
- Identify and Analyze Enterprise applications.

TEXT BOOKS:
1. The complete Reference Java, 8th edition, Herbert Schildt, TMH.
2. Programming in JAVA, Sachin Malhotra, SaurabhChoudary, Oxford.
3. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson.

REFERENCE BOOKS:
1. Swing: Introduction, JFrame, JApplet, JPanel, Componets in Swings, Layout Managers in
2. Swings, JList and JScrollPane, Split Pane, JTabbedPane, JTree, JTable, Dialog Box.

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ADVANCED DATA STRUCTURES

OBJECTIVES:
- Describe and implement a variety of advanced data structures (hash tables, priority queues, balanced search trees, graphs).
- Analyze the space and time complexity of the algorithms studied in the course.
- Identify different solutions for a given problem; analyze advantages and disadvantages to different solutions.
- Demonstrate an understanding of external memory and external search and sorting algorithms.
- Demonstrate an understanding of simple Entity-Relationship models for databases.

UNIT-I: SORTING
External Sorting, Introduction, K-way Merging - Buffer Handling for parallel Operation- Run Generation- Optimal Merging of Runs.

UNIT-II: HASHING
Introduction-Static Hashing- Hash Table- Hash Functions- Secure Hash Function- Overflow Handling- Theoretical Evaluation of Overflow Techniques, Dynamic Hashing- Motivation for Dynamic Hashing -Dynamic Hashing Using Directories- Directory less Dynamic, Hashing,

UNIT-III: PRIORITY QUEUES (HEAPS)
Model, Simple Implementation, Binary Heap-Structure Property-Heap-Order Property-Basic Heap Operations- Other Heap Operation, Applications of Priority Queues- The Selection Problem Event Simulation Problem, Binomial Queues- Binomial Queue Structure – Binomial Queue Operation- Implementation of Binomial Queues

UNIT-IV: EFFICIENT BINARY SEARCH TREES
Optimal Binary Search Trees, AVL Trees, Red-Black Trees, Definition- Representation of a Red- Black Tree- Searching a Red-Black Tree- Inserting into a Red Black Tree- Deletion from a Red-Black Tree- Joining Red-Black Trees, Splitting a Red-Black tree.

UNIT-V: MULTIWAY SEARCH TREES
M-Way Search Trees, Definition and Properties- Searching an M-Way Search Tree, B-Trees, Definition and Properties- Number of Elements in a B-tree- Insertion into B-Tree- Deletion from a B-Tree- B+-Tree Definition- Searching a B+-Tree- Insertion into B+-tree- Deletion from a B+-Tree.

UNIT-VI: DIGITAL SEARCH STRUCTURES

Digital Search Trees, Definition- Search, Insert and Delete- Binary tries and Patricia, Binary Tries, Compressed Binary Tries- Patricia, Multiway Tries- Definitions- Searching a Trie-Sampling Strategies- Insertion into a Trie- Deletion from a Trie- Keys with Different Length-Height of a Trie- Space Required and Alternative Node Structure- Prefix Search and Applications- Compressed Tries- Compressed Tries With Skip Fields- Compressed Tries With Labeled Edges- Space Required by a Compressed Tries, Tries and Internet Packet Forwarding ,-IP Routing- 1-Bit Tries- Fixed-Stride Tries-Variable-Stride Tries.

OUTCOMES:
- Be able to understand and apply amortised analysis on data structures, including binary search trees, mergable heaps, and disjoint sets.
- Understand the implementation and complexity analysis of fundamental algorithms such as RSA, primality testing, max flow, discrete Fourier transform.
- Have an idea of applications of algorithms in a variety of areas, including linear programming and duality, string matching, game-theory

TEXT BOOKS:
1. Data Structures, a Pseudocode Approach, Richard F Gilberg, Behrouz A Forouzan, Cengage.
2. Fundamentals of Data Structures in C++, Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, 2nd Edition, Universities Press (India) Pvt. Ltd
3. Data structures and Algorithm Analysis in C++, 2nd Edition, Mark Allen Weiss, Pearson

REFERENCE BOOKS:
1. Web : http://lcm.csa.iisc.ernet.in/dsa/dsa.html
2. http://utubersity.com/?page_id=878
3. http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures
4. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms
5. File Structures :An Object oriented approach with C++, 3rd ed, Michel J Folk, Greg Riccardi, Bill Zoellick
6. C and Data Structures: A Snap Shot oriented Treatise with Live examples from Science and Engineering, NB Venkateswarlu & EV Prasad, S Chand, 2010

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COMPUTER ORGANIZATION

OBJECTIVES:

- Understand the architecture of a modern computer with its various processing units. Also the Performance measurement of the computer system.
- In addition to this the memory management system of computer.

UNIT -I:
Basic Structure Of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.

UNIT -II:
Machine Instruction and Programs:
Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types,
Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, shift and Rotate Instructions

UNIT -III:
Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

UNIT -IV:
INPUT/OUTPUT ORGANIZATION: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access,
Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

UNIT -V:
The MEMORY SYSTEMS: Basic memory circuits, Memory System Consideration, Read-Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory,
Cache Memories: Mapping Functions, INTERLEAVING
Secondary Storage: Magnetic Hard Disks, Optical Disks,

UNIT -VI:

Processing Unit: Fundamental Concepts: Register Transfers, Performing An Arithmetic Or Logic Operation, Fetching A Word From Memory,

Execution of Complete Instruction, Hardwired Control,

Micro programmed Control: Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field

OUTCOMES:
- Students can understand the architecture of modern computer.
- They can analyze the Performance of a   computer using performance equation
- Understanding of different instruction types.
- Students can calculate the effective address of an operand by addressing modes
- They can understand how computer stores positive and negative numbers.
- Understanding of how a computer performs arithmetic operation of positive and negative numbers.

TEXT BOOKS:

1. Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th Edition,
   McGraw Hill.
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill.

REFERENCE BOOKS:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson
3. Fundamentals or Computer Organization and Design, - Sivaraama Dandamudi Springer Int.
   Edition.
4. "Computer Organization and Design: The Hardware/Software Interface" by David A.
   Patterson and John L. Hennessy.
5. J .P. Hayes, "Computer Architecture and Organization", McGraw-Hill, 1998.

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II Year – II Semester

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FORMAL LANGUAGE AND AUTOMATA THEORY

OBJECTIVE:
- Introduce the student to the concepts of Theory of computation in computer science
- The students should acquire insights into the relationship among formal languages, formal Grammars and automat.

UNIT – I: Finite Automata

Why Study Automata Theory? The Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String by a Finite Automation, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with E-Transition, Minimization of Finite Automata, Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT – II: Regular Expressions

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two Regular Expressions, Manipulations of Regular Expressions, Finite Automata, and Regular Expressions, Inter Conversion, Equivalence between Finite Automata and Regular Expressions, Pumping Lemma, Closers Properties, Applications of Regular Expressions, Finite Automata and Regular Grammars, Regular Expressions and Regular Grammars.

UNIT – III: Context Free Grammars

Formal Languages, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, E-Productions and Unit Productions, Normal Forms for Context Free Grammars-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

UNIT – IV: Pushdown Automata

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description Language Acceptance of pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.

UNIT – V: Turning Machine

Turing Machine, Definition, Model, Representation of Turing Machines-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a Turing Machine, Design of Turing Machines, Techniques for Turing Machine Construction, Types of Turing Machines, Church's Thesis, Universal Turing Machine, Restricted Turing Machine.

UNIT – VI: Computability

Decidable and Un-decidable Problems, Halting Problem of Turing Machines, Post's Correspondence Problem, Modified Post's Correspondence Problem, Classes of P and NP, NP-Hard and NP-Complete Problems.

OUTCOMES:
- Classify machines by their power to recognize languages,
- Employ finite state machines to solve problems in computing,
- Explain deterministic and non-deterministic machines,
- Comprehend the hierarchy of problems arising in the computer science

TEXT BOOKS:
1. Introduction to Automata Theory, Languages and Computation, J.E.Hopcroft, R.Motwani and J.D.Ullman, 3rd Edition, Pearson, 2008.
2. Theory of Computer Science-Automata, Languages and Computation, K.L.P.Mishra and N.Chandrasekharan, 3rd Edition, PHI, 2007.

REFERENCE BOOKS:
1. Formal Language and Automata Theory, K.V.N.Sunitha and N.Kalyani, Pearson, 2015.
2. Introduction to Automata Theory, Formal Languages and Computation, Shyamalendu Kandar, Pearson, 2013.
3. Theory of Computation, V.Kulkarni, Oxford University Press, 2013.
   4. Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014.

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PRINCIPLES OF PROGRAMMING LANGUAGES

OBJECTIVES:
- To understand and describe syntax and semantics of programming languages
- To understand data, data types, and basic statements
- To understand call-return architecture and ways of implementing them
- To understand object-orientation, concurrency, and event handling in programming languages
- To develop programs in non-procedural programming paradigms

UNIT- I:
Syntax and semantics: Evolution of programming languages, describing syntax, context, free grammars, attribute grammars, describing semantics, lexical analysis, parsing, recursive - decent bottom - up parsing

UNIT- II:
Data, data types, and basic statements: Names, variables, binding, type checking, scope, scope rules, lifetime and garbage collection, primitive data types, strings, array types, associative arrays, record types, union types, pointers and references, Arithmetic expressions, overloaded operators, type conversions, relational and boolean expressions , assignment statements , mixed mode assignments, control structures – selection, iterations, branching, guarded Statements

UNIT- III:
Subprograms and implementations: Subprograms, design issues, local referencing, parameter passing, overloaded methods, generic methods, design issues for functions, semantics of call and return, implementing simple subprograms, stack and dynamic local variables, nested subprograms, blocks, dynamic scoping

UNIT- IV:
Object- orientation, concurrency, and event handling: Object – orientation, design issues for OOP languages, implementation of object, oriented constructs, concurrency, semaphores, Monitors, message passing, threads, statement level concurrency, exception handling, event handling

UNIT -V:
Functional programming languages: Introduction to lambda calculus, fundamentals of functional programming languages, Programming with Scheme, –
Programming with ML,

UNIT -VI:
Logic programming languages: Introduction to logic and logic programming, –
Programming with Prolog, multi - paradigm languages

OUTCOMES:
- Describe syntax and semantics of programming languages
- Explain data, data types, and basic statements of programming languages
- Design and implement subprogram constructs, Apply object - oriented, concurrency, and event handling programming constructs
- Develop programs in Scheme, ML, and Prolog
- Understand and adopt new programming languages

TEXT BOOKS:
1. Robert W. Sebesta, "Concepts of Programming Languages", Tenth Edition, Addison Wesley, 2012.
2. Programming Langugaes, Principles & Paradigms, 2ed, Allen B Tucker, Robert E Noonan, TMH

REFERENCE BOOKS:
1. R. Kent Dybvig, "The Scheme programming language", Fourth Edition, MIT Press, 2009.
2. Jeffrey D. Ullman, "Elements of ML programming", Second Edition, Prentice Hall, 1998.
3. Richard A. O'Keefe, "The craft of Prolog", MIT Press, 2009.
4. W. F. Clocksin and C. S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003

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II Year – II Semester	**0**	**0**	**3**	**2**

ADVANCED DATA STRUCTURES LAB

OBJECTIVES:
- To understand heap and various tree structures like AVL, Red-black, B and Segment trees
- To understand the problems such as line segment intersection, convex shell and Voronoi diagram

Programming:

1. To perform various operations i.e., insertions and deletions on AVL trees.

2. To implement operations on binary heap.

      i) Vertex insertion

      ii) Vertex deletion

      iii) Finding vertex

      iv) Edge addition and deletion

3. To implement Prim's algorithm to generate a min-cost spanning tree.

4. To implement Krushkal's algorithm to generate a min-cost spanning tree.

5. To implement Dijkstra's algorithm to find shortest path in the graph.

6. To implementation of Static Hashing (Use Linear probing for collision resolution)

7. To implement of Huffmann coding.

8. To implement of B-tree.

OUTCOMES:
- Implement heap and various tree structure like AVL, Red-black, B and Segment trees
- Solve the problems such as line segment intersection, convex shell and Voronoi diagram

JAVA PROGRAMMING LAB

Exercise - 1   (Basics)

a). Write a JAVA program to display default value of all primitive data type of JAVA

b). Write a java program that display the roots of a quadratic equation $ax2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

c). Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.

d) Write a case study on `public static void main`(**250 words**)

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

a). Write a JAVA program to search for an element in a given list of elements using binary search mechanism.

b). Write a JAVA program to sort for an element in a given list of elements using bubble sort

   (c). Write a JAVA program to sort for an element in a given list of elements using merge sort.

   (d) Write a JAVA program using StringBufferto delete, remove character.

Exercise - 3 (Class, Objects)

a). Write a JAVA program to implement class mechanism. – Create a class, methods and invoke them inside main method.

   b). Write a JAVA program to implement constructor.

Exercise - 4 (Methods)

a). Write a JAVA program to implement constructor overloading.

   b). Write a JAVA program implement method overloading.

Exercise - 5 (Inheritance)

a). Write a JAVA program to implement Single Inheritance

   b). Write a JAVA program to implement multi level Inheritance

   c). Write a java program for abstract class to find areas of different shapes

Exercise - 6 (Inheritance - Continued)

a). Write a JAVA program give example for "super" keyword.

   b). Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise - 7 (Exception)

a).Write a JAVA program that describes exception handling mechanism

   b).Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)

a). Write a JAVA program that implements Runtime polymorphism

b). Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise – 9 (User defined Exception)

   a). Write a JAVA program for creation of Illustrating throw

   b). Write a JAVA program for creation of Illustrating finally

   c). Write a JAVA program for creation of Java Built-in Exceptions

   d).Write a JAVA program for creation of User Defined Exception

Exercise – 10 (Threads)

a). Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)

   b). Write a program illustrating **isAlive** and **join ()**

   c). Write a Program illustrating Daemon Threads.

Exercise - 11 (Threads continuity)

a).Write a JAVA program Producer Consumer Problem

   b).Write a case study on thread Synchronization after solving the above producer consumer problem

Exercise – 12 (Packages)

a). Write a JAVA program illustrate class path

b). Write a case study on including in class path in your os environment of your package.

   c). Write a JAVA program that import and use the defined your package in the previous Problem

Exercise - 13 (Applet)

a).Write a JAVA program to paint like paint brush in applet.

   b) Write a JAVA program to display analog clock using Applet.

   c). Write a JAVA program to create different shapes and fill colors using Applet.

Exercise - 14 (Event Handling)

   a).Write a JAVA program that display the x and y position of the cursor movement using

Mouse.

b).Write a JAVA program that identifies key-up key-down event user entering text in a
   Applet.

Exercise - 15 (Swings)
a).Write a JAVA programto build a Calculator in Swings
b). Write a JAVA program to display the digital watch in swing tutorial.

Exercise – 16 (Swings - Continued)
a). Write a JAVA program that to create a single ball bouncing inside a JPanel.
b). Write a JAVA program JTree as displaying a real tree upside down

COMPILER DESIGN

OBJECTIVES:
- Understand the basic concept of compiler design, and its different phases which will be helpful to construct new tools like LEX, YACC, etc.

UNIT – I
Introduction Language Processing, Structure of a compiler the evaluation of Programming language, The Science of building a Compiler application of Compiler Technology. Programming Language Basics.
Lexical Analysis-: The role of lexical analysis buffing, specification of tokens. Recognitions of tokens the lexical analyzer generator lexical

UNIT –II
Syntax Analysis -: The Role of a parser, Context free Grammars Writing A grammar, top down passing bottom up parsing Introduction to Lr Parser.

UNIT –III
More Powerful LR parser (LR1, LALR) Using Armigers Grammars Equal Recovery in Lr parser Syntax Directed Transactions Definition, Evolution order of SDTS Application of SDTS. Syntax Directed Translation Schemes.

UNIT – IV
Intermediated Code: Generation Variants of Syntax trees 3 Address code, Types and Deceleration, Translation of Expressions, Type Checking. Canted Flow Back patching?

UNIT – V
Runtime Environments, Stack allocation of space, access to Non Local date on the stack Heap Management code generation – Issues in design of code generation the target Language Address in the target code Basic blocks and Flow graphs. A Simple Code generation.

UNIT –VI
Machine Independent Optimization. The principle sources of Optimization peep hole Optimization, Introduction to Date flow Analysis.

OUTCOMES:

- Acquire knowledge in different phases and passes of Compiler, and specifying different types of tokens by lexical analyzer, and also able to use the Compiler tools like LEX, YACC, etc.
- Parser and its types i.e. Top-down and Bottom-up parsers.
- Construction of LL, SLR, CLR and LALR parse table.
- Syntax directed translation, synthesized and inherited attributes.
- Techniques for code optimization.

TEXT BOOKS:

1. Compilers, Principles Techniques and Tools.Alfred V Aho, Monical S. Lam, Ravi Sethi Jeffery D. Ullman,2nd edition,pearson,2007

2. Compiler Design K.Muneeswaran, OXFORD

3. Principles of compiler design,2nd edition,Nandhini Prasad,Elsebier.

REFERENCE BOOKS:

1. Compiler Construction, Principles and practice, Kenneth C Louden, CENGAGE

2. Implementations of Compiler, A New approach to Compilers including the algebraic methods, Yunlinsu ,SPRINGER

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UNIX PROGRAMMING

OBJECTIVES:
- Written technical communication and effective use of concepts and terminology.
- Facility with UNIX command syntax and semantics.
- Ability to read and understand specifications, scripts and programs.
- Individual capability in problem solving using the tools presented within the class. Students will demonstrate a mastery of the course materials and concepts within in class discussions.

UNIT-I
Introduction to unix-Brief History-What is Unix-Unix Components-Using Unix-Commands in Unix-Some Basic Commands-Command Substitution-Giving Multiple Commands.

UNIT-II
The File system –The Basics of Files-What's in a File-Directories and File Names-Permissions-I Nodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

UNIT-III
Using the Shell-Command Line Structure-Met characters-Creating New Commands-Command Arguments and Parameters-Program Output as Arguments-Shell Variables- -More on I/O Redirection-Looping in Shell Programs.

UNIT-IV
Filters-The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language-Good Files and Good Filters.

UNIT-V
Shell Programming-Shell Variables-The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The read Command-Positional parameters-The $? Variable knowing the exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-The Sleep Command-Debugging Scripts-The Script Command-The Eval Command-The Exec Command.

UNIT-VI
The Process-The Meaning-Parent and Child Processes-Types of Processes-More about Foreground and Background processes-Internal and External Commands-Process Creation-The Trap Command-The Stty Command-The Kill Command-Job Control.

OUTCOMES:

- Documentation will demonstrate good organization and readability.
- File processing projects will require data organization, problem solving and research.
- Scripts and programs will demonstrate simple effective user interfaces.
- Scripts and programs will demonstrate effective use of structured programming.
- Scripts and programs will be accompanied by printed output demonstrating completion of a test plan.
- Testing will demonstrate both black and glass box testing strategies.
- Project work will involve group participation.

TEXT BOOKS:

1. The Unix programming Environment by Brain W. Kernighan & Rob Pike, Pearson.
2. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Pearson.

REFERENCE BOOKS:

1. Unix and shell programmingby B.M. Harwani, OXFORD university press.

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OBJECT ORIENTED ANALYSIS & DESIGN USING UML

OBJECTIVE:
- To understand how to solve complex problems
- Analyze and design solutions to problems using object oriented approach
- Study the notations of Unified Modeling Language

UNIT-I:
Introduction: The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems, Evolution of Object Model, Foundation of Object Model, Elements of Object Model, Applying the Object Model.

UNIT-II:
Classes and Objects: Nature of object, Relationships among objects, Nature of a Class, Relationship among Classes, Interplay of Classes and Objects, Identifying Classes and Objects, Importance of Proper Classification, Identifying Classes and Objects, Key abstractions and Mechanisms.

UNIT-III:
Introduction to UML: Why we model, Conceptual model of UML, Architecture, Classes, Relationships, Common Mechanisms, Class diagrams, Object diagrams.

UNIT-IV:
Basic Behavioral Modeling: Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams.

UNIT-V:
Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT-VI:
Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.
Case Study: The Unified Library application.

OUTCOME:
- Ability to find solutions to the complex problems using object oriented approach
- Represent classes, responsibilities and states using UML notation
- Identify classes and responsibilities of the problem domain

TEXT BOOKS:

1. "Object- Oriented Analysis And Design with Applications", Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, 3rd edition, 2013, PEARSON.
2. "The Unified Modeling Language User Guide", Grady Booch, James Rumbaugh, Ivar Jacobson, 12th Impression, 2012, PEARSON.

REFERENCE BOOKS:

1. "Object-oriented analysis and design using UML", Mahesh P. Matha, PHI
2. "Head first object-oriented analysis and design", Brett D. McLaughlin, Gary Pollice, Dave West, O"Reilly
3. "Object-oriented analysis and design with the Unified process", John W. Satzinger, Robert B. Jackson, Stephen D. Burd, Cengage Learning
1. "The Unified modeling language Reference manual", James Rumbaugh, Ivar Jacobson, Grady Booch, Addison-Wesley

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III Year – I Semester

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DATA BASE MANAGEMENT SYSTEMS

OBJECTIVES

- To learn the principles of systematically designing and using large scale Database Management Systems for various applications.

UNIT-I: An Overview of Database Management, Introduction- What is Database System-What is Database-Why Database- Data Independence- Relation Systems and Others- Summary, **Database system architecture, Introduction-** The Three Levels of Architecture-The External Level- the Conceptual Level- the Internal Level- Mapping- the Database Administrator-The Database Management Systems- Client/Server Architecture.

UNIT-II:
The E/R Models, The Relational Model, Relational Calculus, Introduction to Database Design, Database Design and Er Diagrams-Entities Attributes, and Entity Sets-Relationship and Relationship Sets-Conceptual Design With the Er Models, The Relational Model Integrity Constraints Over Relations- Key Constraints –Foreign Key Constraints-General Constraints, Relational Algebra and Calculus, Relational Algebra- Selection and Projection- Set Operation, Renaming – Joins- Division- More Examples of Queries, Relational Calculus, Tuple Relational Calculus- Domain Relational Calculus.

UNIT-III:
Queries, Constraints, Triggers: The Form of Basic SQL Query, Union, Intersect, and Except, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Database.

UNIT-IV:
Schema Refinement (Normalization) : Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF).

UNIT-V:
Transaction Management and Concurrency Control:

Transaction, properties of transactions, transaction log, and transaction management with SQL using commit rollback and save point.

Concurrency control for lost updates, uncommitted data, inconsistent retrievals and the Scheduler. Concurrency control with locking methods : lock granularity, lock types, two phase locking for ensuring serializability, deadlocks, Concurrency control with time stamp ordering : Wait/Die and Wound/Wait Schemes, Database Recovery management : Transaction recovery.

UNIT-VI:
Overview of Storages and Indexing, Data on External Storage- File Organization and Indexing – Clustered Indexing – Primary and Secondary Indexes, Index Data Structures, Hash-Based Indexing – Tree-Based Indexing, Comparison of File Organization

OUTCOMES
- Describe a relational database and object-oriented database.
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design.
- Examine issues in data storage and query processing and can formulate appropriate solutions.
- Understand the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage.
- Design and build database system for a given real world problem

TEXT BOOKS:
1. Introduction to Database Systems, CJ Date, Pearson
2. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGraw
   Hill 3rd Edition
3. Database Systems - The Complete Book, H G Molina, J D Ullman, J Widom Pearson

REFERENCES BOOKS:
1. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th
   Edition.
2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
   3. Introduction to Database Systems, C.J.Date Pearson Education

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OPERATING SYSTEMS

OBJECTIVES:

- Study the basic concepts and functions of operating systems.
- Understand the structure and functions of OS.
- Learn about Processes, Threads and Scheduling algorithms.
- Understand the principles of concurrency and Deadlocks.
- Learn various memory management schemes.
- Study I/O management and File systems.
- Learn the basics of Linux system and perform administrative tasks on Linux Servers.

UNIT I
Introduction to Operating System Concept: Types of operating systems, operating systems concepts, operating systems services, Introduction to System call, System call types.

UNIT-II:
Process Management – Process concept, The process, Process State Diagram , Process control block, Process Scheduling- Scheduling Queues, Schedulers, Operations on Processes, Interprocess Communication, Threading Issues, Scheduling-Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

UNIT-III:
Memory Management: Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation
Virtual Memory Management:
Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing

UNIT-IV:
Concurrency: ProcessSynchronization, The Critical- Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization examples
Principles of deadlock – System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery form Deadlock

UNIT-V:
File system Interface- the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.
File System implementation- File system structure, allocation methods, free-space management
Mass-storage structure overview of Mass-storage structure, Disk scheduling, Device drivers,

UNIT VI:

Linux System: Components of LINUX, Interprocess Communication, Synchronisation, Interrupt, Exception and System Call.

Android Software Platform: Android Architecture, Operating System Services, Android Runtime Application Development, Application Structure, Application Process management

OUTCOMES:

- Design various Scheduling algorithms.

- Apply the principles of concurrency.

- Design deadlock, prevention and avoidance algorithms.

- Compare and contrast various memory management schemes.

- Design and Implement a prototype file systems.

- Perform administrative tasks on Linux Servers

- Introduction to Android Operating System Internals

TEXT BOOK:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012.
2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011.

3. Operating Systems-S Halder, Alex A Aravind Pearson Education Second Edition 2016 .

REFERENCES:

1. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001.
2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata Mc Graw Hill Education", 1996.
3. Operating Systems: A Concept-Based Approach, D M Dhamdhere, Second Edition, Tata Mc Graw-Hill Education, 2007.

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UNIFIED MODELING LAB

OBJECTIVES:
- Construct UML diagrams for static view and dynamic view of the system.
- Generate creational patterns by applicable patterns for given context.
- Create refined model for given Scenario using structural patterns.
- Construct behavioral patterns for given applications.

Week 1:
Familiarization with Rational Rose or Umbrello

For each case study:

Week 2, 3 & 4:
For each case study:
- a) Identify and analyze events
- b) Identify Use cases
- c) Develop event table
- d) Identify & analyze domain classes
- e) Represent use cases and a domain class diagram using Rational Rose
- f) Develop CRUD matrix to represent relationships between use cases and problem domain classes

Week 5 & 6:
- **For each case study:**
- a) Develop Use case diagrams
- b) Develop elaborate Use case descriptions & scenarios
- c) Develop prototypes (without functionality)
- d) Develop system sequence diagrams

Week 7, 8, 9 & 10:
For each case study:
- a) Develop high-level sequence diagrams for each use case
- b) Identify MVC classes / objects for each use case
- c) Develop Detailed Sequence Diagrams / Communication diagrams for each use case showing interactions among all the three-layer objects
- d) Develop detailed design class model (use GRASP patterns for responsibility assignment)
- e) Develop three-layer package diagrams for each case study

Week 11 & 12:
- **For each case study:**
- a) Develop Use case Packages
- b) Develop component diagrams
- c) Identify relationships between use cases and represent them
- d) Refine domain class model by showing all the associations among classes

- **Week 13 onwards:**
- **For each case study:**

- a) Develop sample diagrams for other UML diagrams - state chart diagrams, activity diagrams and deployment diagrams

  OUTCOMES:
- Understand the Case studies and design the Model.
- Understand how design patterns solve design problems.
- Develop design solutions using creational patterns.

Construct design solutions by using structural and behavioral patterns

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OPERATING SYSEMS AND LINUX PROGRAMMING LAB

OBJECTIVES:

- To understand the design aspects of operating system.
- To study the process management concepts & Techniques.
- To study the storage management concepts.
- To familiarize students with theLinux environment
- To learn the fundamentals of shell scripting/programming
- To conceptualize Data Mining and the need for pre-processing.
- To learn the algorithms used for various types of Data Mining Problem

OPERATING SYSTEMS

1. Simulate the following CPU scheduling algorithms

   a) Round Robin b) SJF c) FCFS d) Priority

2. Multiprogramming-Memory management- Implementation of fork (), wait (), exec() and exit (), System calls

3. Simulate the following

   a) Multiprogramming with a fixed number of tasks (MFT)

   b) Multiprogramming with a variable number of tasks (MVT)

4. Simulate Bankers Algorithm for Dead Lock Avoidance

5. Simulate Bankers Algorithm for Dead Lock Prevention.

6. Simulate the following page replacement algorithms.

   a) FIFO b) LRU c) LFU

7. Simulate the following File allocation strategies

   a) Sequenced b) Indexed c) Linked

LINUX PROGRAMMING

1. a) Study of Unix/Linux general purpose utility command list

      man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.

   b) Study of vi editor.

   c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.

   d) Study of Unix/Linux file system (tree structure).

   e) Study of .bashrc, /etc/bashrc and Environment variables.

2.Write a C program that makes a copy of a file using standard I/O, and system calls

3. Write a C program to emulate the UNIX ls –l command.

4. Write a C program that illustrates how to execute two commands concurrently
   with a command pipe.

                         Ex: - ls –l | sort

5. Write a C program that illustrates two processes communicating using sharedmemory

6. Write a C program to simulate producer and consumer problem usingsemaphores

7. Write C program to create a thread using pthreads library and let it run its function.

8. Write a C program to illustrate concurrent execution of threads using pthreads library.

OUTCOMES:

- To use Unix utilities and perform basic shell control of the utilities
- To use the Unix file system and file access control.
- To use of an operating system to develop software
- Students will be able to use Linux environment efficiently
- Solve problems using bash for shell scripting
- Will be able to implement algorithms to solve data mining problems using weka tool

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DATA BASE MANAGEMENT SYSTEM LAB

OBJECTIVES:

- To provide a sound introduction to the discipline of database management as a subject in its own right, rather than as a compendium of techniques and product-specific tools.

- To familiarize the participant with the nuances of database environments towards an information-oriented data-processing oriented framework

- To give a good formal foundation on the relational model of data

- To present SQL and procedural interfaces to SQL comprehensively

- To give an introduction to systematic database design approaches covering conceptual design, logical design and an overview of physical design

List of Experiments:

SQL
1. Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions.

2. Queries using operators in SQL

3. Queries to Retrieve and Change Data: Select, Insert, Delete, and Update

4. Queries using Group By, Order By, and Having Clauses

5. Queries on Controlling Data: Commit, Rollback, and Save point

6. Queries to Build Report in SQL *PLUS

7. Queries for Creating, Dropping, and Altering Tables, Views, and Constraints

8. Queries on Joins and Correlated Sub-Queries

9. Queries on Working with Index, Sequence, Synonym, Controlling Access, and Locking Rows for Update, Creating Password and Security features

PL/SQL

10. Write a PL/SQL Code using Basic Variable, Anchored Declarations, and Usage of

Assignment Operation

11. Write a PL/SQL Code Bind and Substitution Variables. Printing in PL/SQL

12. Write a PL/SQL block using SQL and Control Structures in PL/SQL

13. Write a PL/SQL Code using Cursors, Exceptions and Composite Data Types

14. Write a PL/SQL Code using Procedures, Functions, and Packages FORMS

15. Write a PL/SQL Code Creation of forms for any Information System such as Student Information System, Employee Information System etc. 18

16. Demonstration of database connectivity

OUTCOMES:
- Understand, appreciate and effectively explain the underlying concepts of database technologies
- Design and implement a database schema for a given problem-domain
- Normalize a database
- Populate and query a database using SQL DML/DDL commands.
- Declare and enforce integrity constraints on a database using a state-of-the-artRDBMS
- Programming PL/SQL including stored procedures, stored functions, cursors, packages.
- Design and build a GUI application using a 4GL

Note: The creation of sample database for the purpose of the experiments is expected to be predecided by the instructor.

Text Books/Suggested Reading:
1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007.
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

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PROFESSIONAL ETHICSAND HUMAN VALUES

Course Objectives:

*To give basic insights and inputs to the student to inculcate Human values to grow as a responsible human beings with proper personality.
*Professional Ethics instills the student to maintain ethical conduct and discharge their professional duties.

UNIT I: Human Values:
Morals, Values and Ethics – Integrity –Trustworthiness - Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value Time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality-Character.

UNIT: II: Principles for Harmony:
Truthfulness – Customs and Traditions -Value Education – Human Dignity – Human Rights – Fundamental Duties - Aspirations and Harmony (I, We & Nature) – Gender Bias - Emotional Intelligence – Salovey – Mayer Model – Emotional Competencies – Conscientiousness.

UNIT III: Engineering Ethics and Social Experimentation:
History of Ethics - Need of Engineering Ethics - Senses of Engineering Ethics- Profession and Professionalism —Self Interest - Moral Autonomy – Utilitarianism – Virtue Theory - Uses of Ethical Theories - Deontology- Types of Inquiry –Kohlberg's Theory - Gilligan's Argument – Heinz's Dilemma - Comparison with Standard Experiments — Learning from the Past – Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law - Role of Codes – Codes and Experimental Nature of Engineering.

UNIT IV: Engineers' Responsibilities towards Safety and Risk:

Concept of Safety - Safety and Risk – Types of Risks – Voluntary v/sInvoluntary Risk – Consequences - Risk Assessment – Accountability – Liability - Reversible Effects - Threshold Levels of Risk - Delayed v/sImmediate Risk - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT V: Engineers' Duties and Rights:

Concept of Duty - Professional Duties – Collegiality - Techniques for Achieving Collegiality – Senses of Loyalty - Consensus and Controversy - Professional and Individual Rights – Confidential and Proprietary Information - Conflict of Interest-Ethical egoism - Collective Bargaining – Confidentiality - Gifts and Bribes - Problem solving-Occupational Crimes-Industrial Espionage- Price Fixing-Whistle Blowing.

UNIT VI: Global Issues:

Globalization and MNCs –Cross Culture Issues - Business Ethics – Media Ethics - Environmental Ethics – Endangering Lives - Bio Ethics - Computer Ethics - War Ethics – Research Ethics -Intellectual Property Rights.

- Related Cases Shall be dealt where ever necessary.

Outcome:
*It gives a comprehensive understanding of a variety issues that are encountered by every professional in discharging professional duties.
*It provides the student the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively.

References:

1. Professional Ethics by R. Subramaniam – Oxford Publications, New Delhi.
2. Ethics in Engineering by Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill – 2003.
3. Professional Ethics and Morals by Prof.A.R.Aryasri, DharanikotaSuyodhana - Maruthi Publications.
4. Engineering Ethics by Harris, Pritchard and Rabins, Cengage Learning, New Delhi.
5. Human Values & Professional Ethics by S. B. Gogate, Vikas Publishing House Pvt. Ltd., Noida.
6. Engineering Ethics & Human Values by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd – 2009.
7. Professional Ethics and Human Values by A. Alavudeen, R.Kalil Rahman and M. Jayakumaran – University Science Press.
8. Professional Ethics and Human Values by Prof.D.R.Kiran-Tata McGraw-Hill - 2013
9. Human Values And Professional Ethics by Jayshree Suresh and B. S. Raghavan, S.Chand Publications

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COMPUTER NETWORKS

OBJECTIVES:

- Understand state-of-the-art in network protocols, architectures, and applications.
- Process of networking research
- Constraints and thought processes for networking research
- Problem Formulation—Approach—Analysis—

UNIT – I:
Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models

UNIT – II:
Physical Layer – Fourier Analysis – Bandwidth Limited Signals – The Maximum Data Rate of a Channel - Guided Transmission Media, Digital Modulation and Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing
Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols

UNIT – III:
The Data Link Layer - Services Provided to the Network Layer – Framing – Error Control – Flow Control, Error Detection and Correction – Error-Correcting Codes – Error Detecting Codes, Elementary Data Link Protocols- A Utopian Simplex Protocol-A Simplex Stop and Wait Protocol for an Error free channel-A Simplex Stop and Wait Protocol for a Noisy Channel, Sliding Window Protocols-A One Bit Sliding Window Protocol-A Protocol Using Go-Back-N-A Protocol Using Selective Repeat

UNIT – IV:
The Medium Access Control Sublayer-The Channel Allocation Problem-Static Channel Allocation-Assumptions for Dynamic Channel Allocation, Multiple Access Protocols-Aloha-Carrier Sense Multiple Access Protocols-Collision-Free Protocols-Limited Contention Protocols-Wireless LAN Protocols, Ethernet-Classic Ethernet Physical Layer-Classic Ethernet MAC Sublayer Protocol-Ethernet Performance-Fast Ethernet Gigabit Ethernet-10-Gigabit Ethernet-Retrospective on Ethernet, Wireless Lans-The 802.11 Architecture and Protocol Stack-The 802.11 Physical Layer-The802.11 MAC Sublayer Protocol-The 805.11 Frame Structure-Services

UNIT – V:
Design Issues-The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service-Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path Algorithm, Congestion Control Algorithms-Approaches to Congestion Control-Traffic Aware Routing-Admission Control-Traffic Throttling-Load Shedding.

UNIT – VI:
Transport Layer – The Internet Transport Protocols: Udp, the Internet Transport Protocols: Tcp
Application Layer –The Domain Name System: The DNS Name Space, Resource Records, Name Servers, Electronic Mail: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery

OUTCOMES:

- Understand OSI and TCP/IP models
- Analyze MAC layer protocols and LAN technologies
- Design applications using internet protocols
- Understand routing and congestion control algorithms
- Understand how internet works

TEXT BOOKS:
1. Tanenbaum and David J Wetherall, Computer Networks, 5th Edition, Pearson Edu, 2010
2. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, FirouzMosharraf, McGraw Hill Education

REFERENCE BOOKS:
1. Larry L. Peterson and Bruce S. Davie, "Computer Networks - A Systems Approach" (5th ed), Morgan Kaufmann/ Elsevier, 2011

	L	**T**	**P**	**C**
III Year – II Semester	**4**	**0**	**0**	**3**

DATA WARE HOUSING AND DATA MINING

OBJECTIVES:
- Students will be enabled to understand and implement classical models and algorithms in data warehousing and data mining.
- They will learn how to analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
- They will further be able to assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior.

UNIT –I:
Introduction:Why Data Mining? What Is Data Mining?1.3 What Kinds of Data Can Be Mined?1.4 What Kinds of Patterns Can Be Mined?Which Technologies Are Used?Which Kinds of Applications Are Targeted?Major Issues in Data Mining.Data Objects and Attribute Types,Basic Statistical Descriptions of Data,Data Visualization, Measuring Data Similarity and Dissimilarity

UNIT –II:
Data Pre-processing: Data Preprocessing: An Overview,Data Cleaning,Data Integration,Data Reduction,Data Transformation and Data Discretization

UNIT –III:
Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction.

UNIT –IV:
Classification: Alterative Techniques, Bayes' Theorem, Naïve Bayesian Classification, Bayesian Belief Networks

UNIT –V
Association Analysis: Basic Concepts and Algorithms: Problem Defecation, Frequent Item Set generation, Rule generation, compact representation of frequent item sets, FP-Growth Algorithm. **(Tan &Vipin)**

UNIT –VI
Cluster Analysis: Basic Concepts and Algorithms:Overview: What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. **(Tan &Vipin)**

OUTCOMES:
- Understand stages in building a Data Warehouse
- Understand the need and importance of preprocessing techniques
- Understand the need and importance of Similarity and dissimilarity techniques
- Analyze and evaluate performance of algorithms for Association Rules.
- Analyze Classification and Clustering algorithms

TEXT BOOKS:
1. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson.
2. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier.

REFERENCE BOOKS:
1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning.
2. Data Mining : VikramPudi and P. Radha Krishna, Oxford.
3. Data Mining and Analysis - Fundamental Concepts and Algorithms; Mohammed J. Zaki, Wagner Meira, Jr, Oxford
4. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH.

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III Year – II Semester		**4**	**0**	**0**	**3**

DESIGN AND ANALYSIS OF ALGORITHMS

OBJECTIVES:

Upon completion of this course, students will be able to do the following:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations

UNIT-I:
Introduction: What is an Algorithm, Algorithm Specification, Pseudocode Conventions Recursive Algorithm, Performance Analysis, Space Complexity, Time Complexity, Amortized Complexity, Amortized Complexity, Asymptotic Notation, Practical Complexities, Performance Measurement.

UNIT-II:
Dived and Conquer: General Method, Defective Chessboard, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Performance Measurement, Randomized Sorting Algorithms.

UNIT-III:
The Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, Prim's Algorithm, Kruskal's Algorithms, An Optimal Randomized Algorithm, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT-IV:
Dynamic Programming: All - Pairs Shortest Paths, Single – Source Shortest paths General Weights, String Edition, 0/1 Knapsack, Reliability Design,

UNIT-V:
Backtracking: The General Method, The 8-Queens Problem, Sum of Subsets, Graph Coloring , Hamiltonian Cycles.

UNIT-VI:
Branch and Bound: The Method, Least cost (LC) Search, The 15-Puzzle: an Example, Control Abstraction for LC-Search, Bounding, FIFO Branch-and-Bound, LC Branch and Bound, 0/1 Knapsack Problem, LC Branch-and Bound Solution, FIFO Branch-and-Bound Solution, Traveling Salesperson.

OUTCOMES:
Students who complete the course will have demonstrated the ability to do the following:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analyze worst-case running times of algorithms using asymptotic analysis.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.

TEXT BOOKS:

1. Fundamentals of computer algorithms E. Horowitz S. Sahni, University Press
2. Introduction to AlgorithmsThomas H. Cormen, PHI Learning

REFERENCE BOOKS
1. The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman
2. Algorithm Design, Jon Kleinberg, Pearson.

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III Year – II Semester

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SOFTWARE TESTING METHODOLOGIES

OBJECTIVE:
Fundamentals for various testing methodologies.

- Describe the principles and procedures for designing test cases.
- Provide supports to debugging methods.
- Acts as the reference for software testing techniques and strategies.

UNIT-I:
Introduction: Purpose of Testing, Dichotomies, Model for Testing, Consequences of Bugs,Taxonomy of Bugs.
Flow graphs and Path testing: Basics Concepts of Path Testing, Predicates, Path Predicates andAchievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.

UNIT-II:
Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques.
Dataflow testing: Basics of Dataflow Testing, Strategies in Dataflow Testing, Application ofDataflow Testing.

UNIT-III:
Domain Testing: Domains and Paths, Nice & Ugly Domains, Domain testing, Domains andInterfaces Testing, Domain and Interface Testing, Domains and Testability.

Paths, Path products and Regular expressions: Path Products & Path Expression, Reduction Procedure, Applications, Regular Expressions & Flow Anomaly Detection.

UNIT-IV:
Syntax Testing: Why, What and How, A Grammar for formats, Test Case Generation, Implementation and Application and Testability Tips.
Logic Based Testing: Overview, Decision Tables, Path Expressions, KV Charts, and Specifications.

UNIT – V:
State, State Graphs and Transition Testing: State Graphs, Good & Bad State Graphs, State Testing, and Testability Tips.

Graph Matrices and Application:-Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm.

UNIT -VI:
Software Testing Tools: Introduction to Testing, Automated Testing, Concepts of Test Automation, Introduction to list of tools like Win runner, Load Runner, Jmeter, About Win Runner ,Using Win runner, Mapping the GUI, Recording Test, Working with Test, Enhancing Test, Checkpoints, Test Script Language, Putting it all together, Running and Debugging Tests, Analyzing Results, Batch Tests, Rapid Test Script Wizard.

OUTCOME:
   - Understand the basic testing procedures.

   - Able to support in generating test cases and test suites.

   - Able to test the applications manually by applying different testing methods and automation tools.
   - Apply tools to resolve the problems in Real time environment.

TEXT BOOKS:
   1. Software testing techniques – Boris Beizer, Dreamtech, second edition.

   2. Software Testing- Yogesh Singh, Camebridge

REFERENCE BOOKS:

   1. The Craft of software testing - Brian Marick, Pearson Education.

   2. Software Testing, 3rd edition, P.C. Jorgensen, Aurbach Publications (Dist.by SPD).
   3. Software Testing, N.Chauhan, Oxford University Press.

   4. Introduction to Software Testing, P.Ammann&J.Offutt, Cambridge Univ.Press.

   5. Effective methods of Software Testing, Perry, John Wiley, ^{2nd} Edition, 1999.
   6. Software Testing Concepts and Tools, P.NageswaraRao, dreamtech Press
   7. Win Runner in simple steps by Hakeem Shittu, 2007Genixpress.
   8. Foundations of Software Testing, D.Graham& Others, Cengage Learning.

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III Year – II Semester	4	0	0	3

ARTIFICIAL INTELLIGENCE
(Open Elective)

OBJECTIVES:
- To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language.
- To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs.
- To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning

UNIT-I:
Introduction to artificial intelligence: Introduction ,history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of ai languages, current trends in AI

UNIT-II:
Problem solving: state-space search and control strategies : Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative-deepening a*, constraint satisfaction
Problem reduction and game playing: Introduction, problem reduction, game playing, alpha-beta pruning, two-player perfect information games

UNIT-III:
Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic

UNIT-IV:
Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames **advanced knowledge representation techniques:** Introduction, conceptual dependency theory, script structure, cyc theory, case grammars, semantic web

UNIT-V:
Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools

UNIT-VI:

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory

Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

OUTCOMES:

- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
- Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).
- Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming).
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA
3. Artificial Intelligence- Rich, Kevin Knight, Shiv Shankar B Nair, 3rded, TMH
4. Introduction to Artificial Intelligence, Patterson, PHI

REFERNCE BOOKS:

1. Atificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier

INTERNET OF THINGS
(Open Elective)

OBJECTIVES:
- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
- Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).
- Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming).
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.

UNIT - I:
The Internet of Things: An Overview of Internet of things,Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples OF IoTs, Design Principles For Connected Devices

UNIT – II:
Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT – III:
Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT– IV:
Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

UNIT– V:
Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/Services/Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in

the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT – VI

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology ,Sensing the World.

OUTCOMES:
- Demonstrate knowledge and understanding of the security and ethical issues of the Internet of Things
- Conceptually identify vulnerabilities, including recent attacks, involving the Internet of Things
- Develop critical thinking skills
- Compare and contrast the threat environment based on industry and/or device type

TEXTBOOKS:

- Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
- Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

REFERNCE BOOKS:

1. Designingthe Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things CunoPfister , Oreilly

CYBER SECURITY
(Open Elective)

OBJECTIVES:
- The Cyber security Course will provide the students with foundational Cyber Security principles, Security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
- Students will gain insight into the importance of Cyber Security and the integral role of Cyber Security professionals.

UNIT- I: Introduction to Cybercrime:

Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security ,Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens

UNIT -II: Cyber offenses:

How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

UNIT -III: Cybercrime Mobile and Wireless Devices:

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT -IV: Tools and Methods Used in Cybercrime:

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Phishing and Identity Theft:Introduction,Phishing,IdentityTheft(IDTheft)

UNIT -V: Cybercrimes and Cyber security:

Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program, Continuing Strategies.

UNIT -VI: Understanding Computer Forensics:

Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics

OUTCOMES:
- Cyber Security architecture principles
- Identifying System and application security threats and vulnerabilities
- Identifying different classes of attacks
- Cyber Security incidents to apply appropriate response
- Describing risk management processes and practices
- Evaluation of decision making outcomes of Cyber Security scenarios

TEXT BOOKS:
1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, SunitBelapure, Wiley.
2. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, Cengage Learning.

REFERENCES:
1. Information Security, Mark Rhodes, Ousley, MGH.

DIGITAL SIGNAL PROCESSING
(Open Elective)

OBJECTIVES:
- To study DFT and its computation
- To study the design techniques for digital filters
- To study the finite word length effects in signal processing
- To study the non-parametric methods of power spectrum estimations
- To study the fundamentals of digital signal processors.

UNIT -I
Discrete Fourier Transform
DFT and its properties, Relation between DTFT and DFT, FFT computations using Decimation in time and Decimation in frequency algorithms, Overlap-add and save methods

UNIT -II
Infinite Impulse Response Digital Filters
Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain - Design of IIR digital filters using impulse invariance technique - Design of digital filters using bilinear transform - pre warping - Realization using direct, cascade and parallel   forms.

UNIT- III
Finite Impulse Response Digital Filters
Symmetric and Ant symmetric FIR filters - Linear phase FIR filters - Design using Hamming, Henning and Blackman Windows - Frequency sampling method - Realization of FIR filters - Transversal, Linear phase and Polyphasestructures.

UNIT -IV
Finite Word Length Effects
Fixed point and floating point number representations - Comparison - Truncation and Rounding errors - Quantization noise - derivation for quantization noise power - coefficient quantization error - Product quantization error –

UNIT -V
Overflow error - Round off noise power - limit cycle oscillations due to product round off and overflow errors - signal scaling

UNIT -VI
Multirate Signal Processing
Introduction to Multirate signal processing-Decimation-Interpolation-Polyphase implementation of FIR filters for interpolator and decimator -Multistage implementation of sampling rate conversion- Design of narrow band filters - Applications of Multirate signal processing.

OUTCOMES:
- an ability to apply knowledge of Mathematics, science, and engineering
- an ability to design and conduct experiments and interpret data
- an ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- an ability to function as part of a multi-disciplinary team

TEXT BOOKS:
1. John G Proakis and Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson, Fourth Edition, 2007.
2. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, TMH/McGraw HillInternational, 2007

REFERENCE BOOKS:
1. E.C. Ifeachor and B.W. Jervis, " Digital signal processing - A practical approach", Second edition, Pearson, 2002.
2. S.K. Mitra, Digital Signal Processing, A Computer Based approach, Tata Mc GrawHill, 1998.
3. P.P.Vaidyanathan, Multirate Systems & Filter Banks, Prentice Hall, Englewood cliffs, NJ, 1993.
4. Johny R. Johnson, Introduction to Digital Signal Processing, PHI, 2006.
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EMBEDDED SYSTEMS
(Open Elective)

OBJECTIVES:
- Technology capabilities and limitations of the hardware, software components
- Methods to evaluate design tradeoffs between different technology choices.
- Design Methodologies

UNIT-I:
Introduction to Embedded systems: What is an embedded system Vs. General computing system, history, classification, major application areas, and purpose of embedded systems. Core of embedded system, memory, sensors and actuators, communication interface, embedded firmware, other system components, PCB and passive components.

UNIT-II:
8—bit microcontrollers architecture: Characteristics, quality attributes application specific, domain specific, embedded systems. Factors to be considered in selecting a controller, 8051 architecture, memory organization, registers, oscillator unit, ports, source current, sinking current, design examples.

UNIT-III:
RTOS and Scheduling, Operating basics, types, RTOS, tasks, process and threads, multiprocessing and multitasking, types of multitasking, non preemptive, preemptive scheduling.

UNIT-IV:
Task communication of RTOS, Shared memory, pipes, memory mapped objects, message passing, message queue, mailbox, signaling, RPC and sockets, task communication/synchronization issues, racing, deadlock, live lock, the dining philosopher's problem.

UNIT-V:
The producer-consumer problem, Reader writers problem, Priority Inversion, Priority ceiling, Task Synchronization techniques, busy waiting, sleep and wakery, semaphore, mutex, critical section objects, events, device, device drivers, how to clause an RTOS, Integration and testing of embedded hardware and fire ware.

UNIT-VI:
Simulators, emulators, Debuggers, Embedded Product Development life cycle (EDLC), Trends in embedded Industry, Introduction to ARM family of processor.

OUTCOMES:

Understand the basics of an embedded system
- Program an embedded system
- Design, implement and test an embedded system.

Identify the unique characteristics of real-time systems
- Explain the general structure of a real-time system
- Define the unique design problems and challenges of real-time systems

TEXT BOOK:
1. Introduction to embedded systems Shibu. K.V, TMH, 2009.

REFERENCE BOOKS:
1. Ayala &Gadre: The 8051 Microcontroller & Embedded Systems using Assembly and C, CENGAGE
2. Embedded Systems, Rajkamal, TMH, 2009.
3. Embedded Software Primer, David Simon, Pearson.
4. The 8051 Microcontroller and Embedded Systems, Mazidi, Mazidi, Pearson,.

ROBOTICS

(Open Elective)

OBJECTIVES:
- To introduce the basic concepts, parts of robots and types of robots.
- To make the student familiar with the various drive systems for robot, sensors and their applications in robots and programming of robots.
- To discuss about the various applications of robots, justification and implementation of robot.

UNIT- I:
Introduction

Specifications of Robots- Classifications of robots – Work envelope - Flexible automation versus Robotic technology – Applications of Robots ROBOT KINEMATICS AND DYNAMICS Positions,

UNIT-II:
Orientations and frames, Mappings

Changing descriptions from frame to frame, Operators: Translations, Rotations and Transformations - Transformation Arithmetic - D-H Representation - Forward and inverse Kinematics Of Six Degree of Freedom Robot Arm – Robot Arm dynamics

UNIT- III:
Robot Drives and Power Transmission Systems

Robot drive mechanisms, hydraulic – electric – servomotor- stepper motor - pneumatic drives, Mechanical transmission method - Gear transmission, Belt drives, cables, Roller chains, Link - Rod systems - Rotary-to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearing screws,

UNIT -IV:
Manipulators

Construction of Manipulators, Manipulator Dynamic and Force Control, Electronic and Pneumatic manipulators

UNIT- V:
Robot End Effectors

Classification of End effectors – Tools as end effectors. Drive system for grippers-Mechanical adhesive-vacuum-magnetic-grippers. Hooks&scoops. Gripper force analysis and gripper design. Active and passive grippers.

UNIT -VI:
Path planning & Programming
Trajectory planning and avoidance of obstacles, path planning, skew motion, joint integrated motion – straight line motion-Robot languages-computer control and Robot software.

OUTCOMES:
- The Student must be able to design automatic manufacturing cells with robotic control using
- The principle behind robotic drive system, end effectors, sensor, machine vision robot Kinematics and programming.

TEXT BOOKS:
1. Deb S. R. and Deb S., "Robotics Technology and Flexible Automation", Tata McGraw HillEducation Pvt. Ltd, 2010.
2. John J.Craig, "Introduction to Robotics", Pearson, 2009.
3. Mikell P. Grooveret. al., "Industrial Robots - Technology, Programming and Applications", McGraw Hill, New York, 2008.

REFERENCE BOOKS:
1. Richard D Klafter, Thomas A Chmielewski, Michael Negin, "Robotics Engineering – An Integrated Approach", Eastern Economy Edition, Prentice Hall of India Pvt. Ltd., 2006.
2. Fu K S, Gonzalez R C, Lee C.S.G, "Robotics: Control, Sensing, Vision and Intelligence", McGraw Hill, 1987

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III Year – II Semester	0	0	3	2

NETWORK PROGRAMMING LAB

OBJECTIVES:
- To write, execute and debug c programs which use Socket API.
- To understand the use of client/server architecture in application development
- To understand how to use TCP and UDP based sockets and their differences.
- To get acquainted with unix system internals like Socket files, IPC structures.
- To Design reliable servers using both TCP and UDP sockets

Prerequisites:

 Knowledge of C Programming, Basic commands of UNIX.

List of Programs

1. Understanding and using of commands like ifconfig, netstat, ping, arp, telnet, ftp, finger, traceroute, whoisetc. Usage of elementary socket system calls (socket (), bind(), listen(), accept(),connect(),send(),recv(),sendto(),recvfrom()).

2. Implementation of Connection oriented concurrent service (TCP).

3. Implementation of Connectionless Iterative time service (UDP).

 4. Implementation of Select system call.

5. Implementation of gesockopt (), setsockopt () system calls.

6. Implementation of getpeername () system call.

7. Implementation of remote command execution using socket system calls.

 8. Implementation of Distance Vector Routing Algorithm.

9. Implementation of SMTP.

10. Implementation of FTP.

11. Implementation of HTTP.

12. Implementation of RSA algorithm.

Note: Implement programs 2 to 7 in C and 8 to 12 in JAVA.

OUTCOMES:
- Understand and explain the basic concepts of Grid Computing;
- Explain the advantages of using Grid Computing within a given environment;
- Prepare for any upcoming Grid deployments and be able to get started with a potentially available Grid setup.
- Discuss some of the enabling technologies e.g. high-speed links and storage area networks.
- Build computer grids.

SUGGESTED READING:

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III Year – II Semester

SOFTWARE TESTING LAB

OBJECTIVES:
- Demonstrate the UML diagrams with ATM system descriptions.
- Demonstrate the working of software testing tools with c language.
- Study of testing tools- win runner, selenium etc.
- Writing test cases for various applications

1 Write programs in 'C' Language to demonstrate the working ofthe following constructs:

      i)   do...while

      ii)   while….do

      iii)   if…else

      iv)   switch

      v)   for

2 "A program written in 'C' language for Matrix Multiplication fails" Introspect the causes for its failure and write down the possible reasons for its failure.

3 Take any system (e.g. ATM system) and study its system specifications and report the various bugs.

4 Write the test cases for any known application (e.g. Banking application)

5 Create a test plan document for any application (e.g. Library Management System)

6 Study of Win Runner Testing Tool and its implementation

    a) Win runner Testing Process and Win runner User Interface.

    b) How Win Runner identifies GUI(Graphical User Interface) objects in an application and describes the two modesfor organizing GUI map files.

    c) How to record a test script and explains the basics of Test Script Language (TSL).

    d) How to synchronize a test when the application responds slowly.

    e) How to create a test that checks GUI objects and compare the behaviour of GUI objects in different versions of the sample application.

    f) How to create and run a test that checks bitmaps in your application and run the test on different versions ofthe sample application and examine any differences, pixel by pixel.

g) How to Create Data-Driven Tests which supports to run a single test on several sets of data from a data table.

h) How to read and check text found in GUI objects and bitmaps.

i) How to create a batch test that automatically runs the tests.

j) How to update the GUI object descriptions which in turn supports test scripts as the application changes.

7 Apply Win Runner testing tool implementation in any real time applications.

OUTCOMES:
- Find practical solutions to the problems
- Solve specific problems alone or in teams
- Manage a project from beginning to end
- Work independently as well as in teams

Define, formulate and analyze a problem

	L	T	P	C
III Year – II Semester	**0**	**0**	**3**	**2**

DATA WARE HOUSING AND DATA MINING LAB

OBJECTIVES:
- Practical exposure on implementation of well known data mining tasks.
- Exposure to real life data sets for analysis and prediction.
- Learning performance evaluation of data mining algorithms in a supervised and an unsupervised setting.
- Handling a small data mining project for a given practical domain.

System/Software Requirements:

- **Intel based desktop PC**
- **WEKA TOOL**

1. Demonstration of preprocessing on dataset student.arff

2. Demonstration of preprocessing on dataset labor.arff

3. Demonstration of Association rule process on dataset contactlenses.arff using apriori algorithm

4. Demonstration of Association rule process on dataset test.arff using apriori algorithm

5. Demonstration of classification rule process on dataset student.arff using j48 algorithm

6. Demonstration of classification rule process on dataset employee.arff using j48 algorithm

7. Demonstration of classification rule process on dataset employee.arff using id3 algorithm

8. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm

9. Demonstration of clustering rule process on dataset iris.arff using simple k-means

10. Demonstration of clustering rule process on dataset student.arff using simple k- means.

OUTCOMES:

- The data mining process and important issues around data cleaning, pre-processing and integration.
- The principle algorithms and techniques used in data mining, such as clustering, association mining, classification and prediction..

	L	T	P	C
	0	2	0	0

INTELLECTUAL PROPERTY RIGHTS AND PATENTS

Objectives:
*To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines.
*Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments.

Unit I: Introduction to Intellectual Property Rights (IPR)
Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

Unit II: Copyrights and Neighboring Rights
Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers **–** Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

UNIT III: Patents
Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer –– Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing –– Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

UNIT IV: Trademarks
Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

UNIT V: Trade Secrets
Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law.

UNIT VI: Cyber Law and Cyber Crime

Introduction to Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions - E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

- Relevant Cases Shall be dealt where ever necessary.

Outcome:

* IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents.

*Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements.

References:

1. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2. Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
3. PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
4. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
5. Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
6. Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
7. R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
8. M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

	L	T	P	C
IV Year – I Semester

L T P C
4 0 0 3

CRYPTOGRAPHY AND NETWORK SECURITY

OBJECTIVES:
- In this course the following principles and practice of cryptography and network security are covered:
- Classical systems, symmetric block ciphers (DES, AES, other contemporary symmetric ciphers)
- Public-key cryptography (RSA, discrete logarithms),
- Algorithms for factoring and discrete logarithms, cryptographic protocols, hash functions, authentication, key management, key exchange, signature schemes,
- Email and web security, viruses, firewalls, digital right management, and other topics.

UNIT- I:
Basic Principles
Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography

UNIT- II:
Symmetric Encryption
Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

UNIT- III:
Asymmetric Encryption
Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography

UNIT- IV:
Data Integrity, Digital Signature Schemes & Key Management
Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.

UNIT -V:
Network Security-I
Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS

UNIT -VI:
Network Security-II
Security at the Network Layer: IPSec, System Security

OUTCOMES:
- To be familiarity with information security awareness and a clear understanding of its importance.
- To master fundamentals of secret and public cryptography
- To master protocols for security services
- To be familiar with network security threats and countermeasures
- To be familiar with network security designs using available secure solutions (such asPGP,
- SSL, IPSec, etc)

TEXT BOOKS:
1) Cryptography and Network Security, Behrouz A Forouzan, DebdeepMukhopadhyay, (3e) Mc Graw Hill.
2) Cryptography and Network Security, William Stallings, (6e) Pearson.
3) Everyday Cryptography, Keith M.Martin, Oxford.

REFERENCE BOOKS:
1) Network Security and Cryptography, Bernard Meneges, Cengage Learning.

	L	T	P	C
IV Year – I Semester

L	T	P	C
4	0	0	3

SOFTWARE ARCHITECTURE AND DESIGN PATTERNS

OBJECTIVES:
The course should enable the student:

- To understand interrelationships, principles and guidelines governing architecture and evolution over time.
- To understand various architectural styles of software systems.
- To understand design patterns and their underlying object oriented concepts.
- To understand implementation of design patterns and providing solutions to real world software design problems.
- To understand patterns with each other and understanding the consequences of combining patterns on the overall quality of a system.

UNIT-I:
Envisioning Architecture
The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views.

Creating and Architecture Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

UNIT-II:
Analyzing Architectures
Architecture Evaluation, Architecture design decision making, ATAM, CBAM

Moving from One System to Many
Software Product Lines, Building systems from off the shelf components, Software architecture in future.

UNIT-III:
Patterns
Pattern Description, Organizing catalogs, role in solving design problems, Selection and usage.
Creational Patterns
Abstract factory, Builder, Factory method, Prototype, Singleton

UNIT-IV:
Structural Patterns
Adapter, Bridge, Composite, Decorator, Façade, Flyweight, PROXY.

UNIT-V:
Behavioral Patterns

Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.

UNIT-VI:
Case Studies

A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in Interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development.

A Case Study (Designing a Document Editor): Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation.

TEXT BOOKS:
1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003.

2. Design Patterns, Erich Gamma, Pearson Education, 1995.

REFERENCE BOOKS:
1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall

   PTR,   2001

3. Software Design, David Budgen, second edition, Pearson education, 2003

4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.

5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education,

   2006

6. J2EE Patterns, Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003.

7. Design Patterns in C#, Steven John metsker, Pearson education, 2004.

8. Pattern Oriented Software Architecture, F.Buschmann & others, John Wiley & Sons.

	L	T	P	C
IV Year – I Semester	4	0	0	3

WEB TECHNOLOGIES

OBJECTIVES:
- This course is designed to introduce students with no programming experience to the programming languages and techniques associated with the World Wide Web. The course will introduce web-based media-rich programming tools for creating interactive web pages.

UNIT-I: HTML, CSS
Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, HTML5

CSS: Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model, Conflict Resolution

UNIT-II:
Java script
The Basic of Java script: Objects, Primitives Operations and Expressions, Screen Output and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions
DHTML: Positioning Moving and Changing Elements

UNIT-III:
XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches,

AJAX A New Approach: Introduction to AJAX, Integrating PHP and AJAX.

UNIT-IV:

PHP Programming: Introducing PHP: Creating PHP script, Running PHP script.
Working with variables and constants: Using variables, Using constants, Data types,Operators.**Controlling program flow:** Conditional statements,Control statements,Arrays,functions.Working with forms and Databases such as MySQL.

UNIT-V:

Introduction to PERL, *Operators and if statements, Program design and control structures, Arrays, Hashs and File handling, Regular expressions, Subroutines, Retrieving documents from the web with Perl.*

UNIT-VI:
Introduction to Ruby, Variables, types, simple I/O, Control, Arrays, Hashes, Methods, Classes, Iterators, Pattern Matching. Overview of Rails.

OUTCOMES:
- Analyze a web page and identify its elements and attributes.
- Create web pages using XHTML and Cascading Styles sheets.
- Build dynamic web pages.
- Build web applications using PHP.
- Programming through PERL and Ruby
- Write simple client-side scripts using AJAX

TEXT BOOKS:
1. Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. The Web Warrior Guide to Web Programming, Bai, Ekedahl, Farrelll, Gosselin, Zak, Karparhi, Maclntyre, Morrissey, Cengage

REFERENCE BOOKS:
1. Ruby on Rails Up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006)
2. Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012)
3. Web Technologies, HTML< JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
4. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning
5. http://www.upriss.org.uk/perl/PerlCourse.html

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Common to all Branches)

- **Course Objectives:**
- The Learning objectives of this paper is to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting, Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation. Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

UNIT-I
Introduction to Managerial Economics and demand Analysis:
Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT – II:
Production and Cost Analyses:
Concept of Production function- Cobb-Douglas Production function- Leontief production function - Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total costs –Cost – Volume-Profit analysis-Determination of Breakeven point(simple problems)-Managerial significance and limitations of Breakeven point.

UNIT – III:
Introduction to Markets, Theories of the Firm & Pricing Policies:
Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing.

UNIT – IV:
Types of Business Organization and Business Cycles:
Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms – Business Cycles : Meaning and Features – Phases of a Business Cycle.

Unit – V:
Introduction to Accounting & Financing Analysis:
Introduction to Double Entry Systems – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow statements (Simple Problems)

UNIT – VI:
Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Course Outcome:
*The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product and the knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
* One is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
*The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis and to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

TEXT BOOKS
1. Dr. N. AppaRao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis',
   Cengage Publications, New Delhi – 2011
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011
3. Prof. J.V.Prabhakararao, Prof. P. Venkatarao. 'Managerial Economics and Financial
   Analysis', Ravindra Publication.

REFERENCES:

1.Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis,
   Himalaya Publishing House, 2014.
2. V. Maheswari: Managerial Economics, Sultan Chand.2014
3. Suma Damodaran: Managerial Economics, Oxford 2011.
4. VanithaAgarwal: Managerial Economics, Pearson Publications 2011.
5. Sanjay Dhameja: Financial Accounting for Managers, Pearson.
6. Maheswari: Financial Accounting, Vikas Publications.
7. S. A. Siddiqui& A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age
   International Publishers, 2012
8. Ramesh Singh, Indian Economy, 7th Edn., TMH2015
9. Pankaj Tandon A Text Book of Microeconomic Theory, Sage Publishers, 2015
10. Shailaja Gajjala and Usha Munipalle, Univerties press, 2015

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4	0	0	3

BIG DATA ANALYTICS
(Elective - 1)

OBJECTIVES:
- Optimize business decisions and create competitive advantage with Big Data analytics
- Introducing Java concepts required for developing map reduce programs
- Derive business benefit from unstructured data
- Imparting the architectural concepts of Hadoop and introducing map reduce paradigm
- To introduce programming tools PIG & HIVE in Hadoop echo system.

UNIT-I
Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization

UNIT-II
Working with Big Data: Google File System, Hadoop Distributed File System (HDFS) – Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

UNIT-III
Writing MapReduce Programs: A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New), Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner

UNIT-IV
Hadoop I/O: The Writable Interface, WritableComparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, BytesWritable, NullWritable, ObjectWritable and GenericWritable, Writable collections, Implementing a Custom Writable: Implementing a RawComparator for speed, Custom comparators

UNIT-V
Pig: Hadoop Programming Made Easier
Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin

UNIT-VI
Applying Structure to Hadoop Data with Hive:
Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data

OUTCOMES:
- Preparing for data summarization, query, and analysis.
- Applying data modeling techniques to large data sets
- Creating applications for Big Data analytics
- Building a complete business data analytic solution

TEXT BOOKS:
1. Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
3. Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss

REFERENCE BOOKS:
1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop MapReduce Cookbook, SrinathPerera, ThilinaGunarathne

SOFTWARE LINKS:
1. Hadoop:http://hadoop.apache.org/
2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home
3. Piglatin: http://pig.apache.org/docs/r0.7.0/tutorial.html

INFORMATION RETRIEVAL SYSTEMS
(Elective - 1)

OBJECTIVES
- To provide the foundation knowledge in information retrieval.
- To equip students with sound skills to solve computational search problems.
- To appreciate how to evaluate search engines.
- To appreciate the different applications of information retrieval techniques in the Internet or Web environment.
- To provide hands-on experience in building search engines and/or hands-on experience in evaluating search engines.

UNIT - I:
Introduction to Information Storage and Retrieval System: Introduction, Domain Analysis of IR systems and other types of Information Systems, IR System Evaluation.
Introduction to Data Structures and Algorithms related to Information Retrieval: Basic Concepts, Data structures, Algorithms

UNIT- II:
Inverted files: Introduction, Structures used in Inverted Files, Building Inverted file using a sorted array, Modifications to Basic Techniques.

UNIT -III:
Signature Files: Introduction, Concepts of Signature Files, Compression, Vertical Partitioning, Horizontal Partitioning.

UNIT- IV:
New Indices for Text: PAT Trees and PAT Arrays: Introduction, PAT Tree structure, algorithms on the PAT Trees, Building PAT trees as PATRICA Trees, PAT representation as arrays.

UNIT- V:
Stemming Algorithms: Introduction, Types of Stemming Algorithms, Experimental Evaluations of Stemming to Compress Inverted Files

UNIT- VI:
Thesaurus Construction: Introduction, Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri

OUTCOMES

- Identify basic theories in information retrieval systems
- Identify the analysis tools as they apply to information retrieval systems
- Understands the problems solved in current IR systems
- Describes the advantages of current IR systems
- Understand the difficulty of representing and retrieving documents.
- Understand the latest technologies for linking, describing and searching the web.

TEXT BOOK:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Modern Information Retrieval by Yates Pearson Education.
3. Information Storage & Retrieval by Robert Korfhage – John Wiley & Sons.

REFERENCES:

1. Kowalski, Gerald, Mark T Maybury: Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press, 1997.
2. Information retrieval Algorithms and Heuristics, 2ed, Springer

MOBILE COMPUTING
(Elective - 1)

OBJECTIVE:

- To make the student understand the concept of mobile computing paradigm, its novel applications and limitations.
- To understand the typical mobile networking infrastructure through a popular GSM protocol
- To understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer
- To understand the database issues in mobile environments & data delivery models.
- To understand the ad hoc networks and related concepts.
- To understand the platforms and protocols used in mobile environment.

UNIT- I
Introduction: Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices.
GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS.

UNIT –II
(Wireless) Medium Access Control (MAC) : Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

UNIT –III
Mobile Network Layer: IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, DHCP.

UNIT –IV
Mobile Transport Layer: Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks.
Database Issues: Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models, Query processing, Data Recovery Process &QoS Issues.

UNIT- V
Data Dissemination and Synchronization : Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data Synchronization – Introduction, Software, and Protocols.

UNIT- VI

Mobile Ad hoc Networks (MANETs) : Introduction, Applications & Challenges of a MANET, Routing,   Classification   of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, etc. , Mobile Agents, Service Discovery.

Protocols and Platforms for Mobile Computing :WAP, Bluetooth, XML, J2ME, Java Card, PalmOS, Windows CE, SymbianOS, Linux for Mobile Devices, Android.

OUTCOMES:
- Able to think and develop new mobile application.
- Able to take any new technical issue related to this new paradigm and come up with a solution(s).
- Able to develop new ad hoc network applications and/or algorithms/protocols.
- Able to understand & develop any existing or new protocol related to   mobile environment

TEXT BOOKS:
1. Jochen Schiller, "Mobile Communications", Addison-Wesley, Second Edition, 2009.
2. Raj Kamal, "Mobile Computing", Oxford University Press, 2007, ISBN: 0195686772

REFERENCE BOOKS:
1. ASOKE K TALUKDER, HASAN AHMED, ROOPA R YAVAGAL, "Mobile Computing,   Technology Applications and Service Creation" Second Edition, Mc Graw Hill.
2. UWE Hansmann, LotherMerk, Martin S. Nocklous, Thomas Stober, "Principles of Mobile Computing," Second Edition, Springer.

	L	T	P	C

IV Year – I Semester

L	**T**	**P**	**C**
4	**0**	**0**	**3**

CLOUD COMPUTING
(Elective - 2)

OBJECTIVES:
- The student will learn about the cloud environment, building software systems and components that scale to millions of users in modern internetcloud concepts capabilities across the various cloud service models including Iaas, Paas, Saas, and developing cloud based software applications on top of cloud platforms.

UNIT -I: Systems modeling, Clustering and virtualization
Scalable Computing over the Internet, Technologies for Network based systems, System models for Distributed and Cloud Computing, Software environments for distributed systems and clouds, Performance, Security And Energy Efficiency

UNIT- II:Virtual Machines and Virtualization of Clusters and Data Centers
Implementation Levels of Virtualization, Virtualization Structures/ Tools and mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data Center Automation.

UNIT- III: Cloud Platform Architecture
Cloud Computing and service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, Inter Cloud Resource Management, Cloud Security and Trust Management. Service Oriented Architecture, Message Oriented Middleware.

UNIT -IV: Cloud Programming and Software Environments
Features of Cloud and Grid Platforms, Parallel & Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments.

UNIT- V: Cloud Resource Management and Scheduling
Policies and Mechanisms for Resource Management Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds, Fair Queuing, Start Time Fair Queuing, Borrowed Virtual Time, Cloud Scheduling Subject to Deadlines, Scheduling MapReduce Applications Subject to Deadlines.

UNIT- VI: Storage Systems
Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Apache Hadoop, Big Table, Megastore, Amazon Simple Storage Service (S3)

OUTCOMES:
- Understanding the key dimensions of the challenge of Cloud Computing
- Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization
- Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
- Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas

TEXT BOOKS:
1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
3. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press

REFERNCE BOOKS:
1. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
2. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH

SOFTWARE PROJECT MANAGEMENT
(Elective - 2)

OBJECTIVES:
- To study how to plan and manage projects at each stage of the software development life cycle (SDLC)
- To train software project managers and other individuals involved in software project planning and tracking and oversight in the implementation of the software project management process.
- To understand successful software projects that support organization's strategic goals

UNIT -I:Introduction
Project, Management, Software Project Management activities, Challenges in software projects, Stakeholders, Objectives & goals
Project Planning: Step-wise planning, Project Scope, Project Products & deliverables, Project activities, Effort estimation, Infrastructure

UNIT -II:Project Approach
Lifecycle models, Choosing Technology, Prototyping
Iterative & incremental Process Framework: Lifecycle phases, Process Artifacts, Process workflows (Book 2)

UNIT -III:Effort estimation & activity Planning
Estimation techniques, Function Point analysis, SLOC, COCOMO, Use case-based estimation , Activity Identification Approaches, Network planning models, Critical path analysis

UNIT -IV: Risk Management
Risk categories, Identification, Assessment, Planning and management, PERT technique, Monte Carlo approach

UNIT -V:Project Monitoring & Control, Resource Allocation
Creating a framework for monitoring & control, Progress monitoring, Cost monitoring, Earned value Analysis, Defects Tracking, Issues Tracking, Status reports, Types of Resources, Identifying resource requirements, Resource scheduling

UNIT -VI:Software Quality
Planning Quality, Defining Quality - ISO 9016, Quality Measures, Quantitative Quality Management Planning, Product Quality & Process Quality
 Metrics, Statistical Process Control Capability Maturity Model, Enhancing software Quality (Book3)

OUTCOMES:

- To match organizational needs to the most effective software development model
- To understand the basic concepts and issues of software project management
- To effectively Planning the software projects
- To implement the project plans through managing people, communications and change
- To select and employ mechanisms for tracking the software projects
- To conduct activities necessary to successfully complete and close the Software projects
- To develop the skills for tracking and controlling software deliverables
- To create project plans that address real-world management challenges

TEXT BOOKS:
1. Software Project Management, Bob Hughes & Mike Cotterell, TATA Mcgraw-Hill
2. Software Project Management, Walker Royce: Pearson Education, 2005.
3. Software Project Management in practice, Pankaj Jalote, Pearson.

REFERENCE BOOKS:
1. Software Project Management, Joel Henry, Pearson Education.

SCRIPTING LANGUAGES
(Elective - 2)

OBJECTIVES:
- The course demonstrates an in depth understanding of the tools and the scripting languages necessary for design and development of applications dealing with Bio-information/ Bio-data.
- The instructor is advised to discuss examples in the context of Bio-data/ Bio-information application development.

UNIT - I
Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT - II
Advanced perl Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT- III
PHP Basics PHP Basics- Features, Embedding PHP Code in your Web pages, Outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures, Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

UNIT - IV
Advanced PHP Programming PHP and Web Forms, Files, PHP Authentication and Methodologies -Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the Mcrypt package, Building Web sites for the World.

UNIT -V
TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures , strings , patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface. Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding , Perl-Tk.

UNIT- VI
Python Introduction to Python language, python-syntax, statements, functions, Built-in-functions and Methods, Modules in python, Exception Handling. Integrated Web Applications in Python – Building Small, Efficient Python Web Systems, Web Application Framework.

OUTCOMES:

- To master the theory behind scripting and its relationship to classic programming.
- To survey many of the modern and way cool language features that show up frequently in scripting languages.
- To gain some fluency programming in Ruby, JavaScript, Perl, Python, and related languages.
- To design and implement one's own scripting language.

TEXT BOOKS:

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Python Web Programming, Steve Holden and David Beazley, New Riders Publications.
3. Beginning PHP and MySQL, 3rd Edition, Jason Gilmore, Apress Publications (Dream tech)

REFERENCE BOOKS:

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee and B.Ware (Addison Wesley) Pearson Education.
2. Programming Python, M.Lutz,SPD.
3. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications.
4. PHP 5.1, I.Bayross and S.Shah, The X Team, SPD.
5. Core Python Programming, Chun, Pearson Education.
6. Guide to Programming with Python, M.Dawson, Cengage Learning.
7. Perl by Example, E.Quigley, Pearson Education.

SOFTWARE ARCHITECTURE AND DESIGN PATTERNS LAB

Software Architecture Lab

The course project is divided in 6 small components that will be performed during the different lab sessions; there are, in principle, 7 lab sessions. The project consists of the design and implementation of the software architecture of a Weather Mapping System (WMS). Implementation will take place both in Java and C++ (combination of both languages). Each lab assignment consists of a theoretical part and a practical part, which are defined in specific lab assignment statements that are posted at least one or two weeks before the session.

Report and demo (if applicable) for each assignment is due for the following session.

1. Tool Presentation

This session is an introductory session; there is no lab assignment for this session.

Introduction to working with an industrial strength software development environment, namely Rational Rose: how to write and maintain a UML specification; configuration management; architecture design; CORBA-IDL document generation; Java code generation from a UML model etc.

Presentation of the Project: Weather Mapping System.

2. Use Case View
Design of the Use Case View. Risk Analysis.

3: Logical View

Design of the Logical View of the Weather Mapping System (WMS).

4: Integrating Patterns in the Architecture
Integration of selected architectural and design patterns in the logical view obtained previously.

5: Implementation, Process, and Deployment Views

Design of the implementation, process, and deployment views for the Weather Mapping System.

6: Component and Interprocess Communication Design

Generation from the previous architecture design of CORBA Interfaces and Components Definitions.

7: Implementation of WMS

Implementation of the Weather Mapping System (Java & C++), with a particular emphasis on the Interprocess communication mechanism and the software components identified.

Lab Reports:

Lab reports should include:

- The answers to the questions included in the assignment statement. The answers should motivate briefly your design choices.
- The printout of the diagrams and related documents (e.g. class, use cases, operations descriptions etc.) produced using Rational Rose.

Reference: http://www.ece.uvic.ca/~itraore/seng422-06/eng422-06.html

Design Patterns Lab

S. No   Programs

1.   Use case Diagram for Librarian Scenario

2.   Using UML design Abstract factory design pattern

3.   Using UML design Adapter-class Design pattern

4.   Using UML design Adapter-object Design pattern

5.   Using UML design Strategy Design pattern

6.   Using UML design Builder Design pattern

7.   Using UML design Bridge Design pattern

8.   Using UML design Decorator Design pattern

9.   User gives a print command from a word document. Design to represent this chain of responsibility Design pattern

10.   Design a Flyweight Design pattern

11.   Using UML design Facade Design pattern

12.   Using UML design Iterator Design pattern   .

13.   Using UML design Mediator Design pattern

14.   Using UML design Proxy Design pattern

15.   Using UML design Visitor Design pattern

	L	T	P	C
IV Year – I Semester	0	0	3	2

WEB TECHNOLOGIES LAB

OBJECTIVES:
- To acquire knowledge of XHTML, Java Script and XML to develop web applications
- Ability to develop dynamic web content using Java Servlets and JSP
- To understand JDBC connections and Java Mail API
- To understand the design and development process of a complete web application

1. Design the following static web pages required for an online book store web site.

1) **HOME PAGE:**
The static home page must contain three **frames**.
Top frame: Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).
Left frame: At least four links for navigation, which will display the catalogue of respective links.
For e.g.: When you click the link **"MCA"** the catalogue for MCABooks should be displayed in the Right frame.
Right frame: The *pages to the links in the left frame must be loaded here*. Initially this page contains description of the web site.

	Web Site Name			
Logo				
Home	Login	Registration	Catalogue	Cart
mca mba BCA		Description of the Web Site		

2)**login page**

	Web Site Name			
Logo				
Home	Login	Registration	Catalogue	Cart
MCA MBA BCA	Login : 11a51f0003 Password: ******* Submit Reset			

3) CATOLOGUE PAGE:
The catalogue page should contain the details of all the books available in the web site in a table. The details should contain the following:
1. Snap shot of Cover Page.
2. Author Name.
3. Publisher.
4. Price.
5. Add to cart button.

Logo Home	Login	Registration	Catalogue	Cart
MCA MBA	[XML Bible cover]	Book : XML Bible Author : Winston Publication : Wiely	$ 40.5	Add to cart
BCA	[Artificial Intelligence cover]	Book : AI Author : S.Russel Publication : Princeton hall	$ 63	Add to cart
	[Java2 cover]	Book : Java 2 Author : Watson Publication : BPB publications	$ 35.5	Add to cart
	[HTML 4 cover]	Book : HTML in 24 hours Author : Sam Peter Publication : Sam	$ 50	Add to cart

(Web Site Name shown across the top header)

4. REGISTRATION PAGE:
Create a "*registration form* "with the following fields
1) Name (Text field)
2) Password (password field)
3) E-mail id (text field)
4) Phone number (text field)
5) Sex (radio button)
6) Date of birth (3 select boxes)
7) Languages known (check boxes – English, Telugu, Hindi, Tamil)
8) Address (text area)

5. Design a web page using CSS (Cascading Style Sheets) which includes the following:
1) Use different font, styles:
In the style definition you define how each selector should work (font, color etc.).
Then, in the body of your pages, you refer to these selectors to activate the styles

6. Write an XML file which will display the Book information which includes the following:
1) Title of the book
2) Author Name
3) ISBN number
4) Publisher name
5) Edition
6) Price

Write a Document Type Definition (DTD) to validate the above XML file.

7. Write Ruby program reads a number and calculates the factorial value of it and prints the Same.

8. Write a Ruby program which counts number of lines in a text files using its regular Expressions facility.

9. Write a Ruby program that uses iterator to find out the length of a string.

10. Write simple Ruby programs that uses arrays in Ruby.

11. Write programs which uses associative arrays concept of Ruby.

12. Write Ruby program which uses Math module to find area of a triangle.

13. Write Ruby program which uses tk module to display a window

14. Define complex class in Ruby and do write methods to carry operations on complex objects.

15. Write a program which illustrates the use of associative arrays in perl.

16. Write perl program takes set names along the command line and prints whether they are regular files or special files

17. Write a perl program to implement UNIX `passed' program

18. An example perl program to connect to a MySQl database table and executing simple commands.

19. Example PHP program for cotactus page.

20. User Authentication:
Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a PHP for doing the following.
1. Create a Cookie and add these four user id's and passwords to this Cookie.
2. Read the user id and passwords entered in the Login form (week1)   and authenticate with the values (user id and passwords) available in the cookies.
If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display "You are not an authenticated user ''.
Use init-parameters to do this.

21. Example PHP program for registering users of a website and login.

22. Install a database(Mysql or Oracle).
Create a table which should contain at least the following fields: name, password, email-id, phone number(these should hold the data from the registration form).
Write a PHP program   to connect to that database and extract data from the tables and display them. Experiment with various SQL queries.
Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page (week2).

23. Write a PHP which does the following job:
Insert the details of the 3 or 4 users who register with the web site (week9) by using registration form. Authenticate the user when he submits the login form using the user name and password from the database (similar to week8 instead of cookies).

24.Create tables in the database which contain the details of items (books in our case like Book name , Price, Quantity, Amount) of each category. Modify your catalogue page (week 2)in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using PHP

25.HTTP is a stateless protocol. Session is required to maintain the state.
The user may add some items to cart from the catalog page. He can check the cart page for the selected items. He may visit the catalogue again and select some more items. Here our interest is the selected items should be added to the old cart rather than a new cart. Multiple users can do the same thing at a time(i.e., from different systems in the LAN using the ip-address instead of local host). This can be achieved through the use of sessions. Every user will have his own session which will be created after his successful login to the website. When the user logs out his session should get invalidated (by using the method session. Invalidate ()).
Modify your catalogue and cart PHP pages to achieve the above mentioned functionality using sessions.

OUTCOMES:
- Students will be able to develop static web sites using XHTML and Java Scripts
- To implement XML and XSLT for web applications
- Develop Dynamic web content using Java Servlets and JSP
- To develop JDBC connections and implement a complete Dynamic web application

L	**T**	**P**	**C**
4	**0**	**0**	**3**

DISTRIBUTED SYSTEMS

OBJECTIVES:
- Provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission, IPC mechanisms in distributed systems, Remote procedure calls.
- Expose students to current technology used to build architectures to enhance distributed Computing infrastructures with various computing principles

UNIT-I:
Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges.
System Models: Introduction, Architectural Models- Software Layers, System Architecture, Variations, Interface and Objects, Design Requirements for Distributed Architectures, Fundamental Models- Interaction Model, Failure Model, Security Model.

UNIT-II:
Interprocess Communication: Introduction, The API for the Internet Protocols- The Characteristics of Interprocess communication, Sockets, UDP Datagram Communication, TCP Stream Communication; External Data Representation and Marshalling; Client Server Communication; Group Communication- IP Multicast- an implementation of group communication, Reliability and Ordering of Multicast.

UNIT-III:
Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects- Object Model, Distributed Object Modal, Design Issues for RMI, Implementation of RMI, Distributed Garbage Collection; Remote Procedure Call, Events and Notifications, Case Study: JAVA RMI

UNIT-IV:
Operating System Support: Introduction, The Operating System Layer, Protection, Processes and Threads –Address Space, Creation of a New Process, Threads.

UNIT-V:
Distributed File Systems: Introduction, File Service Architecture; Peer-to-Peer Systems: Introduction, Napster and its Legacy, Peer-to-Peer Middleware, Routing Overlays.
Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication.

UNIT-VI:
Transactions & Replications: Introduction, System Model and Group Communication, Concurrency Control in Distributed Transactions, Distributed Dead Locks, Transaction Recovery; Replication-Introduction, Passive (Primary) Replication, Active Replication.

OUTCOMES:
- Develop a familiarity with distributed file systems.
- Describe important characteristics of distributed systems and the salient architectural features of such systems.
- Describe the features and applications of important standard protocols which are used in distributed systems.
- Gaining practical experience of inter-process communication in a distributed environment

TEXT BOOKS:
1. Ajay D Kshemkalyani, MukeshSighal, "Distributed Computing, Principles, Algorithms and Systems", Cambridge
2. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems- Concepts and Design", Fourth Edition, Pearson Publication

REFERENCE BOOKS
1. Distributed-Systems-Principles-Paradigms-Tanenbaum PHI

	L	T	P	C

IV Year – II Semester

L	T	P	C
4	0	0	3

MANAGEMENT SCIENCE

Course Objectives:
*To familiarize with the process of management and to provide basic insight into select contemporary management practices
*To provide conceptual knowledge on functional management and strategic management.

UNIT I
Introduction to Management: Concept –nature and importance of Management –Generic Functions of Management – Evaluation of Management thought- Theories of Motivation – Decision making process-Designing organization structure- Principles of organization – Organizational typology- International Management: Global Leadership and Organizational behavior Effectiveness(GLOBE) structure

UNIT II
Operations Management: Principles and Types of Management – Work study- Statistical Quality Control- Control charts (P-chart, R-chart, and C-chart) Simple problems- Material Management: Need for Inventory control- EOQ, ABC analysis (simple problems) and Types of ABC analysis (HML, SDE, VED, and FSN analysis).

UNIT III
Functional Management: Concept of HRM, HRD and PMIR- Functions of HR Manager- Wage payment plans(Simple Problems) – Job Evaluation and Merit Rating - Marketing Management- Functions of Marketing – Marketing strategies based on product Life Cycle, Channels of distributions. Operationlizing change through performance management.

UNIT IV
Project Management: (PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path- Probability- Project Crashing (Simple Problems)

Unit V
Strategic Management: Vision, Mission, Goals, Strategy – Elements of Corporate Planning Process – Environmental Scanning – SWOT analysis- Steps in Strategy Formulation and Implementation, Generic Strategy Alternatives. Global strategies, theories of Multinational Companies.

UNIT VI
Contemporary Management Practice: Basic concepts of MIS, MRP, Justin- Time(JIT) system, Total Quality Management(TQM), Six sigma and Capability Maturity Model(CMM) Levies, Supply Chain Management , Enterprise Resource Planning (ERP), Business Process outsourcing (BPO), Business process Re-engineering and Bench Marking, Balanced Score Card.

Course Outcome:

*After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational behavior.

*Will familiarize with the concepts of functional management project management and strategic management.

Text Books

1. Dr. P. Vijaya Kumar & Dr. N. Appa Rao, *'Management Science'* Cengage, Delhi, 2012.
2. Dr. A. R. Aryasri, *Management Science'* TMH 2011.

References:

1. Koontz & Weihrich: 'Essentials *of management'* TMH 2011
2. Seth & Rastogi: Global Management Systems, Cengage learning , Delhi, 2011
3. Robbins: Organizational Behaviour, Pearson publications, 2011
4. Kanishka Bedi: Production & Operations Management, Oxford   Publications, 2011
5. Philip Kotler & Armstrong: Principles of Marketing, Pearson publications
6. Biswajit Patnaik: Human Resource Management, PHI, 2011
7. Hitt and Vijaya Kumar: Starategic Management, Cengage learning
8. Prem Chadha: Performance Management, Trinity Press(An imprint of Laxmi Publications Pvt. Ltd.)   Delhi 2015.
9. Anil Bhat& Arya Kumar : Principles of Management, Oxford University Press, New Delhi, 2015.

	L	T	P	C
IV Year – II Semester

	L	T	P	C
	4	0	0	3

MACHINE LEARNING

OBJECTIVES:
- Familiarity with a set of well-known supervised, unsupervised and semi-supervised
- learning algorithms.
- The ability to implement some basic machine learning algorithms
- Understanding of how machine learning algorithms are evaluated

UNIT -I:The ingredients of machine learning, Tasks: the problems that can be solved with machine learning, Models: the output of machine learning, Features, the workhorses of machine learning. **Binary classification and related tasks:** Classification, Scoring and ranking, Class probability estimation

UNIT- II:Beyond binary classification: Handling more than two classes, Regression, Unsupervised and descriptive learning. **Concept learning**: The hypothesis space, Paths through the hypothesis space, Beyond conjunctive concepts

UNIT- III: Tree models: Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction. **Rule models:**Learning ordered rule lists, Learning unordered rule sets, Descriptive rule learning, First-order rule learning

UNIT -IV:Linear models: The least-squares method, The perceptron: a heuristic learning algorithm for linear classifiers, Support vector machines, obtaining probabilities from linear classifiers, Going beyond linearity with kernel methods.**Distance Based Models:** Introduction, Neighbours and exemplars, Nearest Neighbours classification, Distance Based Clustering, Hierarchical Clustering.

UNIT- V:Probabilistic models: The normal distribution and its geometric interpretations, Probabilistic models for categorical data, Discriminative learning by optimising conditional likelihoodProbabilistic models with hidden variables.**Features:** Kinds of feature, Feature transformations, Feature construction and selection. Model ensembles: Bagging and random forests, Boosting

UNIT- VI: Dimensionality Reduction: Principal Component Analysis (PCA), Implementation and demonstration. **Artificial Neural Networks:**Introduction, Neural network representation, appropriate problems for neural network learning, Multilayer networks and the back propagation algorithm.

OUTCOMES:

- Recognize the characteristics of machine learning that make it useful to real-world
- Problems.
- Characterize machine learning algorithms as supervised, semi-supervised, and
- Unsupervised.
- Have heard of a few machine learning toolboxes.
- Be able to use support vector machines.
- Be able to use regularized regression algorithms.
- Understand the concept behind neural networks for learning non-linear functions.

TEXT BOOKS:

1. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge.
2. Machine Learning, Tom M. Mitchell, MGH.

REFERENCE BOOKS:

1. UnderstandingMachine Learning: From Theory toAlgorithms, Shai Shalev-Shwartz, Shai Ben-

David, Cambridge.

2. Machine Learning in Action, Peter Harington, 2012, Cengage.

	L	T	P	C
IV Year – II Semester

	L	**T**	**P**	**C**
	4	**0**	**0**	**3**

CONCURRENT AND PARALLEL PROGRAMMING
(Elective - 3)

OBJECTIVES:
- Improvement of students comprehension of CPP, new programming concepts, paradigms and idioms
- Change of 'mood' regarding Concurrency counter-intuitiveness
- Proactive attitude: theoretical teaching shouldn't be so dull
- Multipath, individually paced, stop–and–replay, personalized learning process
- Frequent assessment of learning advances on the subject

UNIT- 1
Concurrent versus sequential programming. Concurrent programming constructs and race condition. Synchronization primitives.

UNIT-II
Processes and threads. Interprocess communication. Livelock and deadlocks, starvation, and deadlock prevention. Issues and challenges in concurrent programming paradigm and current trends.

UNIT-III
Parallel algorithms – sorting, ranking, searching, traversals, prefix sum etc.,

UNIT- IV
Parallel programming paradigms – Data parallel, Task parallel, Shared memory and message passing, Parallel Architectures, GPGPU, pthreads, STM,

UNIT-V
OpenMP, OpenCL, Cilk++, Intel TBB, CUDA

UNIT-VI
Heterogeneous Computing: C++AMP, OpenCL

OUTCOMES:
- Understanding improvement of CPP concepts presented
- The number of reinforcement–exercises assigned
- The time required for the resolution of exercises
- Compliance level with the new model of theoretical teaching

TEXT BOOKS:

1. Mordechai Ben-Ari. Principles of Concurrent and Distributed Programming, Prentice-Hall International.
2. Greg Andrews. Concurrent Programming: Principles and Practice, Addison Wesley.
3. GadiTaubenfeld. Synchronization Algorithms and Concurrent Programming, Pearson.
4. M. Ben-Ari. Principles of Concurrent Programming, Prentice Hall.
5. Fred B. Schneider. On Concurrent Programming, Springer.
6. Brinch Hansen. The Origins of Concurrent Programming: From Semaphor

ARTIFICIAL NEURAL NETWORKS
(Elective-3)

OBJECTIVES:
- Understand the role of neural networks in engineering, artificial intelligence, and cognitive modeling.
- Provide knowledge of supervised learning in neural networks
- Provide knowledge of computation and dynamical systems using neural networks
- Provide knowledge of reinforcement learning using neural networks.
- Provide knowledge of unsupervised learning using neural networks.
- Provide hands-on experience in selected applications

UNIT-I: Introduction and ANN Structure.

Biological neurons and artificial neurons. Model of an ANN. Activation functions used in ANNs. Typical classes of network architectures.

UNIT-II

Mathematical Foundations and Learning mechanisms.Re-visiting vector and matrix algebra. State-space concepts. Concepts of optimization. Error-correction learning. Memory-based learning. Hebbian learning. Competitive learning.

UNIT-III

Single layer perceptrons. Structure and learning of perceptrons. Pattern classifier - introduction and Bayes' classifiers. Perceptron as a pattern classifier. Perceptron convergence. Limitations of a perceptrons.

UNIT-IV: Feed forward ANN.

Structures of Multi-layer feed forward networks. Back propagation algorithm. Back propagation - training and convergence. Functional approximation with back propagation. Practical and design issues of back propagation learning.

UNIT-V: Radial Basis Function Networks.

Pattern separability and interpolation. Regularization Theory. Regularization and RBF networks.RBF network design and training. Approximation properties of RBF.

UNIT-VI: Support Vector machines.

Linear separability and optimal hyperplane.Determination of optimal hyperplane. Optimal hyperplane for nonseparable patterns.Design of an SVM.Examples of SVM.

OUTCOMES:

- This course has been designed to offer as a graduate-level/ final year undergraduate level elective subject to the students of any branch of engineering/ science, having basic foundations of matrix algebra, calculus and preferably (not essential) with a basic knowledge of optimization.
- Students and researchers desirous of working on pattern recognition and classification, regression and interpolation from sparse observations; control and optimization are expected to find this course useful. The course covers theories and usage of artificial neural networks (ANN) for problems pertaining to classification (supervised/ unsupervised) and regression.
- The course starts with some mathematical foundations and the structures of artificial neurons, which mimics biological neurons in a grossly scaled down version. It offers mathematical basis of learning mechanisms through ANN. The course introduces perceptrons, discusses its capabilities and limitations as a pattern classifier and later develops concepts of multilayer perceptrons with back propagation learning.

TEXT BOOKS:
1. Simon Haykin, "Neural Networks: A comprehensive foundation", Second Edition, Pearson Education Asia.
2. Satish Kumar, "Neural Networks: A classroom approach", Tata McGraw Hill, 2004.

REFERENCE BOOKS:

1. Robert J. Schalkoff, "Artificial Neural Networks", McGraw-Hill International Editions, 1997.

OPERATION RESEARCH
(Elective - 3)

OBJECTIVE:
- Identify and develop operational research models from the verbal description of the real system.
- Understand the mathematical tools that are needed to solve optimisation problems.
- Use mathematical software to solve the proposed models.
- Develop a report that describes the model and the solving technique, analyse the results and propose recommendations in language understandable to the decision-making processes in Management Engineering

UNIT-I:
Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M method, two-phase method, degeneracy and unbound solutions**.**

UNIT-II:
Transportation Problem. Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method

UNIT-III:
Assignment model. Formulation. Hungarian method for optimal solution. Solving unbalanced problem. Traveling salesman problem and assignment problem Sequencing models. Solution of Sequencing Problem – Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines – Processing n Jobs through m Machines

UNIT-IV:
Dynamic programming. Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stage Coach/Shortest Path, cargo loading and Reliability problems Games Theory. Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games

UNIT-V:
Replacement Models. Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value. Replacement of items that fail suddenly: individual replacement policy, group replacement policy

UNIT-VI:

Inventory models. Inventory costs. Models with deterministic demand – model (a) demand rate uniform and production rate infinite, model (b) demand rate non-uniform and production rate infinite, model (c) demand rate uniform and production rate finite.

OUTCOME:

- Methodology of Operations Research.
- Linear programming: solving methods, duality, and sensitivity analysis.
- Integer Programming.
- Network flows.
- Multi-criteria decision techniques.
- Decision making under uncertainty and risk.
- Game theory. Dynamic programming.

TEXT BOOKS:

1. P. Sankara Iyer,"Operations Research", Tata McGraw-Hill, 2008.
2. A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005.

REFERENCE BOOKS:

1. J K Sharma. "Operations Research Theory & Applications, 3e", Macmillan India Ltd, 2007.
2. P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007.
3. J K Sharma., "Operations Research, Problems and Solutions, 3e", Macmillan India Ltd
4. N.V.S. Raju, "Operations Research", HI-TECH, 2002

		L	T	P	C
IV Year – II Semester		**0**	**3**	**0**	**2**

SEMINAR

IV Year – II Semester

L	T	P	C
0	0	0	10

PROJECT

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

COURSE STRUCTURE AND SYLLABUS
For UG – R20

B. Tech - COMPUTER SCIENCE AND DESIGN
(Applicable for batches admitted from 2020-2021)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

COURSE STRUCTURE

I Year – I SEMESTER

S. No	Course Code	Subjects	L	T	P	Credits
1	HS1101	Communicative English	3	0	0	3
2	BS1101	Mathematics – I	3	0	0	3
3	BS1102	Applied Chemistry	3	0	0	3
4	ES1101	Programming for Problem Solving using C	3	0	0	3
5	ES1102	Design Drawing and Visualization	1	0	4	3
6	HS1102	English Communication Skills Laboratory	0	0	3	1.5
7	BS1103	Applied Chemistry Lab	0	0	3	1.5
8	ES1103	Programming for Problem Solving using C Lab	0	0	3	1.5
9	MC1101	Environmental Science*	2	0	0	0
Total Credits			**15**	**0**	**13**	**19.5**

I Year – II SEMESTER

S. No	Course Code	Subjects	L	T	P	Credits
1	BS1201	Mathematics – II	3	0	0	3
2	BS1202	Applied Physics	3	0	0	3
3	ES1201	Digital Logic Design	3	0	0	3
4	ES1202	Python Programming	3	0	0	3
5	CS1201	Data Structures	3	0	0	3
6	BS1203	Applied Physics Lab	0	0	3	1.5
7	ES1203	Python Programming Lab	0	0	3	1.5
8	CS1202	Data Structures Lab	0	0	3	1.5
9	MC1201	Constitution of India *	2	0	0	0
Total Credits			**17**	**0**	**9**	**19.5**

*Internal Evaluation

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

II Year – I SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	BS2101	Mathematics - III	3	0	0	3
2	CS2101	Mathematical Foundations of Computer Science	3	0	0	3
3	CS2102	Computer Graphics	3	0	0	3
4	CS2103	Multimedia and Application Development	3	0	0	3
5	CS2104	Database Management Systems	3	0	0	3
6	CS2105	Computer Graphics Lab	0	0	3	1.5
7	CS2106	Multimedia and Application Development Lab	0	0	3	1.5
8	CS2107	Database Management Systems Lab	0	0	3	1.5
9	SO2101	Mobile App Development	0	0	4	2
10	MC2101	Essence of Indian Tradition Knowledge	2	0	0	0
		Total Credits	17	0	13	21.5

II Year – II SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	BS2201	Probability and Statistics	3	0	0	3
2	CS2201	Computer Organization	3	0	0	3
3	CS2202	Data warehousing and Mining	3	0	0	3
4	ES2201	Visual Design and Communication	3	0	0	3
5	HS2201	Managerial Economics and Financial Accountancy	3	0	0	3
6	CS2203	Games Development Lab	0	0	3	1.5
7	CS2204	Data Mining using Python Lab	0	0	3	1.5
8	ES2202	Web Application Development Lab	0	0	3	1.5
9	SO2201	Digital Photography using Adobe Photoshop	0	0	4	2
		Total Credits	15	0	13	21.5

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I Year - I Semester		L	T	P	C
		3	0	0	3
	COMMUNICATIVE ENGLISH (HS1101)				

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives

➢ Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers

➢ Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials

➢ Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations

➢ Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information

➢ Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Learning Outcomes

At the end of the module, the learners will be able to

➢ understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information

➢ ask and answer general questions on familiar topics and introduce oneself/others

➢ employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information

➢ recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs

➢ form sentences using proper grammatical structures and correct word forms

Unit 1:

Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications
Lesson-2: Deliverance by Premchandfrom "**The Individual Society",**Pearson Publications. (Non-detailed)

Listening: Listening to short audio texts and identifying the topic.Listening to prose, prose and conversation.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests.Self introductions and introducing others.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.
Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.
Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.
Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.
Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit 2:
Lesson-1: Nehru's letter to his daughter Indira on her birthday from "**Infotech English**", Maruthi Publications
Lesson-2: Bosom Friend by HiraBansodefrom "**The Individual Society",** Pearson Publications.(Non-detailed)

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.
Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.**Reading**: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.
Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)
Grammar: Use of articles and zero article; prepositions.
Pronunciation: Past tense markers, word stress-di-syllabic words

Unit 3:
Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications
Lesson-2: Shakespeare's Sister by Virginia Woolf from "**The Individual Society",** Pearson Publications.(Non-detailed**)**

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.Functional English:Complaining and Apologizing.
Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.Critical reading.
Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing.E-mail etiquette, Writing CV's.
Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words
Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.
Pronunciation: word stress-poly-syllabic words.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

<u>Unit 4:</u>
Lesson-1: Liking a Tree, Unbowed: WangariMaathai-biography from "**Infotech English**", Maruthi Publications
Lesson-2: Telephone Conversation-Wole Soyinka from "**The Individual Society",** Pearson Publications**.**(Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.Functional English: Permissions, Requesting, Inviting.
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.
Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.Writing SOP, writing for media.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.
Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms
Pronunciation: Contrastive Stress

<u>Unit 5:</u>
Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications
Lesson-2: Still I Rise by Maya Angelou from "**The Individual Society",** Pearson Publications.(Non-detailed)

Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.
Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.Functional English: Suggesting/Opinion giving.
Reading: Reading for comprehension. RAP StrategyIntensive reading and Extensive reading techniques.
Reading for Writing: Writing academic proposals- writing research articles: format and style.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.
Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Pronunciation: Stress in compound words

Prescribed text books for theory for Semester-I:
1. "**Infotech English**", Maruthi Publications. (Detailed)
2."**The Individual Society",** Pearson Publications.(Non-detailed)

Prescribed text book for Laboratory for Semesters-I & II:
1. "**Infotech English**", Maruthi Publications. (with Compact Disc)

Reference Books:
 1. Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I Year - I Semester		L	T	P	C
		3	0	0	3
	MATHEMATICS-I (BS1101) **(Common to all Branch's for I Year B. Tech)**				

Course Objectives:
- To familiarize a variety of well-known sequences and series, with a developing intuition about the behaviour of new ones.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes: At the end of the course, the student will be able to
- utilize mean value theorems to real life problems (L3)
- solve the differential equations related to various engineering fields (L3)
- familiarize with functions of several variables which is useful in optimization (L3)
- apply double integration techniques in evaluating areas bounded by region (L3)
- students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems(L5)

UNIT – I: Sequences, Series and Mean value theorems: **(10hrs)**
Sequences and Series: Convergences and divergence, Ratio test, Comparison tests, Integral test, Cauchy's root test, Alternate series, Leibnitz's rule.
Mean Value Theorems (without proofs): Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders, Problems and applications on the above theorem.

UNIT – II: Differential equations of first order and first degree: **(10hrs)**
Linear differential equations, Bernoulli's equations, Exact equations and equations reducible to exact form.
Applications: Newton's Law of cooling, Law of natural growth and decay, Orthogonal trajectories, Electrical circuits.

UNIT – III: Linear differential equations of higher order: **(10hrs)**
Homogeneous and Non-homogeneousdifferential equations of higher order with constant coefficients, with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, $e^{ax}V(x)$ and $x^nV(x)$, Method of Variation of parameters, Cauchy and Legendre's linear equations.
Applications: LCR circuit, Simple Harmonic motion.

UNIT – IV: Partial differentiation: **(10hrs)**
Introduction, Homogeneous function, Euler's theorem, Total derivative, Chain rule, Jacobian Functional dependence, Taylor's and MacLaurin's series expansion of functions of two variables.
Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

UNIT – V: Multiple integrals: (8 hrs)

Double and Triple integrals, Change of order of integration in double integrals, Change of variables to polar, cylindrical and spherical coordinates.

Applications: Finding Areas and Volumes.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers, 2017.
2. B. V. Ramana,Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. Erwin Kreyszig,Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. Joel Hass, Christopher Heil and Maurice D. Weir, Thomas calculus, 14thEdition, Pearson.
3. Lawrence Turyn,Advanced Engineering Mathematics, CRC Press, 2013.
4. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press, 2015.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I Year - I Semester		L	T	P	C
		3	0	0	3
	APPLIED CHEMISTRY (BS1102)				

Course Objectives
- Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- Explain the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- Recall the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- Outlinethe basics of computational chemistry and molecular switches

UNIT I: POLYMER TECHNOLOGY   **8 hrs**
Polymerisation:- Introduction, methods of polymerization (emulsion and suspension), mechanical properties.
Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste (waste to wealth).
Elastomers:- Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes).
Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable polymers, biopolymers, biomedical polymers.
Course Outcomes: At the end of this unit, the students will be able to
- Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION   **10 hrs**
Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, construction of glass electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).
*Corrosion:-*Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (proper designing and cathodic protection), Protective coatings (surface preparation, cathodic coatings, anodic coatings, electroplating and electroless plating [nickel]), Paints (constituents, functions and special paints).
Course Outcomes: At the end of this unit, the students will be able to
- Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.

UNIT III: MATERIAL CHEMISTRY   **10 hrs**
Part I : Non-elemental semiconducting materials:- Stoichiometric, controlled valency&chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

Insulators & magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.
Part II:Nano materials:- Introduction, sol-gel method, characterization by (BrunauerEmmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)
Liquid crystals:- Introduction-types-applications.
Super conductors:-Type –I, Type II-characteristics and applications
Course Outcomes: At the end of this unit, the students will be able to

- Synthesize nanomaterials for modern advances of engineering technology.
- Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors.

UNIT IV:SPECTROSCOPIC TECHNIQUES &NON-CONVENTIONAL ENERGY SOURCES 10 hrs
Part A: **SPECTROSCOPIC TECHNIQUES**
Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR [instrumentation and differentiation of sp, sp^2, sp^3 and IR stretching of functional groups (alcohols, carbonyls, amines) applications], magnetic resonance imaging and CT scan (procedure & applications).
Part B: NON-CONVENTIONAL ENERGY SOURCES
Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.
Course Outcomes: At the end of this unit, the students will be able to

- Analyze the principles of different analytical instruments and their applications.
- Design models for energy by different natural sources.

UNIT V: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY   8 hrs
Computational chemistry: Introduction to computational chemistry, molecular modelling and docking studies
Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor
Course Outcomes: At the end of this unit, the students will be able to

- Obtain the knowledge of computational chemistry and molecular machines

Text Books:
1. P.C. Jain and M. Jain "Engineering Chemistry", 15/e, DhanpatRai& Sons, Delhi, (Latest edition).
2. ShikhaAgarwal, "Engineering Chemistry", Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, "A Textbook of Engineering Chemistry", S.Chand& Co, (2010).
4. ShashiChawla, "Engineering Chemistry", DhanpatRaiPublicating Co. (Latest edition).

Reference Books:
1. K. SeshaMaheshwaramma and MridulaChugh, "Engineering Chemistry", Pearson India Edn, 2016.
2. O.G. Palana, "Engineering Chemistry", Tata McGraw Hill Education Private Limited, 2009.
3. CNR Rao and JM Honig (Eds) "Preparation and characterization of materials" Academic press, New York, 2018.
4. B. S. Murthy, P. Shankar and others, "Textbook of Nanoscience and Nanotechnology", University press , 2013.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I Year - I Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FOR PROBLEM SOLVING USING C (ES1101)					

Course Objectives:
The objectives of Programming for Problem Solving Using C are
- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C
- To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage.
- To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
- To assimilate about File I/O and significance of functions

Course Outcomes:
Upon the completion of the course the student will learn
- To write algorithms and to draw flowcharts for solving problems
- To convert flowcharts/algorithms to C Programs, compile and debug programs
- To use different operators, data types and write programs that use two-way/ multi-way selection
- To select the best loop construct for a given problem
- To design and implement programs to analyze the different pointer applications
- To decompose a problem into functions and to develop modular reusable code
- To apply File I/O operations

UNIT I
Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers
Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.
Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II
Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators. Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions.
Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.

UNIT III
Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages
Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code
Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

UNIT IV

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value
Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application.
Processor Commands: Processor Commands.

UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter- Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion
Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions
Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

Text Books:
1) Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE, 2019 .
2) The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson, 2015.

Reference Books:
1) Computer Fundamentals and Programming, Sumithabha Das, McGraw Hill, 2018.
2) Programming in C, Ashok N. Kamthane, AmitKamthane, 3rd Ed, Pearson, 2015.
3) Computer Fundamentals and Programming in C, PradipDey, ManasGhosh, OXFORD, 2013.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I Year - I Semester		L	T	P	C
		1	0	4	3
DESIGN DRAWING AND VISUALIZATION (ES1102)					

Course Outcomes:

- Students will develop the skill & ability to observe and visually represent all the elements in their environment .
- Students will inculcate skills and develop the ability to explain the importance of precision in design through drawings using instruments/tools and concept of geometrical forms.
- Students will develop the ability to discuss orthographic projections of forms through Technical Drawings and Isometric Views of forms through Analytical Drawings and use these as a tool for visual understanding and visual representation.
- Students will develop the ability to analyse visual structure of 3D forms on 2D surfaces with an understanding of spatial concepts
- Students will develop the ability to analyse complex images and in turn develop the ability to visualise concepts, create mental imageries and articulate them visually.

UNIT-I
INTRODUCTION TO DESIGN DRAWING: Introduction to Materials, Tools & Methods, Introduction to Observation, Introduction to Perception, Introduction to Perspective – Eye level, Vanishing Point
Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles. Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents &normals for the curves. Scales: Plain scales, diagonal scales and vernier scales

UNIT-II
DRAWING OF CUBES and PERSPECTIVES : Introduction to Vanishing Points, View Point, Eye Level, Horizon, Parallel & Converging Lines, One Point Perspective, Two Point Perspective. Three Point Perspective, Perspective in the Environment, Interior Spaces and Objects.
OBJECT DRAWING : Introduction to other geometric forms like cylinder, cuboids etc Introduction to Object Drawing, How to observe – shape, proportions, effect of light on the objects etc.

UNIT-III
PROJECTION DRAWINGS : Orthographic Projection of Planes and Solids, Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane. Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces Projections of Solids Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

UNIT-IV
ANALYTICAL DRAWING : Isometric Projection, Architectonic Drawing
ANALYTICAL DRAWING CONT'D : Isometric Circles. Architectonic Planes with rounded surfaces, tube with square cross section with ellipse at different planes and tube with circular cross-section.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

UNIT-V
Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.
Visualization using AutoCAD: Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects using Auto CAD

Text Books:
1. Engineering Drawing by N.D. Bhatt, Chariot Publications, 2011.
2. Engineering Drawing by Agarwal&Agarwal, 2nd ed, Tata McGraw Hill Publishers, 2013.
3. Erik Olofsson, KlaraSjolen, Design Sketching, 3rd ed, KEEOS Design Books, 2007.
4. K .Morling, Geometric and Engineering Drawing, Third Edition, Graduate of the Institution of Mechanical Engineers, SI Units, Elsevier, 2010.

References:
1. Engineering Drawing by K.L.Narayana& P. Kannaiah, Scitech Publishers, 3rd ed, 2011.
2. Engineering Graphics for Degree by K.C. John, PHIPublishers, 2009.
3. Engineering Graphics by PI Varghese, McGrawHill Publishers, 2013.
4. Engineering Drawing + AutoCad   K Venugopal, V. Prabhu Raja, New Age, 2010.
5. KoosEissen, RoselienSteur, Sketching: The Basics, BIS Publishers, 2011.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I Year - I Semester		L	T	P	C
		0	0	3	1.5
ENGLISH COMMUNICATION SKILLS LABORATORY (HS1102)					

TOPICS

UNIT I:
Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation,

UNIT II:
Word stress-di-syllabic words, poly-syllabic words, weak and strong forms, contrastive stress (Homographs)

UNIT III:
Stress in compound words,rhythm, intonation,accent neutralisation.

UNIT IV:
Listening to short audio texts and identifying the context and specific pieces of information toanswer a series of questions in speaking.

UNIT V:
Newspapers reading;Understanding and identifying key terms and structures useful for writing reports.

Prescribed text book: "**Infotech English**", Maruthi Publications.

References:
1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I Year - I Semester		L	T	P	C
		0	0	3	1.5
	APPLIED CHEMISTRY LAB (BS1103)				

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na_2CO_3 solution.

2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.

3. Determination of Mn^{+2} using standard oxalic acid solution.

4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.

5. Determination of Cu^{+2} using standard hypo solution.

6. Determination of temporary and permanent hardness of water using standard EDTA solution.

7. Determination of Fe^{+3} by a colorimetric method.

8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).

9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method.

10. Determination of the concentration of strong acid vs strong base (by conductometric method).

11. Determination of strong acid vs strong base (by potentiometric method).

12. Determination of Mg^{+2} presentin an antacid.

13. Determination of $CaCO_3$ present in an egg shell.

14. Estimation of Vitamin C.

15. Determination of phosphoric content in soft drinks.

16. Adsorption of acetic acid by charcoal.

17. Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books
1. A Textbook of Quantitative Analysis, Arthur J. Vogel, 5thed, 1989.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I Year - I Semester		L	T	P	C
		0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING USING C LAB (ES1103)					

Course Objectives:
- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers & functions.
- To review the file operations, preprocessor commands.

Course Outcomes:
By the end of the Lab, the student
- Gains Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:
1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

Exercise 2:
1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:
1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:
1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum.
   $1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n$ terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:
1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

Exercise 6:
1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:
1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:
1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:
1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:
1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:
1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:
1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:
1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

Exercise 14:
1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:
1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

Exercise 16:
1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I Year - I Semester		L	T	P	C
		2	0	0	0
	ENVIRONMENTAL SCIENCE (MC1101)				

Course Objectives:
The objectives of the course are to impart:
- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

UNIT I
Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.
Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT II
Natural Resources: Natural resources and associated problems.
Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.
Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.
Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT III
Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

UNIT IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:
1) Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2) Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3) Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference Books:
1) Text Book of Environmental Studies, Deeshita Dave & P. UdayaBhaskar, 3rded, Cengage Learning.
2) A Textbook of Environmental Studies, ShaashiChawla, TMH, New Delhi
3) Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4) Perspectives in Environment Studies, AnubhaKaushik, C P Kaushik, New Age International Publishers, 2014

e-learning resources:
• http://nptel.ac.in/courses.php
• http://jntuk-coeerd.in/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I Year - II Semester		L	T	P	C
		3	0	0	3
	MATHEMATICS - II (BS1201)				

Course Objectives:
- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes: At the end of the course, the student will be able to
- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
- evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
- apply numerical integral techniques to different Engineering problems (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

UNIT – I: Solving systems of linear equations, Eigen values and Eigen vectors: (10hrs)
Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous linear equations – Gauss Eliminationmethod– Eigenvalues and Eigen vectors and properties (article-2.14 in text book-1).

Unit – II: Cayley–Hamilton theorem and Quadratic forms: (10hrs)
Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation.Singular values of a matrix, singular value decomposition (text book-3).

UNIT – III: Iterative methods: (8 hrs)
Introduction– Bisection method–Secant method – Method of false position– Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations numerically.

UNIT – IV: Interpolation: (10 hrs)
Introduction– Errors in polynomial interpolation – Finite differences– Forward differences– Backward differences –Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula– Newton's divide difference formula.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

UNIT – V: Numerical differentiation and integration, Solution of ordinary differential equations with initial conditions: **(10 hrs)**
Numerical differentiation using interpolating polynomial – Trapezoidal rule– Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method –Runge-Kutta method (second and fourth order).

Text Books:
1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. B. V. Ramana,Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. David Poole, Linear Algebra- A modern introduction, 4th Edition, Cengage, 2014.

Reference Books:
1. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science,Tata Mc. Graw Hill Education, 2008.
2. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications, 1996.
3. Lawrence Turyn,Advanced Engineering Mathematics, CRC Press, 2013.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I Year - II Semester		L	T	P	C
		3	0	0	3
	APPLIED PHYSICS (BS1202) **(For All Circuital Branches like ECE, EEE, CSE etc)**				

Course Objectives:

1. Bridging the gap between the physics in school at 10+2 level and UG level engineering courses.
2. To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
3. Understand the mechanism of emission of light, utilization of lasers as coherent light sources for low and high energy applications, study of propagation of light through optical fibers and their implications in optical communications.
4. Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of deBroglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals and band theory for crystalline solids. Metals- Semiconductors-Insulators concepts utilization of transport phenomenon of charge carriers in semiconductors.
5. To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
6. To understand the physics of Semiconductors and their working mechanism. To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications.

Course Outcomes:

1. Explain the need of coherent sources and the conditions for sustained interference (L2). Identify the applications of interference in engineering (L3). Analyze the differences between interference and diffraction with applications (L4). Illustrate the concept of polarization of light and its applications (L2). Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2)
2. Explain various types of emission of radiation (L2). Identify the role of laser in engineering applications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify optical fibers based on refractive index profile and mode of propagation (L2). Identify the applications of optical fibers in medical, communication and other fields (L2). Apply the fiber optic concepts in various fields (L3).
3. Describe the dual nature of matter (L1). Explain the significance of wave function (L2). Identify the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). Identify the role of classical and quantum free electron theory in the study of electrical conductivity (L3). Classify the energy bands of solids (L2).
4. Explain the concept of dielectric constant and polarization in dielectric materials (L2). Summarize various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). Classify the magnetic materials based on susceptibility and their temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3)
5. Outline the properties of charge carriers in semiconductors (L2). Identify the type of semiconductor using Hall effect (L2). Identify applications of semiconductors in

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

electronic devices (L2). Classify superconductors based on Meissner's effect (L2). Explain Meissner's effect, BCS theory & Josephson effect in superconductors (L2).

Unit-I: Wave Optics   12hrs
Interference: Principle of superposition, Interference of light, Interference in thin films (Reflection Geometry) & applications, Colors in thin films, Newton's Rings, Determination of wavelength and refractive index.
Diffraction: Introduction, Fresnel and Fraunhofer diffraction, Fraunhofer diffraction due to single slit, double slit, N-slits (Qualitative), Diffraction Grating, Dispersive power and resolving power of Grating(Qualitative).
Polarization: Introduction, Types of polarization, Polarization by reflection, refraction and Double refraction, Nicol's Prism, Half wave and Quarter wave plates.
Unit Outcomes:
The students will be able to
 ➢ **Explain** the need of coherent sources and the conditions for sustained interference (L2)
 ➢ **Identify** engineering applications of interference (L3)
 ➢ **Analyze** the differences between interference and diffraction with applications (L4)
 ➢ **Illustrate** the concept of polarization of light and its applications (L2)
 ➢ **Classify** ordinary polarized light and extraordinary polarized light (L2)

Unit-II: Lasers and Fiber optics   8hrs
Lasers: Introduction, Characteristics of laser, Spontaneous and Stimulated emissions of radiation, Einstein's coefficients, Population inversion, Lasing action, Pumping mechanisms, Ruby laser, He-Ne laser, Applications of lasers.
Fiber optics: Introduction, Principle of optical fiber, Acceptance Angle, Numerical Aperture, Classification of optical fibers based on refractive index profile and modes, Propagation of electromagnetic wave through optical fibers, Applications.
Unit Outcomes:
The students will be able to
 ➢ **Understand** the basic concepts of LASER light Sources (L2)
 ➢ **Apply** the concepts to learn the types of lasers (L3)
 ➢ **Identifies** the Engineering applications of lasers (L2)
 ➢ **Explain** the working principle of optical fibers (L2)
 ➢ **Classify** optical fibers based on refractive index profile and mode of propagation (L2)
 ➢ **Identify** the applications of optical fibers in various fields (L2)

Unit III: Quantum Mechanics, Free Electron Theory and Band theory   10hrs
Quantum Mechanics: Dual nature of matter, Heisenberg's Uncertainty Principle, Significance and properties of wave function, Schrodinger's time independent and dependent wave equations, Particle in a one-dimensional infinite potential well.
Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits), Quantum free electron theory, Equation for electrical conductivity based on quantum free electron theory, Fermi-Dirac distribution, Density of states (3D), Fermi energy.
Band theory of Solids: Bloch's Theorem (Qualitative), Kronig - Penney model (Qualitative), EvsK diagram, VvsK diagram, effective mass of electron, Classification of crystalline solids, concept of hole.
Unit Outcomes:
 The students will be able to

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

- ➢ **Explain** the concept of dual nature of matter (L2)
- ➢ **Understand** the significance of wave function (L2)
- ➢ **Interpret** the concepts of classical and quantum free electron theories (L2)
- ➢ **Explain** the importance of K-P model
- ➢ **Classify** the materials based on band theory (L2)
- ➢ **Apply** the concept of effective mass of electron (L3)

Unit-IV: Dielectric and Magnetic Materials   8hrs

Dielectric Materials: Introduction, Dielectric polarization, Dielectric polarizability, Susceptibility and Dielectric constant, Types of polarizations, Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative), Lorentz internal field, Clausius-Mossotti equation, Piezoelectricity.

Magnetic Materials: Introduction, Magnetic dipole moment, Magnetization-Magnetic susceptibility and permeability, Origin of permanent magnetic moment, Classification of magnetic materials: Dia, para, Ferro, antiferro&Ferri magnetic materials, Domain concept for Ferromagnetism & Domain walls (Qualitative), Hysteresis, soft and hard magnetic materials, Eddy currents, Engineering applications.

Unit Outcomes: *The students will be able to*
- ➢ **Explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- ➢ **Summarize** various types of polarization of dielectrics (L2)
- ➢ **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics(L2)
- ➢ **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- ➢ **Explain** the applications of dielectric and magnetic materials (L2)
- ➢ **Apply** the concept of magnetism to magnetic data storage devices (L3)

Unit – V: Semiconductors and Superconductors   10hrs

Semiconductors: Introduction, Intrinsic semiconductors, Density of charge carriers, Electrical conductivity, Fermi level, extrinsic semiconductors, density of charge carriers, dependence of Fermi energy on carrier concentration and temperature, Drift and diffusion currents, Einstein's equation, Hall effect, Hall coefficient, Applications of Hall effect.

Superconductors: Introduction, Properties of superconductors, Meissner effect, Type I and Type II superconductors, BCS theory (Qualitative), Josephson effects (AC and DC), SQUIDs, High T_c superconductors, Applications of superconductors.

Unit Outcomes:
The students will be able to
- ➢ **Classify** the energy bands of semiconductors (L2)
- ➢ **Interpret** the direct and indirect band gap semiconductors (L2)
- ➢ **Identify** the type of semiconductor using Hall effect (L2)
- ➢ **Identify** applications of semiconductors in electronic devices (L2)
- ➢ **Classify** superconductors based on Meissner's effect (L2)
- ➢ **Explain** Meissner's effect, BCS theory & Josephson effect in superconductors (L2)

Text books:
1. M.N.Avadhanulu, P.G.Kshirsagar& TVS Arun Murthy" A Text book of Engineering Physics"- S.Chand Publications, 11ᵗʰ Edition 2019.
2. Engineering Physics" by D.K.Bhattacharya and PoonamTandon, Oxford press, 2015.
3. Applied Physics by P.K.Palanisamy SciTech publications, 2018.

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KAKINADA – 533 003, Andhra Pradesh, India

Reference Books:
1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons, 2013.
2. Engineering Physics by M.R.Srinivasan, New Age international publishers, 2009.
3. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education, 2018
4. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press, 2016.
5. Semiconductor physics and devices- Basic principle – Donald A, Neamen, McGraw Hill, 2011.
6. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2013.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I Year - II Semester		L	T	P	C
		3	0	0	3
	DIGITAL LOGIC DESIGN (ES1201)				

Course objectives:
- To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, theory of Boolean algebra and map method for minimization of switching functions.
- To introduce the basic tools for design of combinational and sequential digital logic.
- To learn simple digital circuits in preparation for computer engineering.

Course outcomes:
A student who successfully fulfills the course requirements will have demonstrated:
- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different switching algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays.
- Students will be able to design various sequential circuits starting from flip-flop to registers and counters.

UNIT I: Digital Systems and Binary Numbers
Digital Systems, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit codes: BCD, EXCESS 3, alphanumeric codes, 9's complement, 2421, etc..

UNIT II: Concept of Boolean algebra
Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms.Gate level Minimization
Map Method, Three-Variable K-Map, Four Variable K-Maps. Products of Sum Simplification, Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation, ExclusiveOR Function.

UNIT III: Combinational Logic
Introduction, Analysis Procedure, Binary Adder–Subtractor, Binary Multiplier, Decoders, Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, Magnitude Comparator, HDL Models of Combinational Circuits.
Realization of Switching Functions Using PROM, PAL and PLA.

UNIT IV: Synchronous Sequential Logic
Introduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops, Truth and Excitation Tables, Conversion of Flip Flops.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

UNIT V: Registers and Counters
Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter.

Text Books:
1. Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA,2013.
2. Fundamentals of Logic Design, 5/e, Roth, Cengage, 2020.

Reference Books:
1. Digital Logic and Computer Design, M.Morris Mano, PEA.
2. Digital Logic Design, Leach, Malvino, Saha, TMH.
3. Modern Digital Electronics, R.P. Jain, TMH.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I Year – II Semester		L	T	P	C
		3	0	0	3
	PYTHON PROGRAMMING (ES1202)				

Course Objectives:
The Objectives of Python Programming are
- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes:
- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language
- Solve coding tasks related conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in object- oriented programming

UNIT I
Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.
Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.
Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

UNIT II
Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement, Conditional Iteration The While Loop
Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

UNIT III
List and Dictionaries: Lists, Defining Simple Functions, Dictionaries
Design with Function**:** Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.
Modules: Modules, Standard Modules, Packages.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

UNIT IV
File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations
Object Oriented Programming**:** Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support
Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism

UNIT V
Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.
Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.
Programming**:** Introduction to Programming Concepts with Scratch.

Text Books
1) Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage, 2018.
2) Python Programming: A Modern Approach, VamsiKurama, 1sted, Pearson, 2018.

Reference Books:
1) Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press, 2018.
2) Introduction to Programming Using Python, Y. Daniel Liang, Pearson, 2013.

e-Resources:
https://www.tutorialspoint.com/python3/python_tutorial.pdf

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I Year – II Semester		L	T	P	C
		3	0	0	3
	DATA STRUCTURES (CS1201)				

Course Objectives:
The objective of the course is to
- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

Course Outcomes:
After completing this course a student will be able to:
- Summarize the properties, interfaces, and behaviors of basic abstract data types
- Discuss the computational efficiency of the principal algorithms for sorting & searching
- Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
- Demonstrate different methods for traversing trees

UNIT I
Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.
Searching - Linear search, Binary search, Fibonacci search.
Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II
Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation ,Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III
Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues-Circular Queues, Dequeues, Priority Queues, Multiple Queues.
Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.

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KAKINADA – 533 003, Andhra Pradesh, India

UNIT IV
Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees-AVL Trees, Insertion, Deletion and Rotations.

UNIT V
Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims &Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

Text Books:
1) Data Structures Using C. 2nd Edition, ReemaThareja, Oxford, 2014.
2) Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss, 1996.

Reference Books:
1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press, 2008.
2) Data Structures: A PseudoCode Approach, 2nded, Richard F.Gilberg, Behrouz A. Forouzon, Cengage, 2004.
3) Data Structures with C, Seymour Lipschutz,2nded, TMH

e-Resources:
1) http://algs4.cs.princeton.edu/home/
2) https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf

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KAKINADA – 533 003, Andhra Pradesh, India

I Year - II Semester		L	T	P	C
		0	0	3	1.5
APPLIED PHYSIC LAB (BS1203) **(For All Circuital Branches like CSE, ECE, EEE etc.)**					

(Any 10 of the following listed experiments)

List of Applied Physics Experiments

1. Determination of thickness of thin object by wedge method.
2. Determination of radius of curvature of a given plano convex lens by Newton's rings.
3. Determination of wavelengths of different spectral linesinmercury spectrum using diffraction grating in normal incidence configuration.
4. Determination of dispersive power of the prism.
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of wavelength of Laser light using diffraction grating.
9. Estimation of Planck's constant using photoelectric effect.
10. Determination of the resistivity of semiconductor by four probe method.
11. To determine the energy gap of a semiconductor using p-n junction diode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart&Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.
14. Measurement of resistance of a semiconductor with varying temperature.
15. Resistivity of a Superconductor using four probe method &Meissner effect.

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text Book of Practical Physics"- S Chand Publishers, 2017.

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KAKINADA – 533 003, Andhra Pradesh, India

I Year – II Semester		L	T	P	C
		0	0	3	1.5
	PYTHON PROGRAMMING LAB (ES1203)				

Course Objectives:

The aim of Python Programming Lab is

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

Course Outcomes:

By the end of this lab, the student is able to

- Write, Test and Debug Python Programs
- Use Conditionals and Loops for Python Programs
- Use functions and represent Compound data using Lists, Tuples and Dictionaries
- Use various applications using python

List of Experiments:

1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
3) Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
4) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
5) Use a *for*loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

        *
        **
        ***
        ****

6) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
7) Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and Not close otherwise.
8) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
9) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters *abcde*and*ABCDE*the program should print out *AaBbCcDdEe*.
10) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.

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KAKINADA – 533 003, Andhra Pradesh, India

11) In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4y or 3(x+5). Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.

12) Write a program that generates a list of 20 random numbers between 1 and 100.
   (a) Print the list.
   (b) Print the average of the elements in the list.
   (c) Print the largest and smallest values in the list.
   (d) Print the second largest and second smallest entries in the list
   (e) Print how many even numbers are in the list.

13) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.

14) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is 4.

15) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].

16) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements,it is much shorter with lists and it is also easier to add new conversions if you use lists.

17) Write a function called *sum_digits*that is given an integer num and returns the sum of the digits of num.

18) Write a function called *first_diff*that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.

19) Write a function called *number_of_factors*that takes an integer and returns how many factors the number has.

20) Write a function called *is_sorted*that is given a list and returns True if the list is sorted and False otherwise.

21) Write a function called root that is given a number x and an integer n and returns $x^{1/n}$. In the function definition, set the default value of n to 2.

22) Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be 100.

23) Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
   (a) Do this using the sort method. (b) Do this without using the sort method.

24) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.

25) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.

26) Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.

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KAKINADA – 533 003, Andhra Pradesh, India

27) Write a class called Product. The class should have fields called name, amount, and price, holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get_price*that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make_purchase*that receives the number of items to be bought and decreases amount by that much.

28) Write a class called Time whose only field is a time in seconds. It should have a method called *convert_to_minutes*that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert_to_hours*that returns a string of hours, minutes, and seconds formatted analogously to the previous method.

29) Write a class called Converter. The user will pass a length and a unit when declaring an object from the class—for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call c.feet() and should get 0.75 as the result.

30) Write a Python class to implement pow(x, n).

31) Write a Python class to reverse a string word by word.

32) Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.

33) Write a program to demonstrate Try/except/else.

34) Write a program to demonstrate try/finally and with/as.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I Year – II Semester		L	T	P	C
		0	0	3	1.5
	DATA STRUCTURES LAB (CS1202)				

Course Objectives:
The objective of this lab is to demonstrate the different data structures implementation.

Course Outcomes:
By the end of this lab the student is able to
- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

Exercise -1 (Searching)
a) Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.
b) Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

Exercise – 2 (Sorting-I)
a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order
b) Write C program that implement Quick sort, to sort a given list of integers in ascending order
c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order

Exercise -3 (Sorting-II)
a) Write C program that implement radix sort, to sort a given list of integers in ascending order
b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4 (Singly Linked List)
a) Write a C program that uses functions to create a singly linked list
b) Write a C program that uses functions to perform insertion operation on a singly linked list
c) Write a C program that uses functions to perform deletion operation on a singly linked list
d) Write a C program to reverse elements of a single linked list.

Exercise -5(Queue)
a) Write C program that implement Queue (its operations) using arrays.
b) Write C program that implement Queue (its operations) using linked lists

Exercise -6 (Stack)
a) Write C program that implement stack (its operations) using arrays
b) Write C program that implement stack (its operations) using Linked list
c) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7 (Binary Search Tree)
a) Write a C program to Create a BST
b) Write a C program to insert a node into a BST.
c) Write a C program to delete a node from a BST.
d) Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

I Year - II Semester		L	T	P	C
		2	0	0	0
	CONSTITUTION OF INDIA (MC1201)				

Course Objectives:
- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcomes:
At the end of the course, the student will be able to have a clear knowledge on the following:
- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
  1. Know the sources, features and principles of Indian Constitution.
  2. Learn about Union Government, State government and its administration.
  3. Get acquainted with Local administration and Pachayati Raj.
  4. Be aware of basic concepts and developments of Human Rights.
  5. Gain knowledge on roles and functioning of Election Commission

UNIT I
Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.
Learning outcomes:After completion of this unit student will
- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT II
Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;
Learning outcomes: After completion of this unit student will
- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

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KAKINADA – 533 003, Andhra Pradesh, India

UNIT III

State Government and its Administration Governor, Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

Learning outcomes: After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor, state Secretariat and Chief Minister
- Differentiate between structure and functions of state secretariat

UNIT IV

A.Local Administration, District's Administration Head, Role and Importance, Municipalities, Mayor and role of Elected Representative, CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy(Different departments), Village level, Role of Elected and Appointed officials, Importance of grass root democracy

Learning outcomes:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zillapanchayat block level organisation

UNIT V

Election Commission: Election Commission, Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes: After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

References:
1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
2) SubashKashyap, Indian Constitution, National Book Trust
3) J.A. Siwach, Dynamics of Indian Government & Politics
4) D.C. Gupta, Indian Government and Politics
5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6) J.C. Johari, Indian Government andPolitics Hans
7) J. Raj IndianGovernment and Politics
8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

esources:
1) nptel.ac.in/courses/109104074/8
2) nptel.ac.in/courses/109104045/
3) nptel.ac.in/courses/101104065/
4) www.hss.iitb.ac.in/en/lecture-details
5) www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

		L	T	P	C
II Year -I Semester		3	0	0	3
	MATHEMATICS – III (BS2101)				

Course Objectives:
- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Course Outcomes:
At the end of the course, the student will be able to
- Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- Estimate the work done against a field, circulation and flux using vector calculus (L5)
- Apply the Laplace transform for solving differential equations   (L3)
- Find or compute the Fourier series of periodic signals (L3)
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
- Identify solution methods for partial differential equations that model physical processes (L3)

UNIT I: Vector calculus: (10 hrs)
Vector Differentiation: Gradient, Directional derivative, Divergence, Curl, Scalar Potential.
Vector Integration: Line integral, Work done, Area, Surface and volume integrals, Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

UNIT II: Laplace Transforms: (10 hrs)
Laplace transforms of standard functions, Shifting theorems, Transforms of derivatives and integrals, Unit step function, Dirac's delta function, Inverse Laplace transforms, Convolution theorem (without proof).
Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT III: Fourier series and Fourier Transforms: (10 hrs)
Fourier Series: Introduction, Periodic functions, Fourier series of periodic function, Dirichlet's conditions, Even and odd functions, Change of interval, Half-range sine and cosine series.
Fourier Transforms: Fourier integral theorem (without proof), Fourier sine and cosine integrals, Sine and cosine transforms, Properties, inverse transforms, Finite Fourier transforms.

UNIT IV: PDEof first order: (8 hrs)
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT V: Second order PDE and Applications: (10 hrs)
Second order PDE: Solutions of linear partial differential equations with constant coefficients, RHS term of the type $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$.
Applications of PDE: Method of separation of Variables, Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

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KAKINADA – 533 003, Andhra Pradesh, India

Text Books:
1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2020.
2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:
1) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India, 2008.
2) Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press, 2013.
3) Peter O' Neil, Advanced Engineering Mathematics, 7thed, Cengage, 2011.
4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press, 2015.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

II Year – I Semester		L	T	P	C
		3	0	0	3

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (CS2101)

Course Objectives:
This course is designed to:
- Introduce the students to the topics and techniques of discrete methods and combinatorial reasoning
- Introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science

Course Outcomes:
At the end of the course student will be able to
- Demonstrate skills in solving mathematical problems
- Comprehend mathematical principles and logic
- Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
- Manipulate and analyze data numerically and/or graphically using appropriate Software
- Communicate effectively mathematical ideas/results verbally or in writing

UNIT I
Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus:Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT II
Set Theory: Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hassie Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties, Algebraic Structures:Algebraic Systems, Properties, Semi Groups and Monoids, Group, Subgroup and AbelianGroup, Homomorphism, Isomorphism.

UNIT III
Combinatorics: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems, Number Theory: Properties of Integers, Division Theorem, Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic, Fermat's and Euler's Theorems

UNIT IV
Recurrence Relations:Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations

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KAKINADA – 533 003, Andhra Pradesh, India

UNIT V
Graph Theory:Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

Text Books:
1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill, 1997.
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rdEdition, Tata McGraw Hill, 2008.

Reference Books:
1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India, 1985.
2. Discrete Mathematical Structures, BernandKolman, Robert C. Busby and Sharon Cutler Ross, PHI, 2018.
3. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill,2010.

e-Resources:
1) https://nptel.ac.in/courses/106/106/106106094/

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KAKINADA – 533 003, Andhra Pradesh, India

II Year – I Semester		L	T	P	C
		3	0	0	3
	COMPUTER GRAPHICS (CS2102)				

Course objectives:
This course allows the students to:
1. Understand the fundamental concepts and theory of computer graphics
2. Understand modeling, and interactive control of 3D computer graphics applications
3. The underlying parametric surface concepts be understood
4. Learn multimedia authoring tools.

Course outcomes:
Upon successful completion of the course, students will be able to:
1. Use the principles and commonly used paradigms and techniques of computer graphics
2. Write basic graphics application programs including animation
3. Design programs to display graphic images to given specifications

UNIT-I
INTRODUCTION: Application areas of computer graphics, overview of graphic system, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices.

UNIT-II
OUTPUT PRIMITIVES: Points and lines, line drawing algorithms, mid-point circle algorithm, Filled area primitives: scan-line polygon fill algorithm, boundary-fill and flood-fill algorithm.
2-D GEOMETRICAL TRANSFORMATIONS: Translation, scaling, rotation, reflection and shear transformation matrix representations and homogeneous co-ordinates, composite transformations, transformations between coordinates.

UNIT -III
2-D VIEWING : The viewing pipe-line, viewing coordinate reference frame, window to view-port co-ordinate transformations, viewing function, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland-Hodgeman polygon clipping algorithm

UNIT -IV
3-D OBJECT REPRESENTATION: spline representation, Hermite curve, Bezier curve and B-spline curve, Polygon surfaces, quadric surfaces, Solid modeling Scalars – wire frame, CSG, B-rep. Bezier and B-spline surfaces, Basic illumination models, shading algorithms

UNIT -V
3-D GEOMETRIC TRANSFORMATIONS: Translation, rotation, scaling, reflection and shear transformation and composite transformations. Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting.
COMPUTER ANIMATION: Design of animation sequence, general computer animation functions, raster animation, computer animation language, key frame system, motion specification
Text Books:
1. Computer Graphics C version/ Donald Hearn and M. Pauline Baker/Pearson/PHI, 2002
2. Computer Graphics Principles & Practice, Second edition in C/ Foley, VanDam, Feiner and Hughes/Pearson Education, 2013

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KAKINADA – 533 003, Andhra Pradesh, India

References:
1. Computer Graphics Second edition, Zhigandxiang, Roy Plastock, Schaum's outlines, Tata Mc-Graw hill edition,2002.
2. Procedural elements for Computer Graphics, David F Rogers, Tata McGraw hill, 2nd edition,1988.
3. Principles of Interactive Computer Graphics, Neuman and Sproul, TMH, 1979.
4. Computer Graphics, Steven Harrington, TMH, 1987.

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KAKINADA – 533 003, Andhra Pradesh, India

II Year – I Semester		L	T	P	C
		3	0	0	3
MULTIMEDIA AND APPLICATION DEVELOPMENT(CS2103)					

Course Objectives:
- This course aims to further develop students' competency in producing dynamic and creative graphic solutions for multimedia productions.
- It provides students with the basic concepts and techniques of interactive authoring.
- It also introduces students with the advanced scripting skills necessary for implementing highly interactive, rich internet applications using multimedia technologies and authoring tools.
- Students will develop aesthetic value and competencies in multimedia authoring.
- Artistic visual style and layout design are stressed, as well as the editing and integration of graphic images, animation, video and audio files.
- The course allows students to master industry-wide software and technologies to create highly interactive, rich internet applications.

Course Outcomes:
- Ability to apply different multimedia development tools to produce web based and stand-alone user interfaces.

UNIT - I
Fundamental concepts in Text and Image: Multimedia and hypermedia, World Wide Web, overview of multimedia software tools. Graphics and image data representation graphics/image data types, file formats, **Color in image and video:** color science, color models in images, color models in video.

UNIT - II
Fundamental concepts in video and digital audio: Types of video signals, analog video, digital video, digitization of sound, MIDI, quantization and transmission of audio. **Multimedia Data Compression:** Lossless compression algorithms, Lossy compression algorithms, Image compression standards.

UNIT - III
Basic Video compression techniques, Case study: MPEG Video Coding I, Basic Audio compression techniques, Case study: MPEG Audio compression.
Web 2.0: What is web 2.0, Search, Content Networks, User Generated Content, Blogging, Social Networking, Social Media, Tagging, Social Marking, Rich Internet Applications, Web Services, Mashups, Location Based Services, XML, RSS, Atom, JSON, and VoIP, Web 2.0 Monetization and Business Models, Future of the Web.

UNIT - IV
Rich Internet Applications (RIAs) with Adobe Flash: Adobe Flash- Introduction, Flash Movie Development, Learning Flash with Hands-on Examples, Publish your flash movie, Creating special effects with Flash, Creating a website splash screen, action script, web sources.
Rich Internet Applications (RIAs) with Flex 3 - Introduction, Developing with Flex 3, Working with Components, Advanced Component Development, Visual Effects and Multimedia.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

UNIT - V
Ajax- Enabled Rich Internet Application : Introduction, Traditional Web Applications vs. Ajax Applications, Rich Internet Application with Ajax, History of Ajax, Raw Ajax example using xml http request object, Using XML, Creating a full scale Ajax Enabled application, Dojo Tool Kit.

Text Books:
1. Fundamentals of Multimedia by Ze-Nian Li and Mark S. Drew PHI Learning, 2004 (UNITS 1, 2, 3.)
2. AJAX, Rich Internet Applications, and Web Development for Programmers, Paul J Deitel and Harvey M Deitel, Deitel Developer Series, Pearson Education, 2008. (UNITS 4,5)

Reference Books:
1. Professional Adobe Flex 3, Joseph Balderson, Peter Ent, et al, Wrox Publications,Wiley India, 2009.
2. Multimedia Communications: Applications, Networks, Protocols and Standards, FredHalsall, Pearson Education, 2001, RP 2005.
3. Multimedia making it work, Tay Vaughan, 7th edition, TMH, 2008.
4. Introduction to multimedia communications and Applications, Middleware,Networks, K. R. Rao, Zoran, Dragored, Wiley India, 2006, RP. 2009.
5. Multimedia Computing, Communications & Applications, Ralf Steinmetz and KlaraNahrstedt, Pearson Education, 2004
6. Principles of Multimedia, Ranjan Parekh, TMH, 2006.
7. Multimedia in Action, James E. Shuman, Cengage Learning, 198, RP 2008.
8. Multimedia Systems design, Prabhat K. Andleigh, KiranThakrar, PHI, 1986.
9. Multimedia and Communications Technology, Steve Heath, Elsevier, 1999, RP 2003.
10. Adobe Flash CS3 Professional, Adobe press, Pearson Education, 2007.
11. Flash CS3 Professional Advanced, Russel Chun, Pearson Education, 2007.
12. Flash CS5, Chris Grover, O'Reilly, SPD, 2010.
13. SAMS Teach yourself Adobe flash CS3, Pearson Education, 2007.
14. Flex 4 Cookbook, Joshua Noble, et. al, O'Reilly, SPD 2010.
15. Flex3 – A beginner's guide, Michele E. Davis, Jon A. Phillips, TMH, 2008.
16. Mastering Dojo, R. Gill, C. Riecke and A. Russell, SPD, 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

II Year – I Semester		L	T	P	C
		3	0	0	3
	DATABASE MANAGEMENT SYSTEMS(CS2104)				

Course Objectives:
- To introduce about database management systems
- To give a good formal foundation on the relational model of data and usage of Relational Algebra
- To introduce the concepts of basic SQL as a universal Database language
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes:
By the end of the course, the student will be able to
- Describe a relational database and object-oriented database
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design
- Examine issues in data storage and query processing and can formulate appropriate solutions
- Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

UNIT I
Introduction:Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

UNIT II
Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL:Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).

UNIT III
Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. SQL:Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

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KAKINADA – 533 003, Andhra Pradesh, India

UNIT IV

Schema Refinement (Normalization):Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd Normal Form(BCNF), Lossless join and dependency preserving decomposition, Fourth Normal Form(4NF), Fifth Normal Form (5NF).

UNIT V

Transaction Concept:Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.
Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing: Tree base Indexing ,Comparison of File Organizations, Indexes and Performance Tuning

Text Books:
1. Database Management Systems, 3rded, , Raghurama Krishnan, Johannes Gehrke, TMH, 2014
2. Database System Concepts,5thed,Silberschatz, Korth, TMH, 2005.

Reference Books:
1. Introduction to Database Systems, 8thed, C J Date, PEA, 2004.
2. Database Management System, 6thedRamezElmasri, Shamkant B. Navathe, PEA, 2019.
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

e-Resources:
1. https://nptel.ac.in/courses/106/105/106105175/
2. https://www.geeksforgeeks.org/introduction-to-nosql/

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KAKINADA – 533 003, Andhra Pradesh, India

II Year – I Semester		L	T	P	C
		0	0	3	1.5
	COMPUTER GRAPHICS LAB (CS2105)				

Course Objectives:
This is an introductory course on principles of computer graphics including both 2D and 3D graphics. Main objective is to give a practical exposure of raster scan graphics including line and circle drawing, polygon filling, anti-aliasing algorithms, clipping, hidden-line and hidden surface algorithms

Course Outcomes: The students, after the completion of the course, are expected to
- Design and develop programs for drawing Computer Graphics primitives.
- Implement different algorithms for line clipping,
- Create 3D graphical scenes using C.
- Implement image manipulation and enhancement.
- Create 2D animations using C.

Software Requirement:
- Turbo C / C++ compiler that supports graphics.h package.
- special DOSBOXed installer for Turbo C++ compiler

  Download from following link:
  http://www.megaleecher.net/Download_Turbo_For_Windows

List of Experiments:
1. Using Digital Differential Analyzer Algorithm, Write C-Program to draw a line segment between two given points.
2. Write a C program for determining pixel activation list between two given points in order to draw line segment using bresenham's Line drawing algorithm.
3. Using Midpoint circle generation algorithm, write a C-Program to generate pixel activation list for drawing a circle with a given centre of circle P(x, y) and a radius r.
4. Using Midpoint ellipse generation algorithm, write a C-Program to generate pixel activation list for drawing an ellipse.
5. Using different graphics functions available for text formatting in C-Language, Write a C program for displaying text in different sizes, different colors, different font styles.
6. Using certain graphic functions available in C-language for drawing lines, rectangles & circles, Write a C- Program which generates pixel activation list for drawing the following simple two dimensional objects.
   i) House ii) Car iii) Fish iv) man
7. Write a C-program for performing the basic 2D transformations such as translation, Scaling, Rotation, shearing and reflection for a given 2D object?

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KAKINADA – 533 003, Andhra Pradesh, India

8.
    i.   Using the concept of flood fill algorithm, Write a C- program for filling a given rectangle object with color.

    ii.   Using the concept of Boundary fill algorithm, Write a C- program for filling a given rectangle object with color.

    iii.   Using the concept of Scan line polygon fill algorithm, write a C- program for filling a given object with color.

9. Write a C-program for performing the basic transformations such as translation, Scaling, Rotation for a given 3D object?

10. Write a C-program for generating a curve for a given set of control points.

11. Write C-programs for designing simple animations using transformations.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

II Year – I Semester		L	T	P	C
		0	0	3	1.5

MULTIMEDIA AND APPLICATION DEVELOPMENT LAB (CS2106)

Course Outcomes: By the end of the course, student will be able to
• Describe different realizations of multimedia tools and the way in which they are used.
• Compare various data compression schemes.
• Analyze user interface for a given application

Multimedia Programs using FLASH
1. Write a Program to perform motion tweening operation using flash
2. Write a Program to create a 24 spokes on a wheel using flash.
3. Write a Program to change and object shape using a shape tweening concept.
4. Write a program to create an animated e-card using adobe Flash.
5. Write a Program to create an animation to represent the Growing Moon.
6. Write a Program to create an animation to indicate a ball bouncing on Steps
7. Write a Program to simulate a ball hitting another ball.
8. Write a Program to change a circle into a square using Flash.

Rich Internet Applications (RIA) using Adobe Flex and Ajax
9. Write an MXML code to display Hello World using Flex.
10. Create a Flex Project using Flash Builder IDE to run Hello World Application.
11. Implement an AJAX program to fetch RSS feeds from a well-known RSS feed site. Provide a scrolling display of latest news on your page. You can use xparser.js if you like.
12. Implement an RSS-based search feature. Have a text box and a button in your page for the same. Show the results in a separate <div> which has the results as hyperlinks, which the user can click.
13. Use the Reverse AJAX technique to build a web-based chat application. The application is one-way browser-based. That is, we have a window in which one user types his messages. From other side, the second user directly updates a file on the server (instead of a browser area).
14. A file on a server has information about cricket players. The fields represent name, country, matches, runs and centuries. The fields are separated by colons (:). The front end screen has a text field in which the user can enter a country. The server returns details of all players belonging to that country in the form of one big JSON object. The client parses the JSON object and builds an HTML table to print the results. Implement the server side script and the client code.
15. Write an Ajax enabled address book web application that interacts with a web service to obtain data and to modify data in a server-side database.
16. Write a Calender web application built using Dojo toolkit

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

II Year – I Semester		L	T	P	C
		0	0	3	1.5

DATABASE MANAGEMENT SYSTEMS LAB (CS2107)

Course Objectives:
This Course will enable students to
- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

Course Outcomes:
At the end of the course the student will be able to:
- Utilize SQL to execute queries for creating database and performing data manipulation operations
- Examine integrity constraints to build efficient databases
- Apply Queries using Advanced Concepts of SQL
- Build PL/SQL programs including stored procedures, functions, cursors and triggers

List of Exercises:
1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5.
    i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
    ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexing techniques.

Text Books/Suggested Reading:
1) Oracle: The Complete Reference by Oracle Press
2) Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3) Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

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KAKINADA – 533 003, Andhra Pradesh, India

II Year - I Semester	Skill Oriented Course- I	L	T	P	C
		0	0	4	2
	MOBILE APP DEVELOPMENT(SO2101)				

Course Objectives:
- To understand the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
- To understand how to work with various mobile application development frameworks.
- To learn the basic and important design concepts and issues of development of mobile applications.
- To understand the capabilities and limitations of mobile devices.

Course Outcomes:
At the end of this course, students will be able to:
1. Identify various concepts of mobile programming that make it unique from programming for other platforms
2. Critique mobile applications on their design pros and cons
3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
4. Program mobile applications for the Android operating system that use basic and advanced phone features and
5. Deploy applications to the Android marketplace for distribution.

LIST OF EXPERIMENTS
1. Introduction to mobile technologies and devices , Android platform and applications overview
2. Setting Android development environments
3. Writing Android applications, Understanding anatomy of an Android application
4. Develop an application that uses GUI components, Font and Colours
5. Develop an application that uses Layout Managers and event listeners.
6. Write an application that draws basic graphical primitives on the screen.
7. Develop an application that makes use of databases.
8. Develop an application that makes use of Notification Manager
9. Implement an application that uses Multi-threading
10. Develop a native application that uses GPS location information
11. Implement an application that writes data to the SD card.
12. Implement an application that creates an alert upon receiving a message
13. Write a mobile application that makes use of RSS feed
14. Develop a mobile application to send an email.
15. Develop a Mobile application for simple needs (Mini Project)

References:
1. Android Programming unleashed , B.M. Harwani, Pearson, 2013.
2. Android Programming (Big Nerd Ranch Guide), by Bill Phillips, Chris Stewart, Brian Hardy, Kristin Marsicano, Pearson, 2016
3. Android Programming – Pushing the limits by Hellman by Erik Hellman, WILEY, 2013

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KAKINADA – 533 003, Andhra Pradesh, India

Web References:

1. The Complete Android N Developer Course –Udemy
   https://www.udemy.com/course/complete-android-n-developer-course/?altsc=428526
2. Android Development Courses on Google developers training
   https://developers.google.com/training/android/
3. Mobile Computing - Video course- NPTEL
   https://nptel.ac.in/courses/106/106/106106147/#
4. Android Tutorial – Tutorial Point https://www.tutorialspoint.com/android/index.htm

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

II Year - I Semester		L	T	P	C
		2	0	0	0

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE (MC2101)

Course Objectives:

- The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
- Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- Understand the significance of Indian Traditional Knowledge
- Classify the Indian Traditional Knowledge
- Compare Modern Science with Indian Traditional Knowledge system.
- Analyze the role of Government in protecting the Traditional Knowledge
- Understand the impact of Philosophical tradition on Indian Knowledge System.

Unit I
Introduction to Traditional Knowledge: Define Traditional Knowledge- Nature and Characteristics- Scope and Importance- kinds of Traditional Knowledge- The historical impact of social change on Traditional Knowledge Systems- Value of Traditional knowledge in global economy.

Unit II
Basic structure of Indian Knowledge System: AstadashVidya- 4 Ved - 4 Upaved (Ayurved,Dhanurved,GandharvaVed&SthapthyaAdi),6vedanga(Shisha,Kalppa,Nirukha,Vykaran,Jyothisha&Chand),4upanga(Dharmashastra,Meemamsa,purana&Tharka Shastra).

Unit III
Modern Science and Indian Knowledge System-Indigenous Knowledge, Characteristics- Yoga and Holistic Health care-cases studies.

Unit IV
Protection of Traditional Knowledge: The need for protecting traditional knowledge - Significance of Traditional knowledge Protection-Role of government to harness Traditional Knowledge.

Unit V
Impact of Traditions: Philosophical Tradition (Sarvadarshan) Nyaya, Vyshepec, Sankhya, Yog, Meemamsa, Vedantha, Chavanka, Jain &Boudh - Indian Artistic Tradition - Chitrakala, Moorthikala, Vasthukala , Sthapthya, Sangeetha, NruthyaYevamSahithya

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KAKINADA – 533 003, Andhra Pradesh, India

Reference Books :

1. Traditional Knowledge System in India, by AmitJha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and
Vipin Kumar Singh, PratibhaPrakashan 2012.
3. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, BharatiyaVidya
4. Swami Jitatmanand, Holistic Science and Vedant, BharatiyaVidyaBhavan
5. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.
6. Pramod Chandra, India Arts, Howard Univ. Press, 1983.
7. Krishna Chaitanya, Arts of India, Abhinav Publications, 1987.

Web Resources:

1. https://www.wipo.int/wipo_magazine/en/2017/01/article_0004.html
2. http://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil-Kapoor.pdf
3.https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_21/wipo_grtkf_ic_21_ref_facilitators_text.pdf

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

II Year – II Semester		L	T	P	C
		3	0	0	3
PROBABILITY AND STATISTICS (BS2201)					

Course Objectives:
- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

Upon successful completion of this course, the student should be able to
- Classify the concepts of data science and its importance
- Interpret the association of characteristics and through correlation and regression tools
- Make use of the concepts of probability and their applications
- Apply discrete and continuous probability distributions
- Design the components of a classical hypothesis test
- Infer the statistical inferential methods based on small and large sampling tests

UNIT I

Descriptive statistics and methods for data science: Data science – Statistics Introduction – Population vs Sample – Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability (spread or variance) – Skewness Kurtosis.

UNIT II

Correlation and Curve fitting: Correlation – correlation coefficient – rank correlation – regression coefficients and properties – regression lines – Method of least squares – Straight line – parabola – Exponential – Power curves.

UNIT III

Probability and Distributions: Probability– Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT IV

Sampling Theory: Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t, χ^2 and F-distributions – Point and Interval estimations – Maximum error of estimate.

UNIT V

Tests of Hypothesis: Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

Text Books:
1. Miller and Freund's, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

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KAKINADA – 533 003, Andhra Pradesh, India

Reference Books:

1) Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2) Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
3) Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

II Year – II Semester		L	T	P	C
		3	0	0	3

COMPUTER ORGANIZATION (CS2201)

Course Objectives:
The course objectives of Computer Organization are to discuss and make student familiar with
- Principles and the Implementation of Computer Arithmetic
- Operation of CPUs including RTL, ALU, Instruction Cycle and Busses
- Fundamentals of different Instruction Set Architectures and their relationship to theCPU Design
- Memory System and I/O Organization
- Principles of Operation of Multiprocessor Systems and Pipelining

Course Outcomes:
By the end of the course, the student will
- Develop a detailed understanding of computer systems
- Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
- Develop a detailed understanding of architecture and functionality of central processing unit
- Exemplify in a better way the I/O and memory organization
- Illustrate concepts of parallel processing, pipelining and inter processor communication

UNIT I
Basic Structure of Computers: Basic Organization of Computers, Historical Perspective, BusStructures, Data Representation: Data types, Complements, Fixed Point Representation. FloatingPoint Representation. Other Binary Codes, Error Detection Codes.
Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

UNIT II
Register Transfer Language and Microoperations: Register Transfer language. Register TransferBus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift MicroOperations, Arithmetic Logic Shift Unit.
Basic Computer Organization and Design: Instruction Codes, Computer Register, ComputerInstructions, Instruction Cycle, Memory – Reference Instructions. Input –Output and Interrupt,Complete Computer Description.

UNIT III
Central Processing Unit: General Register Organization, STACK Organization. InstructionFormats, Addressing Modes, Data Transfer and Manipulation, Program Control, ReducedInstruction Set Computer.
Microprogrammed Control: Control Memory, Address Sequencing, Micro Program example,Design of Control Unit.

UNIT IV
Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, AssociativeMemory, Cache Memory, Virtual Memory.
Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous datatransfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

UNIT V
Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures,Inter Processor Arbitration.
Pipeline: Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor.

Text Books:
1. Computer System Architecture, M. Morris Mano, Third Edition, Pearson, 2008.
2. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 5/e, McGrawHill, 2002.

Reference Books:
1. Computer Organization and Architecture, William Stallings, 6/e, Pearson, 2006.
2. Structured Computer Organization, Andrew S. Tanenbaum, 4/e, Pearson, 2005.
3. Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer,2006.

Web Resources:
1. https://nptel.ac.in/courses/106/105/106105163/
2. http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

II Year – II Semester		L	T	P	C
		3	0	0	3
	DATA WAREHOUSING AND MINING(CS2202)				

Course Objectives:
- To understand and implement classical models and algorithms in data warehousing and data mining.
- To analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
- To assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior.

Course Outcomes:
Upon successful completion of the course, the student will be able to:
- Summarize the architecture of data warehouse
- Apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data.
- Construct a decision tree and resolve the problem of model overfitting
- Compare Apriori and FP-growth association rule mining algorithms for frequent itemset generation
- Apply suitable clustering algorithm for the given data set

UNIT- I
Data Warehouse and OLAP Technology: An Overview: What Is a Data Warehouse? A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining. (Han &Kamber)

UNIT- II
Data Mining: Introduction, What is Data Mining?, Motivating challenges, The origins of Data Mining, Data Mining Tasks, Types of Data, Data Quality.
Data Preprocessing: Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature creation, Discretization and Binarization, Variable Transformation, Measures of Similarity and Dissimilarity. (Tan &Vipin)

UNIT -III
Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction.
Model Overfitting: Due to presence of noise, due to lack of representation samples, evaluating the performance of classifier: holdout method, random sub sampling, cross-validation, bootstrap. Bayes Theorem, Naïve Bayes Classifier (Tan &Vipin)

UNIT -IV
Association Analysis: Basic Concepts and Algorithms: Problem Definition, Frequent Item Set Generation, Apriori Principle, Apriori Algorithm, Rule Generation, Compact Representation of Frequent Itemsets, FP-Growth Algorithm. (Tan &Vipin)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

UNIT -V
Cluster Analysis: Basic Concepts and Algorithms: Overview, What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. (Tan &Vipin)

Text Books:
1. Introduction to Data Mining : Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Fifth Impression, Pearson, 2015.
2. Data Mining concepts and Techniques, 3rd Edition, Jiawei Han, Michel Kamber, Elsevier, 2011

Reference Books:
1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning, 2010
2. Data Mining : Introductory and Advanced topics : Dunham, First Edition, Pearson, 2020
3. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH, 2008
4. Data Mining Techniques, Arun K Pujari, Universities Press, 2001

Web Resources:
1. NPTEL Online Course on Data Mining : https://onlinecourses.nptel.ac.in/noc18_cs14/preview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

II Year – II Semester		L	T	P	C
		3	0	0	3
	VISUAL DESIGN AND COMMUNICATION (ES2201)				

Course Outcomes:

- Students will develop the ability to create visual compositions using basic elements and apply appropriate principles of visual composition to communicate ideas.
- Students will begin to understand the visual language and develop the ability to perceive, visualize and communicate using visual narratives.
- Students will develop the ability to apply the visual dynamics of visual language in Typography, Photography and Videography.
- Students will begin to understand the visual dynamics that exists in visual design as a visualisation process to evolve mental imageries that represent solutions to simple communication problems.
- Students will be able to execute design solutions using appropriate software programmes.

UNIT-I
INTRODUCTION TO VISUAL DESIGN: The importance of understanding visual language and its relation in context to nature and environment
ELEMENTS OF VISUAL LANGUAGE: Exploring and understanding Dots, Lines, Forms, Space, Pattern, Texture and Colouras an elements of visual language.

UNIT-II
INTRODUCTION TO THE PRINCIPLES OF VISUAL LANGUAGE: Visual explorations and experiments with Form, Colour, and Space, Texture, in relation to the context and environments – Concepts of harmony, balance, contrast, proportion, order, symmetry, asymmetry, rhythm, tension, juxtaposition, proximity, size, scale, proportion, orientation, alignment, variety, gradation, dominance, subordination, transition etc.

UNIT-III
INTRODUCTION TO FUNDAMENTALS OF TYPOGRAPHY: Introduces Typography as a means of Communication and engages in typographical explorations to understand the technicalities, nuances and aesthetics of types.Study of visual principles of text and image composition : Layouts, Grids, Content Development and Information Hierarchy.
Application of Typography, Image and layouts in the design of signage systems, identity systems, social communications,

UNIT-IV
INTRODUCTION TO PHOTOGRAPHY: Study of photography as a medium to document, communicate and create photographic imagery. Exploring photo story as a narrative medium.
INTRODUCTION TO VIDEOGRAPY: Study of videography as a medium to document, communicate and create a short 2 minute video.

UNIT-V
COMMUNICATION THEORIES, SEMIOTICS AND VISUAL PERCEPTION: Understand the process of communication and the theories that make a difference to the development of a visual language.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

STORY TELLING, NARRATIVES AND ITS ROLE IN DESIGN: Understand story telling and narratives as effective methods to scope problems and problem solving processes.

Text Books:

1. Wallschlaeger, Charles, &Busic-Synder, Cynthia, Basic Visual Concepts and Principles for Artists, Architects and Designers, McGraw-Hill, 1992.

Reference Books:

1. Buxton, Bill, Sketching User Experience: Getting the Design Right and the Right Design (Interactive Technologies), Morgan Kaufmann, 2007.
2. Caplin, Steve; Banks, Adam,The Complete Guide to Digital Illustration, Publisher: Watson - Guptill Publications, 2003
3. Demers, Owen,Digital Texturing & Painting, Publisher: New Riders Press; Bk&CD-ROM Edition,2001.
4. Cairo, Alberto,The Functional Art. New Riders, 2013.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

		L	T	P	C
II Year – II Semester		**3**	**0**	**0**	**3**
MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY(HS2201)					

Course Objectives:
- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals

Course Outcomes:
- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

UNIT I
Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement-Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT II
Theories of Production and Cost Analyses: Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

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KAKINADA – 533 003, Andhra Pradesh, India

UNIT III

Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

UNIT IV

Introduction to Accounting & Financing Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

UNIT V

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(payback period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Books:
1) A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

Reference Books:
1) Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd.
2) JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3) N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd.
4) MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
5) I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6) V. Maheswari, Managerial Economics, S. Chand & Company Ltd.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

II Year – II Semester		L	T	P	C
		0	0	3	1.5

GAMES DEVELOPMENT LAB (CS2203)

Course Outcomes:

At the end of the course, students will be able to

- Learning how to use the various fundamentals of Unity
- Understanding how everything works in the engine
- Understanding the basic concepts of game design
- Creating and building actual sample games
- Learning how to deploy your projects to the market

Software Requirement:

Unity Game Engine

List of Experiments:

1. Unity Installation and Setup
2. Creating and Modifying Sprites
3. Transforms and Object Parenting
4. Creation of Internal assets
5. Saving and Loading Scenes
6. Basic Movement Scripting
7. Understanding Collisions, Rigid bodies
8. Custom Collision Boundaries
9. Understanding Prefabs and Instantiation
10. Game Object Destruction
11. Starting with UI
12. The Button and Text Element, slider
13. Materials and Shaders
14. The Particle System
15. Using the Asset Store

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

II Year – II Semester		L	T	P	C
		0	0	3	1.5

DATA MINING USING PYTHON LAB (CS2204)

Course Objectives:
- Practical exposure on implementation of well-known data mining algorithms
- Learning performance evaluation of data mining algorithms in a supervised and an unsupervised setting.

Course Outcomes:
Upon successful completion of the course, the student will be able to:
- Apply preprocessing techniques on real world datasets
- Apply apriori algorithm to generate frequent itemsets.
- Apply Classification and clustering algorithms on different datasets.

Note: Use python library scikit-learn wherever necessary

1. Demonstrate the following data preprocessing tasks using python libraries.
   a) Loading the dataset
   b) Identifying the dependent and independent variables
   c) Dealing with missing data

2. Demonstrate the following data preprocessing tasks using python libraries.
   a) Dealing with categorical data
   b) Scaling the features
   c) Splitting dataset into Training and Testing Sets

3. Demonstrate the following Similarity and Dissimilarity Measures using python
   a) Pearson's Correlation
   b) Cosine Similarity
   c) Jaccard Similarity
   d) Euclidean Distance
   e) Manhattan Distance
4. Build a model using linear regression algorithm on any dataset.
5. Build a classification model using Decision Tree algorithm on iris dataset
6. Apply Naïve Bayes Classification algorithm on any dataset
7. Generate frequent itemsets using Apriori Algorithm in python and also generate association rules for any market basket data.
8. Apply K- Means clustering algorithm on any dataset.
9. Apply Hierarchical Clustering algorithm on any dataset.
10. Apply DBSCAN clustering algorithm on any dataset.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

Web Resources:

1. https://analyticsindiamag.com/data-pre-processing-in-python/
2. https://towardsdatascience.com/decision-tree-in-python-b433ae57fb93
3. https://towardsdatascience.com/calculate-similarity-the-most-relevant-metrics-in-a-nutshell-9a43564f533e
4. https://www.springboard.com/blog/data-mining-python-tutorial/
5. https://medium.com/analytics-vidhya/association-analysis-in-python-2b955d0180c
6. https://www.datacamp.com/community/tutorials/naive-bayes-scikit-learn
7. https://www.analyticsvidhya.com/blog/2019/05/beginners-guide-hierarchical-clustering/
8. https://towardsdatascience.com/dbscan-algorithm-complete-guide-and-application-with-python-scikit-learn-d690cbae4c5d

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

II Year – II Semester		L	T	P	C
		0	0	3	1.5
WEB APPLICATION DEVELOPMENT LAB (ES2202)					

Course Objectives:
- To develop the skill in Creating dynamic web pages with servlets
- To provide knowledge in connecting java programs with database using JDBC.
- To develop the skill in server side programming using JSP, node.js, React.js
- To provide knowledge about MERN stack
- Testing the application on an Application Server.
- Debugging Web applications locally and remotely

Course Outcomes:
By the end of the course, the student will be able to
- Develop Single Page Applications
- Develop NodeJS&ReactJS Reusable Service
- Store the data in MySQL
- Get acquainted with the latest web application development trends in the IT industry

List of Experiments:
1. Authentication using Java Servlet
2. Authentication using JSP
3. Connect MySQL database using JSP
4. Design and development of Online Book Shop using JSP/Node.js & React.js
5. Design and development of Online Examination using JSP/Node.js & React.js
6. Design and development of online ticket reservation system using JSP/Node.js & React.js
7. Design and development of online library using JSP/Node.js & React.js
8. Design and development of online banking using JSP/Node.js & React.js
9. Design and development of online job portal using JSP/Node.js & React.js
10. Design and development of Online Auction using JSP/Node.js & React.js

Note: Students are encouraged to propose innovative ideas in the field of E-commerce as projects.

References:
1. Jason Hunter, William Crawford , Java Servlet Programming, Second Edition, ,O'Reilly Media
2. Hans Bergsten, Java Server Pages, O'Reilly
3. http://www.oracle.com/technetwork/java/index-jsp-135475.html
4. http://www.oracle.com/technetwork/java/javaee/jsp/index.html

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

II Year - II Semester	Skill Oriented Course- II	L	T	P	C
		0	0	4	2

DIGITAL PHOTOGRAPHY USING ADOBE PHOTOSHOP (SO2201)

Software Requirement:
Adobe Photoshop

List of Experiments:
1. Installation of Photoshop
2. Photoshop Workspace and Shortcut Keys
3. Layers in Photoshop
4. Demonstrate how to Remove Background of an Image Using Photoshop.
5. Photoshop Brush Tool and Pen Tool
6. Demonstrate how to change color in photoshop.
7. Demonstrate how to Resize a layer in Photoshop.
8. Demonstrate how to Add Fonts in Photoshop.
9. Demonstrate how to Crop an Image in Photoshop.
10. Demonstrate how to Curve Text in Photoshop.
11. Demonstrate how to Flip an Image in Photoshop.
12. Demonstrate how to Smooth Edges in Photoshop.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE AND SYLLABUS

For UG –R20

B. TECH - COMPUTER SCIENCE & ENGINEERING

(Applicable for batches admitted from 2020-2021)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA - 533 003, Andhra Pradesh, India

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE

		I Year – I SEMESTER				
S. No	**Course Code**	**Courses**	**L**	**T**	**P**	**Credits**
1	HS	Communicative English	3	0	0	3
2	BS	Mathematics - I (Calculus And Differential Equations)	3	0	0	3
3	BS	Applied Physics	3	0	0	3
4	ES	Programming for Problem Solving using C	3	0	0	3
5	ES	Computer Engineering Workshop	1	0	4	3
6	HS	English Communication Skills Laboratory	0	0	3	1.5
7	BS	Applied Physics Lab	0	0	3	1.5
8	ES	Programming for Problem Solving using C Lab	0	0	3	1.5
Total Credits						**19.5**

		I Year – II SEMESTER				
S. No	**Course Code**	**Courses**	**L**	**T**	**P**	**Credits**
1	BS	Mathematics – II (Linear Algebra And Numerical Methods)	3	0	0	3
2	BS	Applied Chemistry	3	0	0	3
3	ES	Computer Organization	3	0	0	3
4	ES	Python Programming	3	0	0	3
5	ES	Data Structures	3	0	0	3
6	BS	Applied Chemistry Lab	0	0	3	1.5
7	ES	Python Programming Lab	0	0	3	1.5
8	ES	Data Structures Lab	0	0	3	1.5
9	MC	Environment Science	2	0	0	0
Total Credits						**19.5**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

S. No	Course Code	Courses	L	T	P	Credits
		II Year – I SEMESTER				
1	BS	Mathematics III	3	0	0	3
2	CS	Object Oriented Programming through C++	3	0	0	3
3	CS	Operating Systems	3	0	0	3
4	CS	Software Engineering	3	0	0	3
5	CS	Mathematical Foundations of Computer Science	3	0	0	3
6	CS	Object Oriented Programming through C++ Lab	0	0	3	1.5
7	CS	Operating Systems Lab	0	0	3	1.5
8	CS	Software Engineering Lab	0	0	3	1.5
9	SO	**Skill oriented Course - I** Applications of Python-NumPy **OR** 2) Web Application Development Using Full Stack -Frontend Development – Module-I	0	0	4	2
10	MC	Constitution of India	2	0	0	0
Total Credits						**21.5**

S. No	Course Code	Courses	L	T	P	Credits
		II Year – II SEMESTER				
1	BS	Probability and Statistics	3	0	0	3
2	CS	Database Management Systems	3	0	0	3
3	CS	Formal Languages and Automata Theory	3	0	0	3
4	ES	Java Programming	3	0	0	3
5	HS	Managerial Economics and Financial Accountancy	3	0	0	3
6	CS	Database Management Systems Lab	0	0	2	1
7	CS	R Programming Lab	0	1	2	2
8	ES	Java Programming Lab	0	0	3	1.5
9	SO	**Skill Oriented Course - II** Applications of Python-Pandas **OR** 2) Web Application Development Using Full Stack -Frontend Development –Module-II	0	0	4	2
Total Credits						**21.5**
10	Minor	Operating Systems$	3	0	2	3+1
11	Honors	Any course from the Pool, as per the opted track	4	0	0	4

$- Integrated Course

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

S.No	Course Code	Courses	Hours per week			Credits
		III B. Tech – I Semester				
			L	T	P	C
1	PC	Computer Networks	3	0	0	3
2	PC	Design and Analysis of Algorithms	3	0	0	3
3	PC	Data Warehousing and Data Mining	3	0	0	3
4	Open Elective / Job Oriented	**Open Elective-I** Open Electives offered by other departments/ Optimization in Operations Research (Job oriented course)	3	0	0	3
5	PE	**Professional Elective-I** Artificial Intelligence Software Project Management Distributed Systems Advanced Unix Programming	3	0	0	3
6	PC	Data Warehousing and Data Mining Lab	0	0	3	1.5
7	PC	Computer Networks Lab	0	0	3	1.5
8	SO	**Skill Oriented Course – III** 1. Animation course: Animation Design **OR** 2.Continuous Integration and Continuous Delivery using DevOps	0	0	4	2
9	MC	Employability Skills-I	2	0	0	0
10	PR	**Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester**	0	0	0	1.5
		Total credits				**21.5**
11	Minor	Database Management Systems$	3	0	2	3+1
12	Honors	Any course from the Pool, as per the opted track	4	0	0	4

$- Integrated Course

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

S.No	Course Code	Courses	Hours per week			Credits
			L	T	P	C
1	PC	Machine Learning	**3**	**0**	**0**	**3**
2	PC	Compiler Design	**3**	**0**	**0**	**3**
3	PC	Cryptography and Network Security	**3**	**0**	**0**	**3**
4	PE	**Professional Elective-II** 1.Mobile Computing 2.Big Data Analytics 3.Object Oriented Analysis and Design 4.Network Programming	**3**	**0**	**0**	**3**
5	Open Elective /Job Oriented	**Open Elective-II** Open Electives offered by other departments/ MEAN Stack Development *(Job Oriented)*	**3**	**0**	**0**	**3**
6	PC	Machine Learning using Python Lab	**0**	**0**	**3**	**1.5**
7	PC	Compiler Design Lab	**0**	**0**	**3**	**1.5**
8	PC	Cryptography and Network Security Lab	**0**	**0**	**3**	**1.5**
9	SO	**Skill Oriented Course - IV** 1.Big Data:Spark **OR** 2.MEAN Stack Technologies-Module I (HTML 5, JavaScript, Node.js, Express.js and TypeScript)	**0**	**0**	**4**	**2**
10	MC	Employability skills-II	**2**	**0**	**0**	**0**
Total credits						**21.5**
Industrial/Research Internship(Mandatory) 2 Months during summer vacation						
11	Minor	Data Structures and Algorithms$	3	0	2	3+1
12	Honors	Any course from the Pool, as per the opted track	4	0	0	4
Minor course through SWAYAM			-	-	-	**2**

III B. Tech – II Semester

$- Integrated Course

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

S.No	Course Code	Course Title	Hoursperweek			Credits
		IV B. Tech –I Semester				
			L	T	P	C
1	PE	**Professional Elective-III** 1.Cloud Computing 2.Neural Networks and Soft Computing 3.Ad-hoc and Sensor Networks 4.Cyber Security & Forensics	3	0	0	3
2	PE	**Professional Elective-IV** 1. Deep Learning Techniques 2. Social Networks & Semantic Web 3. Computer Vision 4.MOOCS-NPTEL/SWAYAM$^{\%}$	3	0	0	3
3	PE	**Professional Elective-V** 1.Block-Chain Technologies 2.Wireless Network Security 3.Ethical Hacking 4.MOOCS-NPTEL/SWAYAM$^{\%}$	3	0	0	3
4	Open Elective /Job Oriented	**Open Elective-III** Open Electives offered by other departments/ API and Microservices (Job Oriented Course)	3	0	0	3
5	Open Elective /Job Oriented	**Open Elective-IV** Open Electives offered by other departments/ Secure Coding Techniques (Job Oriented Course)	3	0	0	3
6	HS	Universal Human Values 2: Understanding Harmony	3	0	0	3
7	SO	1.PYTHON: Deep Learning **OR** 2.MEAN Stack Technologies-Module II-Angular JS and MongoDB **OR** 3.APSSDC offered Courses	0	0	4	2
8	PR	**Industrial/Research Internship 2 months (Mandatory) after third year (to be evaluated during VII semester**	0	0	0	3
Total credits						**23**
11	Minor	Software Engineering$^{\$}$ / any other from PART-B (For Minor)	3	0	2	3+1
12	Honors	Any course from the Pool, as per the opted track	4	0	0	4
Minor course through SWAYAM			**-**	**-**	**-**	**2**

$- Integrated Course

% - MOOC Course

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

S.No	Course Code	Course Title	Hours per week			Credits
IV B. Tech –II Semester						
			L	T	P	C
1	Project	Major Project Work, Seminar Internship	-	-	-	12
Total credits						12

Note:
1. *For integrated courses*: Theory and laboratory exams will be conducted separately, and the student concern will get credits if successfully completes both theory and laboratory. Only external exam will be conducted for Laboratory component. Credit based weightage shall be considered while awarding the grade.
2. *For MOOC courses*: Based on the students interest, student can register and complete a 12 week course one year in advance, by prior information to the concern.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

SUGGESTED COURSES FOR HONORS PROGRAM

POOL1- AI & ML	POOL2- Systems Engineering
1. Mathematics for Machine Learning 2. Text Mining and Time Series Analysis 3. Natural Language Processing 4. Reinforcement Learning	1. Internet of Things 2. Data Communications and Information Coding Theory 3. Service Oriented Architectures 4. Design of Secure Protocols 5. Network Coding
POOL3- Information Security 1. Principles of Cyber Security 2. Computational Number Theory 3. Cryptanalysis 4. Elliptic Curve Cryptography 5. Introduction to Quantum Computing and Quantum Cryptography 6. Public Key Infrastructure and Trust Management 7. Information Security Analysis and Audit 6. Cloud and IoT Security 7. Web Security 8. Block Chain Architecture Design and Use Cases	**POOL4 – Data Science** 1. Data Visualization 2. Statistical Foundations for Data Science 3. Mining Massive Data Sets 4. Medical Image Data Processing

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

SUGGESTED COURSES MINOR ENGINEERING IN CSE

Note:
1. Any THREE courses need to be studied from PART-A.
2. Any ONE course need to be studied from PART-B.
3. TWO, NPTEL courses of EIGHT week duration covering a total of 4 credits (offered by CSE Department only), Student can register at any time after the completion of II B.Tech. I Sem.
4. Students can pursue suggested MOOC Courses via NPTEL from II B.Tech II Sem and onwards, by prior information to the concern.

Eligibility for Minor in CSE:

S.No	Subject	L-T-P	Credits	Course available in NPTEL	NPTEL Link
PART A					
1	Operating Systems	3-0-2	4	Operating Systems	https://onlinecourses.swayam2.ac.in/cec21_cs20/preview
2	Data Structures and Algorithms	3-0-2	4	Data Structures Programming, Data Structures and Algorithms using Python	https://onlinecourses.swayam2.ac.in/cec22_cs10/preview https://onlinecourses.nptel.ac.in/noc22_cs26/preview
3	Software Engineering	3-0-2	4	Software Engineering	https://onlinecourses.swayam2.ac.in/cec21_cs21/preview
4	Computer Networks	3-0-2	4	Computer Networks	https://onlinecourses.swayam2.ac.in/cec22_cs05/preview
5	Database Management Systems	3-0-2	4	Data Base Management System (noc22-cs51)	https://onlinecourses.nptel.ac.in/noc22_cs51/preview

S.No	Subject	L-T-P	Credits	Course available in NPTEL	NPTEL Link
PART B					
1	Computational Thinking	4-0-0	4	Physics through Computational Thinking	https://onlinecourses.nptel.ac.in/noc22_ph12/preview
2	Object Oriented Programming through JAVA	3-0-2	4		
3	Data Analytics using Python	3-0-2	4	Data Analytics with Python	https://onlinecourses.nptel.ac.in/noc22_cs8/ preview
4	Artificial Intelligence	4-0-0	4	Artificial Intelligence: Knowledge Representation And Reasoning	1. https://onlinecourses.nptel.ac.in/noc22_cs56/preview 2. https://onlinecour

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

				(noc22-cs02), An Introduction to Artificial Intelligence (noc22-cs56), AI: Constraint Satisfaction (noc22-cs06)	ses.swayam2.ac.in/cec21_cs08/preview
5	Unix and Shell Programming	3-0-2	4		
6	Cloud Computing	4-0-0	4	Cloud Computing and Distributed Systems (noc22-cs18), Cloud computing(noc22-cs20)	1. https://onlinecourses.nptel.ac.in/noc22_cs18/preview 2. https://onlinecourses.nptel.ac.in/noc22_cs20/preview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Open Electives to be offered by CSE for other Branches:

Open Elective-I:	**Open Elective-II:**
1. Data Structures 2. Object Oriented Programming through JAVA 3. Data Base Management Systems 4. Computer Graphics 5. Advanced UNIX Programming 6. Computer Organization and Architecture 7. Operating Systems	1. Python Programming 2. Web Technologies 3. Soft Computing 4. Distributed Computing 5. AI and ML for Robotics 6. Computer Networks 7. Big Data Analytics 8. Computational Tools
Open Elective-III:	**Open Elective-IV:**
1. AI Tools & Techniques 2. Image Processing 3. Information Security 4. Mobile Application Development 5. Data Science 6. Cyber Security 7. Introduction to Internet of Things	1. MEAN Stack Technologies 2. Deep Learning Techniques 3. Cloud computing with AWS 4. Block Chain Technologies 5. Cryptography & Network Security 6. Introduction to Machine Learning 7. Machine Learning with Python

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
	COMMUNICATIVE ENGLISH				

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives:
  ➢ Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
  ➢ Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
  ➢ Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
  ➢ Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
  ➢ Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes:

At the end of the module, the learners will be able to
  ➢ understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
  ➢ ask and answer general questions on familiar topics and introduce oneself/others
  ➢ employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
  ➢ recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
  ➢ form sentences using proper grammatical structures and correct word forms

Unit 1:

Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications

Lesson-2: Deliverance by Premchand from "**The Individual Society",**Pearson Publications. (Non-detailed)

Listening: Listening to short audio texts and identifying the topic. Listening to prose, prose and conversation.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.

Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.

Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.

Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.

Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit 2:
Lesson-1: Nehru's letter to his daughter Indira on her birthday from "**Infotech English**", Maruthi Publications

Lesson-2: Bosom Friend by Hira Bansode from "**The Individual Society",** Pearson Publications.(Non-detailed)

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.**Reading**: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)

Grammar: Use of articles and zero article; prepositions.

Pronunciation: Past tense markers, word stress-di-syllabic words

Unit 3:
Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications

Lesson-2: Shakespeare's Sister by Virginia Woolf from "**The Individual Society",** Pearson Publications.(Non-detailed**)**

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing.

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing.E-mail etiquette, Writing CV's.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Pronunciation: word stress-poly-syllabic words.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Unit 4:
Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "**Infotech English**", Maruthi Publications
Lesson-2: Telephone Conversation-Wole Soyinka from "**The Individual Society",** Pearson Publications**.**(Non-detailed)
Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.Functional English: Permissions, Requesting, Inviting.
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.
Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.Writing SOP, writing for media.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.
Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms
Pronunciation: Contrastive Stress

Unit 5:
Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications
Lesson-2: Still I Rise by Maya Angelou from "**The Individual Society",** Pearson Publications.(Non-detailed)
Listening: Identifying key terms,   understanding concepts and interpreting the concepts both in speaking and writing.
Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Functional English: Suggesting/Opinion giving.
Reading: Reading for comprehension. RAP StrategyIntensive reading and Extensive reading techniques.
Reading for Writing: Writing academic proposals- writing research articles: format and style.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.
Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Pronunciation: Stress in compound words

Text Books:
1. "**Infotech English**", Maruthi Publications. (Detailed)
2."**The Individual Society",** Pearson Publications.(Non-detailed)

Prescribed text book for Laboratory for Semesters-I & II:
1.   "**Infotech English**", Maruthi Publications. (with Compact Disc)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books
1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
	MATHEMATICS-I (Calculus And Differential Equations)				

Course Objectives:
- To familiarize a variety of well-known sequences and series, with a developing intuition about the behaviour of new ones.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes: At the end of the course, the student will be able to
- utilize mean value theorems to real life problems (L3)
- solve the differential equations related to various engineering fields (L3)
- familiarize with functions of several variables which is useful in optimization (L3)
- apply double integration techniques in evaluating areas bounded by region (L3)
- students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems(L5)

UNIT – I: Sequences, Series and Mean value theorems: **(10hrs)**
Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series– Leibnitz's rule.
Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders, Problems and applications on the above theorem.

UNIT – II: Differential equations of first order and first degree: **(10hrs)**
Linear differential equations– Bernoulli's equations –Exact equations and equations reducible to exact form.
Applications: Newton's Law of cooling– Law of natural growth and decay– Orthogonal trajectories– Electrical circuits.

UNIT – III: Linear differential equations of higher order: **(10hrs)**
Homogeneous and Non-homogeneousdifferential equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters, Cauchy and Legendre's linear equations.
Applications: LCR circuit, Simple Harmonic motion.

UNIT – IV: Partial differentiation: **(10hrs)**
Introduction – Homogeneous function – Euler's theorem– Total derivative– Chain rule– Jacobian – Functional dependence –Taylor's and MacLaurin's series expansion of functions of two variables.
Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT – V: Multiple integrals: **(8 hrs)**

Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates.

Applications: Finding Areas and Volumes.

Text Books:
1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. B. V. Ramana,Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:
1. Erwin Kreyszig,Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. Joel Hass, Christopher Heil and Maurice D. Weir, Thomas calculus, 14thEdition, Pearson.
3. Lawrence Turyn,Advanced Engineering Mathematics, CRC Press, 2013.
4. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
	APPLIED PHYSICS **(For All Circuital Branches like ECE, EEE, CSE etc)**				

Course Objectives:

1. Bridging the gap between the physics in school at 10+2 level and UG level engineering courses.

2. To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications

3. Understand the mechanism of emission of light, utilization of lasers as coherent light sources for low and high energy applications, study of propagation of light through optical fibers and their implications in optical communications.

4. Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of deBroglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals and band theory for crystalline solids. Metals-Semiconductors-Insulators concepts utilization of transport phenomenon of charge carriers in semiconductors.

5. To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.

6. To Understand the physics of Semiconductors and their working mechanism. To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications.

Course Outcomes:

1. Explain the need of coherent sources and the conditions for sustained interference (L2). Identify the applications of interference in engineering (L3). Analyze the differences between interference and diffraction with applications (L4). Illustrate the concept of polarization of light and its applications (L2). Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2)

2. Explain various types of emission of radiation (L2). Identify the role of laser in engineering applications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify optical fibers based on refractive index profile and mode of propagation (L2). Identify the applications of optical fibers in medical, communication and other fields (L2). Apply the fiber optic concepts in various fields (L3).

3. Describe the dual nature of matter (L1). Explain the significance of wave function (L2). Identify the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). Identify the role of classical and quantum free electron theory in the study of electrical conductivity (L3). Classify the energy bands of solids (L2).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

4. Explain the concept of dielectric constant and polarization in dielectric materials (L2). Summarize various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). Classify the magnetic materials based on susceptibility and their temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3)

5. Outline the properties of charge carriers in semiconductors (L2). Identify the type of semiconductor using Hall effect (L2). Identify applications of semiconductors in electronic devices (L2). Classify superconductors based on Meissner's effect (L2). Explain Meissner's effect, BCS theory & Josephson effect in superconductors (L2).

Unit-I: Wave Optics   **12hrs**
Interference: Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating(Qualitative).

Polarization: Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

Unit Outcomes:
The students will be able to

➢ **Explain** the need of coherent sources and the conditions for sustained interference (L2)
➢ **Identify** engineering applications of interference (L3)
➢ **Analyze** the differences between interference and diffraction with applications (L4)
➢ **Illustrate** the concept of polarization of light and its applications (L2)
➢ **Classify** ordinary polarized light and extraordinary polarized light (L2)

Unit-II: Lasers and Fiber optics   **8hrs**
Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture - Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers - Applications.

Unit Outcomes:
The students will be able to
➢ **Understand** the basic concepts of LASER light Sources (L2)
➢ **Apply** the concepts to learn the types of lasers (L3)
➢ **Identifies** the Engineering applications of lasers (L2)
➢ **Explain** the working principle of optical fibers (L2)
➢ **Classify** optical fibers based on refractive index profile and mode of propagation (L2)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

- ➢ **Identify** the applications of optical fibers in various fields (L2)

Unit III: Quantum Mechanics, Free Electron Theory and Band theory   10hrs

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of states (3D) - Fermi energy.

Band theory of Solids: Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)-
E vs K diagram - v vs K diagram - effective mass of electron – Classification of crystalline solids– concept of hole.

Unit Outcomes:

The students will be able to

- ➢ **Explain** the concept of dual nature of matter (L2)
- ➢ **Understand** the significance of wave function (L2)
- ➢ **Interpret** the concepts of classical and quantum free electron theories (L2)
- ➢ **Explain** the importance of K-P model
- ➢ **Classify** the materials based on band theory (L2)
- ➢ **Apply** the concept of effective mass of electron (L3)

Unit-IV: Dielectric and Magnetic Materials   8hrs

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius-Mossotti equation- Piezoelectricity.

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classification of magnetic materials: Dia, para, Ferro, antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Eddy currents- Engineering applications.

Unit Outcomes: *The students will be able to*

- ➢ **Explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- ➢ **Summarize** various types of polarization of dielectrics (L2)
- ➢ **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics(L2)
- ➢ **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- ➢ **Explain** the applications of dielectric and magnetic materials (L2)
- ➢ **Apply** the concept of magnetism to magnetic data storage devices (L3)

Unit – V: Semiconductors and Superconductors   10hrs

Semiconductors: Introduction- Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – extrinsic semiconductors – density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation- Hall effect – Hall coefficient –Applications of Hall effect.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Superconductors: Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory (Qualitative) – Josephson effects (AC and DC) – SQUIDs – High T_c superconductors – Applications of superconductors.

Unit Outcomes:
The students will be able to
- ➢ **Classify** the energy bands of semiconductors (L2)
- ➢ **Interpret** the direct and indirect band gap semiconductors (L2)
- ➢ **Identify** the type of semiconductor using Hall effect (L2)
- ➢ **Identify** applications of semiconductors in electronic devices (L2)
- ➢ **Classify** superconductors based on Meissner's effect (L2)
- ➢ **Explain** Meissner's effect, BCS theory & Josephson effect in superconductors (L2)

Text books:
1. M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S.Chand Publications, 11th Edition 2019.
2. Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).
3. Applied Physics by P.K.Palanisamy SciTech publications.

Reference Books:
1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Engineering Physics by M.R.Srinivasan, New Age international publishers (2009).
3. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education, 2018
4. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press
5. Semiconductor physics and devices- Basic principle – Donald A, Neamen, Mc Graw Hill
6. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FOR PROBLEM SOLVING USING C					

Course Objectives:

The objectives of Programming for Problem Solving Using C are

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C
- To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage.
- To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
- To assimilate about File I/O and significance of functions

Course Outcomes:

Upon the completion of the course the student will learn

- To write algorithms and to draw flowcharts for solving problems
- To convert flowcharts/algorithms to C Programs, compile and debug programs
- To use different operators, data types and write programs that use two-way/ multi-way selection
- To select the best loop construct for a given problem
- To design and implement programs to analyze the different pointer applications
- To decompose a problem into functions and to develop modular reusable code
- To apply File I/O operations

UNIT I

Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II

Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.

Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions.

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.

UNIT III

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code

Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT IV

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value
Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation
Function, Array of Pointers, Programming Application.
Processor Commands: Processor Commands.

UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function
Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions,
Recursion
Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input /
Output Functions, Character Input / Output Functions
Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting
File Type.

Text Books:
1) Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE.
2) The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson.

Reference Books:
1) Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill.
2) Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson.
3) Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		1	0	4	3
	COMPUTER ENGINEERING WORKSHOP				

Course Objectives:
The objective of this course is to

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
- Demonstrate basic command line interface commands on Linux
- Teach the usage of Internet for productivity and self paced lifelong learning
- Describe about Compression, Multimedia and Antivirus tools
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools

Course Outcomes:
Students should be able to:

- Assemble and disassemble components of a PC
- Construct a fully functional virtual machine, Summarize various Linux operating system commands,
- Recognize characters & extract text from scanned images, Create audio files and podcasts

Computer Hardware:
Experiment 1: Identification of peripherals of a PC, Laptop, Server and Smart Phones: Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Operating Systems:

Experiment 2: Virtual Machine setup:
- o Setting up and configuring a new Virtual Machine
- o Setting up and configuring an existing Virtual Machine
- o Exporting and packaging an existing Virtual Machine into a portable format

Experiment 2: Operating System installation:
- o Installing an Operating System such as Linux on Computer hardware.

Experiment 3: Linux Operating System commands:
- o General command syntax
- o Basic *help* commands
- o Basic File system commands
- o Date and Time
- o Basic Filters and Text processing
- o Basic File compression commands
- o Miscellaneous: apt-get, vi editor

Networking and Internet:

 Experiment 4: Networking Commands:

- o ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget,route

Experiment 5: Internet Services:
- o Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/ plugins

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

- Antivirus installation, configuring a firewall, blocking pop-ups
- Email creation and usage, Creating a Digital Profile on LinkedIn

Productivity Tools:

Experiment 6: Basic HTML tags, Introduction to HTML5 and its tags, Introduction to CSS3 and its properties. Preparation of a simple website/ homepage,

Assignment: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

Features to be covered:- Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, etc.,

Internet of Things (IoT): IoT fundamentals, applications, protocols, communication models, architecture, IoT devices

Office Tools:

Experiment 7: Demonstration and Practice on Text Editors like Notepad++, Sublime Text, Atom, Brackets, Visual code, etc

Experiment 8: Demonstration and practice on Microsoft Word, Power Point, Microsoft Excel

Experiment 10: Demonstration and practice on LaTeX and produce professional pdf documents.

Text Books:
1) Computer Fundamentals, Anita Goel, Pearson Education, 2017
2) PC Hardware Trouble Shooting Made Easy, TMH

References Books:
1) Essential Computer and IT Fundamentals for Engineering and Science Students, Dr.N.B.Vekateswarlu, S.Chand

e-Resources:
1) https://explorersposts.grc.nasa.gov/post631/2006-2007/computer_basics/ComputerPorts.doc

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
ENGLISH COMMUNICATION SKILLS LABORATORY					

UNIT I:
Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation,

UNIT II:
Word stress-di-syllabic words, poly-syllabic words, weak and strong forms, contrastive stress (Homographs)

UNIT III: Stress in compound words,rhythm, intonation,accent neutralisation.

UNIT IV: Listening to short audio texts and identifying the context and specific pieces of information toanswer a series of questions in speaking.

UNIT V: Newspapers reading; Understanding and identifying key terms and structures useful for writing reports.

Text Book:
1.“Infotech English”, Maruthi Publications.

Reference Books:
1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4.   English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
	APPLIED PHYSICS LAB				

(For All Circuital Branches like CSE, ECE, EEE etc.)
(Any 10 of the following listed experiments)

List of Applied Physics Experiments

1. Determination of thickness of thin object by wedge method.
2. Determination of radius of curvature of a given plano convex lens by Newton's rings.
3. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
4. Determination of dispersive power of the prism.
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of wavelength of Laser light using diffraction grating.
9. Estimation of Planck's constant using photoelectric effect.
10. Determination of the resistivity of semiconductor by four probe method.
11. To determine the energy gap of a semiconductor using p-n junction diode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect .
14. Measurement of resistance of a semiconductor with varying temperature.
15. Resistivity of a Superconductor using four probe method & Meissner effect.

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text Book of Practical Physics"- S Chand Publishers, 2017.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5

PROGRAMMING FOR PROBLEM SOLVING USING C LAB

Course Objectives:
- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers & functions.
- To review the file operations, preprocessor commands.

Course Outcomes:
By the end of the Lab, the student
- Gains Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:
1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

Exercise 2:
1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:
1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:
1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:
1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Exercise 6:
1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:
1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:
1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:
1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:
1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:
1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:
1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:
1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

Exercise 14:
1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:
1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:
1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3

MATHEMATICS-II
(Linear Algebra And Numerical Methods)

Course Objectives:
- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes: At the end of the course, the student will be able to
- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
- evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
- apply numerical integral techniques to different Engineering problems (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

UNIT – I: Solving systems of linear equations, Eigen values and Eigen vectors: (10hrs)
Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous linear equations – Gauss Eliminationmethod – Eigenvalues and Eigen vectors and properties (article-2.14 in text book-1).

Unit – II: Cayley–Hamilton theorem and Quadratic forms: (10hrs)
Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation. Singular values of a matrix, singular value decomposition (text book-3).

UNIT – III: Iterative methods: (8 hrs)
Introduction– Bisection method–Secant method – Method of false position– Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations numerically.

UNIT – IV: Interpolation: (10 hrs)
Introduction– Errors in polynomial interpolation – Finite differences– Forward differences– Backward differences –Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula– Newton's divide difference formula.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT – V: Numerical differentiation and integration, Solution of ordinary differential equations with initial conditions: (10 hrs)

Numerical differentiation using interpolating polynomial – Trapezoidal rule– Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method –Runge-Kutta method (second and fourth order).

Text Books:
1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. B. V. Ramana,Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. David Poole, Linear Algebra- A modern introduction, 4th Edition, Cengage.

Reference Books:
1. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science,Tata Mc. Graw Hill Education.
2. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
3. Lawrence Turyn,Advanced Engineering Mathematics, CRC Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
	APPLIED CHEMISTRY				

Course Objectives
- Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- Explain the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- Recall the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- Outline the basics of computational chemistry and molecular switches

UNIT I: POLYMER TECHNOLOGY   **8 hrs**
Polymerisation:- Introduction, methods of polymerization (emulsion and suspension), mechanical properties.
Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste (waste to wealth).
Elastomers:- Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes).
Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable polymers, biopolymers, biomedical polymers.
 Course Outcomes: At the end of this unit, the students will be able to
- Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION   **10 hrs**
Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, construction of glass electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).
*Corrosion:-*Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (proper designing and cathodic protection), Protective coatings (surface preparation, cathodic coatings, anodic coatings, electroplating and electroless plating [nickel]), Paints (constituents, functions and special paints).

 Course Outcomes: At the end of this unit, the students will be able to
- Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT III: MATERIAL CHEMISTRY   10 hrs

Part I : Non-elemental semiconducting materials:- Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Insulators & magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.

Part II: Nano materials:- Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

Liquid crystals:- Introduction-types-applications.

Super conductors:-Type –I, Type II-characteristics and applications

Course Outcomes: At the end of this unit, the students will be able to

- Synthesize nanomaterials for modern advances of engineering technology.
- Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors.

UNIT IV: SPECTROSCOPIC TECHNIQUES & NON-CONVENTIONAL ENERGY SOURCES 10 hrs

Part A: **SPECTROSCOPIC TECHNIQUES**

Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR [instrumentation and differentiation of sp, sp^2, sp^3 and IR stretching of functional groups (alcohols, carbonyls, amines) applications], magnetic resonance imaging and CT scan (procedure & applications).

Part B*: NON-CONVENTIONAL ENERGY SOURCES**

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

Course Outcomes: At the end of this unit, the students will be able to

- Analyze the principles of different analytical instruments and their applications.
- Design models for energy by different natural sources.

UNIT V: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY   8 hrs

Computational chemistry: Introduction to computational chemistry, molecular modelling and docking studies

Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor

Course Outcomes: At the end of this unit, the students will be able to

- Obtain the knowledge of computational chemistry and molecular machines

Text Books:

1. P.C. Jain and M. Jain "Engineering Chemistry", 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, "Engineering Chemistry", Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, "A Textbook of Engineering Chemistry", S.Chand & Co, (2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latest edition).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:
1. K. Sesha Maheshwaramma and Mridula Chugh, "Engineering Chemistry", Pearson India Edn.
2. O.G. Palana, "Engineering Chemistry", Tata McGraw Hill Education Private Limited, (2009).
3. CNR Rao and JM Honig (Eds) "Preparation and characterization of materials" Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, "Textbook of Nanoscience and Nanotechnology", University press (latest edition)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
	COMPUTER ORGANIZATION				

Course Objectives:
The purpose of the course is to introduce principles of computer organization and the basic architectural concepts. It provides an in depth understanding of basic organization, design, programming of a simple digital computer, computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems.

Course Outcomes:
By the end of the course the student will be able to
- Demonstrate and understanding of the design of the functional units of a digital computer system.
- Relate Postulates of Boolean algebra and minimize combinational functions
- Recognize and manipulate representations of numbers stored in digital computers
- Build the logic families and realization of logic gates.
- Design and analyze combinational and sequential circuits
- Recall the internal organization of computers, CPU, memory unit and Input/Outputs and the relations between its main components
- Solve elementary problems by assembly language programming

UNIT I:
Digital Computers and Data Representation: Introduction ,Numbering Systems, Decimal to Binary Conversion, Binary Coded Decimal Numbers, Weighted Codes, Self-Complementing Codes, Cyclic Codes, Error Detecting Codes, Error Correcting Codes, Hamming Code for Error Correction, Alphanumeric Codes, ASCI Code
Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.
Boolean Algebra and Logical gates:
Boolean Algebra :Theorems and properties, Boolean functions, canonical and standard forms , minimization of Boolean functions using algebraic identities; Karnaugh map representation and minimization using two and three variable Maps ;Logical gates ,universal gates and Two-level realizations using gates : AND-OR, OR-AND, NAND-NAND and NOR-NOR structures

UNIT II:
Digital logic circuits: Combinatorial Circuits: Introduction, Combinatorial Circuit Design Procedure, Implementation using universal gates, Multi-bit adder, Multiplexers, De-multiplexers, Decoders
Sequential Switching Circuits: Latches and Flip-Flops, Ripple counters using T flip-flops; Synchronous counters: Shift Registers; Ring counters

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT III:
Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Booth multiplication algorithm, Division Algorithms, Floating – point Arithmetic operations.
Register Transfer language and microinstructions : Bus memory transfer, arithmetic and logical micro-operations, shift and rotate micro-operations
Basic Computer Organization and Design: Stored program concept, computer Registers, common bus system, Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input–Output configuration and program Interrupt.

UNIT IV:
Microprogrammed Control: Control memory, Address sequencing, microprogram example, design of control unit.
Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control: conditional Flags and Branching

UNIT V:
Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.
Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Text Books:
1. Digital Logic and Computer Design,Moriss Mano,11thEdition,PearsonEducation.

2. Computer System Architecture,3rded., M.MorrisMano, PHI

Reference Books:
1. Digital Logic and Computer Organization, Rajaraman,Radhakrishnan,PHI,2006

2. Computer Organization, 5thed.,Hamacher, VranesicandZaky,TMH,2002

3. Computer Organization & Architecture :Designing for Performance, 7thed.,
William Stallings, PHI, 2006

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year – II Semester		L	T	P	C
		3	0	0	3
	PYTHON PROGRAMMING				

Course Objectives:
The Objectives of Python Programming are
- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes:
- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language
- Solve coding tasks related conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming

UNIT I
Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.
Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.
Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

UNIT II
Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop
Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

UNIT III
List and Dictionaries: Lists, Defining Simple Functions, Dictionaries
Design with Function**:** Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.
Modules: Modules, Standard Modules, Packages.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT IV
File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations
Object Oriented Programming**:** Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support
Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism

UNIT V
Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.
Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.
Programming**:** Introduction to Programming Concepts with Scratch.

Text Books
1) Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
2) Python Programming: A Modern Approach, Vamsi Kurama, Pearson.

Reference Books:
1) Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
2) Introduction to Programming Using Python, Y. Daniel Liang, Pearson.
e-Resources:
https://www.tutorialspoint.com/python3/python_tutorial.pdf

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year – II Semester		L	T	P	C
		3	0	0	3
	DATA STRUCTURES				

Course Objectives:

The objective of the course is to

- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

Course Outcomes:

After completing this course a student will be able to:

- Summarize the properties, interfaces, and behaviors of basic abstract data types
- Discuss the computational efficiency of the principal algorithms for sorting & searching
- Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
- Demonstrate different methods for traversing trees

UNIT I

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.

Searching - Linear search, Binary search, Fibonacci search.

Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation ,Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues-Circular Queues, Deques, Priority Queues, Multiple Queues.

Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.

UNIT IV

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees- AVL Trees, Insertion, Deletion and Rotations.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V
Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

Text Books:
1) Data Structures Using C. 2nd Edition.Reema Thareja, Oxford.
2) Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:
1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2) Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
3) Data Structures with C, Seymour Lipschutz TMH

e-Resources:
1) http://algs4.cs.princeton.edu/home/
2) https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		0	0	3	1.5
	APPLIED CHEMISTRY LAB				

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn^{+2} using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of Cu^{+2} using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe^{+3} by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method.
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).
12. Determination of Mg^{+2} present in an antacid.
13. Determination of $CaCO_3$ present in an egg shell.
14. Estimation of Vitamin C.
15. Determination of phosphoric content in soft drinks.
16. Adsorption of acetic acid by charcoal.
17. Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books
1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		0	0	3	1.5
	PYTHON PROGRAMMING LAB				

Course Objectives:

The Objectives of Python Programming are

- *To learn about Python programming language syntax, semantics, and the runtime environment*
- *To be familiarized with universal computer programming concepts like data types, containers*
- *To be familiarized with general computer programming concepts like conditional execution, loops & functions*
- *To be familiarized with general coding techniques and object-oriented programming*

Course Outcomes:

- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language
- Solve coding tasks related conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming

List of Experiments:

1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
3) Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
4) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
5) Use a *for* loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

        *
        **
        ***
        ****

6) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
7) Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and Not close otherwise.
8) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
9) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

length, the program should alternate the characters of the two strings. For example, if the user enters *abcde* and *ABCDE* the program should print out *AaBbCcDdEe*.

10) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.

11) In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4y or 3(x+5). Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.

12) Write a program that generates a list of 20 random numbers between 1 and 100.
    (a) Print the list.
    (b) Print the average of the elements in the list.
    (c) Print the largest and smallest values in the list.
    (d) Print the second largest and second smallest entries in the list
    (e) Print how many even numbers are in the list.

13) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.

14) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is 4.

15) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].

16) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements,it is much shorter with lists and it is also easier to add new conversions if you use lists.

17) Write a function called *sum_digits* that is given an integer num and returns the sum of the digits of num.

18) Write a function called *first_diff* that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.

19) Write a function called *number_of_factors* that takes an integer and returns how many factors the number has.

20) Write a function called *is_sorted* that is given a list and returns True if the list is sorted and False otherwise.

21) Write a function called root that is given a number x and an integer n and returns $x^{1/n}$. In the function definition, set the default value of n to 2.

22) Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be 100.

23) Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
    (a) Do this using the sort method. (b) Do this without using the sort method.

24) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.

25) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

26) Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.

27) Write a class called Product. The class should have fields called name, amount, and price, holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get_price* that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make_purchase* that receives the number of items to be bought and decreases amount by that much.

28) Write a class called Time whose only field is a time in seconds. It should have a method called *convert_to_minutes* that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert_to_hours* that returns a string of hours, minutes, and seconds formatted analogously to the previous method.

29) Write a class called Converter. The user will pass a length and a unit when declaring an object from the class—for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call c.feet() and should get 0.75 as the result.

30) Write a Python class to implement pow(x, n).

31) Write a Python class to reverse a string word by word.

32) Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.

33) Write a program to demonstrate Try/except/else.

34) Write a program to demonstrate try/finally and with/as.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year – II Semester		L	T	P	C
		0	0	3	1.5
	DATA STRUCTURES LAB				

Course Objectives:
The objective of this lab is to
- Demonstrate the different data structures implementation.

Course Outcomes:
By the end of this lab the student is able to
- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

List of Experiments:

Exercise -1 (Searching)
a)Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.
b) Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

Exercise -2 (Sorting-I)
a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order
b) Write C program that implement Quick sort, to sort a given list of integers in ascending order
c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order

Exercise -3(Sorting-II)
a) Write C program that implement radix sort, to sort a given list of integers in ascending order
b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4(Singly Linked List)
a) Write a C program that uses functions to create a singly linked list
b) Write a C program that uses functions to perform insertion operation on a singly linked list
c) Write a C program that uses functions to perform deletion operation on a singly linked list
d) Write a C program to reverse elements of a single linked list.

Exercise -5(Queue)
a) Write C program that implement Queue (its operations) using arrays.
b) Write C program that implement Queue (its operations) using linked lists

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Exercise -6(Stack)

a) Write C program that implement stack (its operations) using arrays

b) Write C program that implement stack (its operations) using Linked list

c) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7(Binary Tree)

d) Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.

Exercise -8(Binary Search Tree)

a) Write a C program to Create a BST

b) Write a C program to insert a node into a BST.

c) Write a C program to delete a node from a BST.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year – II Semester		L	T	P	C
		2	0	0	0
	ENVIRONMENT SCIENCE				

Course Objectives:

The objectives of the course are to impart:

- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

UNIT I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT II

Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT III

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT IV
Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.
Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT V
Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on an**y** **issues related to Environmental Studies course and make a power point presentation.**

Text Books:
1) Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2) Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3) Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference Books:
1) Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2) A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3) Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4) Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

		L	T	P	C
II Year I Semester		3	0	0	3
	MATHEMATICS - III				

Course Objectives:
- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Course Outcomes:
At the end of the course, the student will be able to
- Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- Estimate the work done against a field, circulation and flux using vector calculus (L5)
- Apply the Laplace transform for solving differential equations (L3)
- Find or compute the Fourier series of periodic signals (L3)
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
- Identify solution methods for partial differential equations that model physical processes (L3)

UNIT I: Vector calculus: (10 hrs)
Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential.
Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

UNIT II: Laplace Transforms: (10 hrs)
Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (without proof).
Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT III: Fourier series and Fourier Transforms: (10 hrs)
Fourier Series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.
Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – inverse transforms – Finite Fourier transforms.

UNIT IV: PDE of first order: (8 hrs
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V: Second order PDE and Applications: (10 hrs)
Second order PDE: Solutions of linear partial differential equations with constant coefficients
– RHS term of the type $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$.
Applications of PDE: Method of separation of Variables – Solution of One dimensional
Wave, Heat and two-dimensional Laplace equation.

Text Books:
1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:
1) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2) Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
3) Peter O' Neil, Advanced Engineering Mathematics, Cengage.
4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	3
	OBJECT ORIENTED PROGRAMMING THROUGH C++				

Course Objectives:
- Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
- Understand dynamic memory management techniques using pointers, constructors, destructors
- Describe the concept of function overloading, operator overloading, virtual functions and polymorphism
- Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
- Demonstrate the use of various OOPs concepts with the help of programs

Course Outcomes:
By the end of the course, the student
- Classify object oriented programming and procedural programming
- Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
- Build C++ classes using appropriate encapsulation and design principles
- Apply object oriented or non-object oriented techniques to solve bigger computing problems

UNIT I
Introduction to C++: Difference between C and C++, Evolution of C++, The Object Oriented Technology, Disadvantage of Conventional Programming, Key Concepts of Object Oriented Programming, Advantage of OOP, Object Oriented Language.

UNIT II
Classes and Objects &Constructors and Destructor: Classes in C++, Declaring Objects, Access Specifiers and their Scope, Defining Member Function, Overloading Member Function, Nested class, Constructors and Destructors, Introduction, Constructors and Destructor, Characteristics of Constructor and Destructor, Application with Constructor, Constructor with Arguments parameterized Constructor, Destructors, Anonymous Objects.

UNIT III
Operator Overloading and Type Conversion & Inheritance: The Keyword Operator, Overloading Unary Operator, Operator Return Type, Overloading Assignment Operator (=), Rules for Overloading Operators, Inheritance, Reusability, Types of Inheritance, Virtual Base Classes- Object as a Class Member, Abstract Classes, Advantages of Inheritance, Disadvantages of Inheritance.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT IV
Pointers & Binding Polymorphisms and Virtual Functions: Pointer, Features of Pointers, Pointer Declaration, Pointer to Class, Pointer Object, The this Pointer, Pointer to Derived Classes and Base Class, Binding Polymorphisms and Virtual Functions, Introduction, Binding in C++, Virtual Functions, Rules for Virtual Function, Virtual Destructor.

UNIT V
Generic Programming with Templates & Exception Handling: Definition of class Templates, Normal Function Templates, Over Loading of Template Function, Bubble Sort Using Function Templates, Difference between Templates and Macros, Linked Lists with Templates, Exception Handling, Principles of Exception Handling, The Keywords try throw and catch, Multiple Catch Statements, Specifying Exceptions.
Overview of Standard Template Library, STL Programming Model, Containers, Sequence Containers, Associative Containers, Algorithms, Iterators, Vectors, Lists, Maps.

Text Books:
1) A First Book of C++, Gary Bronson, Cengage Learning.
2) The Complete Reference C++, Herbert Schildt, TMH.

Reference Books:
1) Object Oriented Programming C++, Joyce Farrell, Cengage.
2) C++ Programming: from problem analysis to program design, DS Malik, Cengage Learning
3) Programming in C++, Ashok N Kamthane, Pearson 2nd Edition

e- Resources:
1) https://nptel.ac.in/courses/106/105/106105151/
2) https://github.com/topics/object-oriented-programming

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	3
	OPERATING SYSTEMS				

Course Objectives:

The objectives of this course is to

- Introduce to the internal operation of modern operating systems
- Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems
- Understand File Systems in Operating System like UNIX/Linux and Windows
- Understand Input Output Management and use of Device Driver and Secondary Storage (Disk) Mechanism
- Analyze Security and Protection Mechanism in Operating System

Course Outcomes:

After learning, the course the students should be able to:
- Describe various generations of Operating System and functions of Operating System
- Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
- Solve Inter Process Communication problems using Mathematical Equations by various methods
- Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
- Outline File Systems in Operating System like UNIX/Linux and Windows

UNIT I

Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems.
System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.

UNIT II

Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems.
Multithreaded Programming: Multithreading models, Thread libraries, Threading issues.
Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling.
Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT III

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation.

Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation.

UNIT IV

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention.

File Systems: Files, Directories, File system implementation, management and optimization.

Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

UNIT V

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.

System Security: Introduction, Program threats, System and network threats, Cryptography for security, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer security classification.

Case Studies: Linux, Microsoft Windows.

Text Books:
1) Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
2) Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Interprocess Communication and File systems.)

Reference Books:
1) Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
2) Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
3) Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105214/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	3
	SOFTWARE ENGINEERING				

Course Objectives:

This course is designed to:

- Give exposure to phases of Software Development, common process models including Waterfall, and the Unified Process, and hands-on experience with elements of the agile process
- Give exposure to a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, traceability, and version control
- Give exposure to Software Design techniques

Course Outcomes:

Students taking this subject will gain software engineering skills in the following areas:

- Ability to transform an Object-Oriented Design into high quality, executable code
- Skills to design, implement, and execute test cases at the Unit and Integration level
- Compare conventional and agile software methods

UNIT I

The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

UNIT II

Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge, Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

UNIT III

Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modelling, Requirements Modeling for WebApps.

UNIT IV

Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles,

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, Components, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development.

UNIT V

The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation, Elements of Software Qualtiy Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing.

Text Books:
1) Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
2) Software Engineering, Ian Sommerville, Ninth Edition, Pearson.

Reference Books:
1) Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
2) Software Engineering, Ugrasen Suman, Cengage.

e-Resources:
1) https://nptel.ac.in/courses/106/105/106105182/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	3
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE					

Course Objectives:

This course is designed to:

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science

Course Outcomes:

At the end of the course student will be able to

- Demonstrate skills in solving mathematical problems
- Comprehend mathematical principles and logic
- Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
- Manipulate and analyze data numerically and/or graphically using appropriate Software
- Communicate effectively mathematical ideas/results verbally or in writing

UNIT I

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT II

Set Theory: Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties, Algebraic Structures: Algebraic Systems, Properties, Semi Groups and Monoids, Group, Subgroup and Abelian Group, Homomorphism, Isomorphism.

UNIT III

Combinatorics: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems, Number Theory: Properties of Integers, Division Theorem,

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic, Fermat's and Euler's Theorems

UNIT IV

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations

UNIT V

Graph Theory: Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

Text Books:
1) Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2) Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.

Reference Books:
1) Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
2) Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
3) Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

e-Resources:
1) https://nptel.ac.in/courses/106/106/106106094/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

		L	T	P	C
II Year – I Semester		0	0	3	1.5
	OBJECT ORIENTED PROGRAMMING THROUGH C++ LAB				

Course Objectives:

The objective of this lab is to

- Demonstrate procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
- Understand dynamic memory management techniques using pointers, constructors, destructors, etc
- Demonstrate the concept of function overloading, operator overloading, virtual functions and polymorphism, inheritance.

Course Outcomes:

By the end of this lab the student is able to

- Apply the various OOPs concepts with the help of programs.

Exercise -1 (Classes Objects)

Create a Distance class with:

> •feet and inches as data members

> •member function to input distance

> •member function to output distance

> •member function to add two distance objects

1. Write a main function to create objects of DISTANCE class. Input two distances and output the sum.
2. Write a C++ Program to illustrate the use of Constructors and Destructors (use the above program.)
3. Write a program for illustrating function overloading in adding the distance between objects (use the above problem)

Exercise – 2 (Access)

Write a program for illustrating Access Specifiers public, private, protected

1. Write a program implementing Friend Function
2. Write a program to illustrate this pointer
3. Write a Program to illustrate pointer to a class

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Exercise -3 (Operator Overloading)

1. Write a program to Overload Unary, and Binary Operators as Member Function, and Non Member Function.
     1. Unary operator as member function
     2. Binary operator as non member function
2. Write a c ++ program to implement the overloading assignment = operator

Exercise -4 (Inheritance)

1. Write C++ Programs and incorporating various forms of Inheritance
     i)   Single Inheritance
     ii) Hierarchical Inheritance
     iii) Multiple Inheritances
     iv) Multi-level inheritance
     v)   Hybrid inheritance
2. Also illustrate the order of execution of constructors and destructors in inheritance

Exercise -5(Templates, Exception Handling)

1. a)Write a C++ Program to illustrate template class
2. b)Write a Program to illustrate member function templates
3. c) Write a Program for Exception Handling Divide by zero
4. d)Write a Program to rethrow an Exception

Exercise -6

1. Write a C++ program illustrating user defined string processing functions using pointers (string length, string copy, string concatenation)
2. Write a C++ program illustrating Virtual classes & virtual functions.
3. Write C++ program that implement Bubble sort, to sort a given list of integers in ascending order

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		0	0	3	1.5
	OPERATING SYSTEM LAB				

Course Objectives:
- To understand the design aspects of operating system
- To study the process management concepts & Techniques
- To study the storage management concepts
- To familiarize students with the Linux environment
- To learn the fundamentals of shell scripting/programming

Course Outcomes:
- To use Unix utilities and perform basic shell control of the utilities
- To use the Unix file system and file access control
- To use of an operating system to develop software
- Students will be able to use Linux environment efficiently
- Solve problems using bash for shell scripting

1) a) Study of Unix/Linux general purpose utility command list: man,who,cat, cd, cp, ps,

   ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger,

   pwd, cal, logout, shutdown.

   b) Study of vi editor

   c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system

   d) Study of Unix/Linux file system (tree structure)

   e) Study of .bashrc, /etc/bashrc and Environment variables.

2) Write a C program that makes a copy of a file using standard I/O, and system calls

3) Write a C program to emulate the UNIX ls –l command.

4) Write a C program that illustrates how to execute two commands concurrently with a

   command pipe. Ex: - ls –l | sort

5) Simulate the following CPU scheduling algorithms:

   (a) Round Robin (b) SJF (c) FCFS (d) Priority

6) Multiprogramming-Memory management-Implementation of fork (), wait (), exec()

   and exit (), System calls

7) Simulate the following:

   a) Multiprogramming with a fixed number of tasks (MFT)
   b) Multiprogramming with a variable number of tasks (MVT)

8) Simulate Bankers Algorithm for Dead Lock Avoidance

9) Simulate Bankers Algorithm for Dead Lock Prevention.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

10) Simulate the following page replacement algorithms:
         a) FIFO b) LRU c) LFU

11) Simulate the following File allocation strategies
    (a) Sequenced (b) Indexed (c) Linked

12) Write a C program that illustrates two processes communicating using shared memory

13) Write a C program to simulate producer and consumer problem usingsemaphores

14) Write C program to create a thread using pthreads library and let it run its function.

15) Write a C program to illustrate concurrent execution of threads using pthreads library.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

		L	T	P	C
II Year – I Semester		0	0	3	1.5
	SOFTWARE ENGINEERING LAB				

Course Objectives:
The objective of this lab is to acquire the generic software development skill through various stages of software life cycle and also to ensure the quality of software through software development with various protocol based environment

Course Outcomes:

- By the end of this lab the student is able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project
- prepare SRS document, design document, test cases and software configuration management and risk management related document.
- develop function oriented and object oriented software design using tools like rational rose.
- use modern engineering tools necessary for software project management, estimations, time management and software reuse
- generate test cases for software testing

1) Perform the following, for the following experiments:

    i.   Do the Requirement Analysis and Prepare SRS
    ii.   Draw E-R diagrams, DFD, CFD and structured charts for the project.

    1) Course Registration System

    2) Students Marks Analyzing System

    3) Online Ticket Reservation System

    4) Stock Maintenance

5) Consider any application, using COCOMO model, estimate the effort.
6) Consider any application, Calculate effort using FP oriented estimation model.
7) Draw the UML Diagrams for the problem 1,2, 3, 4.

8) Design the test cases for e-Commerce application (Flipcart, Amazon)

9) Design the test cases for a Mobile Application (Consider any example from Appstore)

10) Design and Implement ATM system through UML Diagrams.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - I Semester	Skill Oriented Course- I	L	T	P	C
		0	0	4	2
	APPLICATIONS OF PYTHON-NumPy				

Course Objectives:

The objective of this lab is to acquire programming skills in Python package NumPy and perform mathematical and statistical operations.

Course Outcomes:

By the end of this lab the student is able to

- Explain how data is collected, managed and stored for processing
- Understand the workings of various numerical techniques, different descriptive measures of Statistics, correlation and regression to solve the engineering problems
- Understand how to apply some linear algebra operations to n-dimensional arrays
- Use NumPy perform common data wrangling and computational tasks in Python.

Perform the following:

1) NumPy Installation using different scientific python distributions(Anaconda, Python(x,y), WinPython, Pyzo)
2) NumPy Basics (np.array, np.arrange, np.linespace, np.zeros, np.ones, np.random.random, np.empty)
3) Arrays (array.shape, len(array), array.ndim, array.dtype, array.astype(type), type(array))
4) Array Manipulation (np.append, np.insert, np.resize, np.delete, np.concatenate, np.vstack, np.hstack)
5) Mathematical Operations(np.add, np.substract, np.divide, np.multiply, np.sqrt, np.sin, np.cos, np.log, np.dot, np.roots) , Statistical Operations(np.mean, np.median, np.std, array.corrcoef( ))
6) NumPy data types
7) NumPy ndarray
8) NumPy String Operations
9) NumPy Financial functions
10) NumPy Functional Programming

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - I Semester	Skill Oriented Course- I	L	T	P	C
		0	0	4	2

WEB APPLICATION DEVELOPMENT USING FULL STACK
Frontend Development – Module -I

Course Objectives:
The objective of this lab is to provide understanding about the core concepts of frontend programming for web application

Course Outcomes:
By the end of this lab the student is able to

- Analyze a web page and identify its elements and attributes.
- Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet
- Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone
- Create web pages using HTML and Cascading Style Sheets.

Perform experiments related to the following concepts:

A) HTML

1) Introduction to HTML
2) Browsers and HTML
3) Editor's Offline and Online
4) Tags, Attribute and Elements
5) Doctype Element
6) Comments
7) Headings, Paragraphs, and Formatting Text
8) Lists and Links
9) Images and Tables

B) CSS

1) Introduction CSS
2) Applying CSS to HTML
3) Selectors, Properties and Values
4) CSS Colors and Backgrounds
5) CSS Box Model
6) CSS Margins, Padding, and Borders
7) CSS Text and Font Properties
8) CSS General Topics

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - I Semester		L	T	P	C
		2	0	0	0
	CONSTITUTION OF INDIA				

Course Objectives:
- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcomes:

At the end of the course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
    1. Know the sources, features and principles of Indian Constitution.
    2. Learn about Union Government, State government and its administration.
    3. Get acquainted with Local administration and Pachayati Raj.
    4. Be aware of basic concepts and developments of Human Rights.
    5. Gain knowledge on roles and functioning of Election Commission

UNIT I
Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes:After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;

Learning outcomes: After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

UNIT III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

Learning outcomes: After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariat

UNIT IV

A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning outcomes:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zillapanchayat block level organisation

UNIT V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes: After completion of this unit student will
- Know the role of Election Commission apply knowledge
- Contrast   and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

References:
1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
2) SubashKashyap, Indian Constitution, National Book Trust
3) J.A. Siwach, Dynamics of Indian Government & Politics
4) D.C. Gupta, Indian Government and Politics
5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6) J.C. Johari, Indian Government andPolitics Hans
7) J. Raj IndianGovernment and Politics
8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

e-Resources:
1) nptel.ac.in/courses/109104074/8
2) nptel.ac.in/courses/109104045/
3) nptel.ac.in/courses/101104065/
4) www.hss.iitb.ac.in/en/lecture-details
5) www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	0	0	3
	PROBABILITY AND STATISTICS				

Course Objectives:
- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:
Upon successful completion of this course, the student should be able to
- Classify the concepts of data science and its importance (L4) or (L2)
- Interpret the association of characteristics and through correlation and regression tools (L4)
- Make use of the concepts of probability and their applications (L3)
- Apply discrete and continuous probability distributions (L3)
- Design the components of a classical hypothesis test (L6)
- Infer the statistical inferential methods based on small and large sampling tests (L4)

UNIT I
Descriptive statistics and methods for data science: Data science – Statistics Introduction – Population vs Sample – Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability (spread or variance) – Skewness Kurtosis.

UNIT II
Correlation and Curve fitting: Correlation – correlation coefficient – rank correlation – regression coefficients and properties – regression lines – Method of least squares – Straight line – parabola – Exponential – Power curves.

UNIT III
Probability and Distributions: Probability – Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT IV
Sampling Theory:Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t, χ^2 and F-distributions – Point and Interval estimations – Maximum error of estimate.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V

Tests of Hypothesis: Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

Text Books:
1) Miller and Freund's, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2) S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:
1) Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2) Jay l. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3) Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4) Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	0	0	3
	DATABASE MANAGEMENT SYSTEMS				

Course Objectives:
- To introduce about database management systems
- To give a good formal foundation on the relational model of data and usage of Relational Algebra
- To introduce the concepts of basic SQL as a universal Database language
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes:
By the end of the course, the student will be able to

- Describe a relational database and object-oriented database
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design
- Examine issues in data storage and query processing and can formulate appropriate solutions
- Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

UNIT I
Introduction: Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

UNIT II
Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).

UNIT III
Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT IV

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).

UNIT V

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing: Tree base Indexing ,Comparison of File Organizations, Indexes and Performance Tuning

Text Books:
1) Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
2) Database System Concepts,5/e, Silberschatz, Korth, TMH

Reference Books:
1) Introduction to Database Systems, 8/e C J Date, PEA.
2) Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

e-Resources:
1) https://nptel.ac.in/courses/106/105/106105175/
2) https://www.geeksforgeeks.org/introduction-to-nosql/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	0	0	3
	FORMAL LANGUAGES AND AUTOMATA THEORY				

Course Objectives:
- To learn fundamentals of Regular and Context Free Grammars and Languages
- To understand the relation between Regular Language and Finite Automata and machines
- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators
- To understand the relation between Contexts free Languages, PDA and TM
- To learn how to design PDA as acceptor and TM as Calculators

Course Outcomes:

By the end of the course students can
- Classify machines by their power to recognize languages.
- Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy
- Employ finite state machines to solve problems in computing
- Illustrate deterministic and non-deterministic machines
- Quote the hierarchy of problems arising in the computer science

UNIT I

Finite Automata: Need of Automata theory, Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with Є-Transitions, Minimization of Finite Automata, Finite Automata with output-Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT II

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two RE, Manipulations of REs, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between FA and RE, Pumping Lemma of Regular Sets, Closure Properties of Regular Sets, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Right and Left Linear Regular Grammars, Equivalence between RG and FA, Inter Conversion.

UNIT III

Formal Languages, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, Є-Productions and Unit Productions, Normal Forms-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT IV

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description, Language Acceptance of Pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars, Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.

UNIT V

Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a TM, Design of TMs, Types of TMs, Church's Thesis, Universal and Restricted TM, Decidable and Un-decidable Problems, Halting Problem of TMs, Post's Correspondence Problem, Modified PCP, Classes of P and NP, NP-Hard and NP-Complete Problems.

Text Books:
1) Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008
2) Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007

Reference Books:
1) Elements of Theory of Computation, Lewis H.P. & Papadimition C.H., Pearson /PHI
2) Theory of Computation, V. Kulkarni, Oxford University Press, 2013
3) Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014

e-Resources:
1) https://nptel.ac.in/courses/106/104/106104028/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	0	0	3
	JAVA PROGRAMMING				

Course Objectives:

The learning objectives of this course are:

- To identify Java language components and how they work together in applications
- To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- To understand how to design applications with threads in Java
- To understand how to use Java APIs for program development

Course Outcomes:

By the end of the course, the student will be

- Able to realize the concept of Object Oriented Programming & Java Programming Constructs
- Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
- Apply the concept of exception handling and Input/ Output operations
- Able to design the applications of Java & Java applet
- Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit

UNIT I

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators: Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class String Builder.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread- Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface, Creating JDBC Application, JDBC Batch Processing, JDBC Transaction Management

Text Books:

1) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2) The complete Reference Java, 8th edition, Herbert Schildt, TMH.

References Books:

1) Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
2) Murach's Java Programming, Joel Murach

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105191/
2) https://www.w3schools.com/java/java_data_types.asp

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	0	0	3
MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY					

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals

Course Outcomes:

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

UNIT I
Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics – Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT II
Theories of Production and Cost Analyses: Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT III

Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

UNIT IV

Introduction to Accounting & Financing Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

UNIT V

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods (pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Books:

1) A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

Reference Books:

1) Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd.
2) JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3) N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd.
4) MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
5) I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6) V. Maheswari, Managerial Economics, S. Chand & Company Ltd.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		0	0	2	1
	DATABASE MANAGEMENT SYSTEMS LAB				

Course Objectives:

This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

Course Outcomes:

At the end of the course the student will be able to:

- Utilize SQL to execute queries for creating database and performing data manipulation operations
- Examine integrity constraints to build efficient databases
- Apply Queries using Advanced Concepts of SQL
- Build PL/SQL programs including stored procedures, functions, cursors and triggers

List of Exercises:

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5.
    i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
    ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexing techniques.

Text Books/Suggested Reading:
1) Oracle: The Complete Reference by Oracle Press
2) Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3) Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		0	1	2	2

R PROGRAMMING LAB

COURSE OBJECTIVES:

- To learn statistical programming, computation, graphics, and modeling,
- To learn Writing functions and use R in an efficient way,
- To learn about basic types of statistical models

COURSE OUTCOMES:

At the end of this course, students will be able to:

- Access online resources for R and import new function packages into the R workspace
- Import, review, manipulate and summarize data-sets in R
- Explore data-sets to create testable hypotheses and identify appropriate statistical tests
- Perform appropriate statistical tests using R
- Create and edit visualizations with R

1) Write a R program to take input from the user (name and age) and display the values. Also print the version of R installation.
2) Write a R program to get the details of the objects in memory.
3) Write a R program to create a sequence of numbers from 20 to 50 and find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91.
4) Write a R program to create a simple bar plot of five subjects marks.
5) Write a R program to get the unique elements of a given string and unique numbers of vector.
6) Write a R program to create three vectors a,b,c with 3 integers. Combine the three vectors to become a 3×3 matrix where each column represents a vector. Print the content of the matrix.
7) Write a R program to create a 5 x 4 matrix , 3 x 3 matrix with labels and fill the matrix by rows and 2 × 2 matrix with labels and fill the matrix by columns.
8) Write a R program to combine three arrays so that the first row of the first array is followed by the first row of the second array and then first row of the third array.
9) Write a R program to create a two-dimensional 5x3 array of sequence of even integers greater than 50.
10) Write a R program to create an array using four given columns, three given rows, and two given tables and display the content of the array.
11) Write a R program to create an empty data frame.
12) Write a R program to create a data frame from four given vectors.
13) Write a R program to create a data frame using two given vectors and display the duplicated elements and unique rows of the said data frame.
14) Write a R program to save the information of a data frame in a file and display the information of the file.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

15) Write a R program to create a matrix from a list of given vectors.
16) Write a R program to concatenate two given matrices of same column but different rows.
17) Write a R program to find row and column index of maximum and minimum value in a given matrix.
18) Write a R program to append value to a given empty vector.
19) Write a R program to multiply two vectors of integers type and length 3.
20) Write a R program to find Sum, Mean and Product of a Vector, ignore element like NA or NaN.
21) Write a R program to list containing a vector, a matrix and a list and give names to the elements in the list.
22) Write a R program to create a list containing a vector, a matrix and a list and give names to the elements in the list. Access the first and second element of the list.
23) Write a R program to create a list containing a vector, a matrix and a list and remove the second element.
24) Write a R program to select second element of a given nested list.
25) Write a R program to merge two given lists into one list.
26) Write a R program to create a list named s containing sequence of 15 capital letters, starting from 'E'.
27) Write a R program to assign new names "a", "b" and "c" to the elements of a given list.
28) Write a R program to find the levels of factor of a given vector.
29) Write a R program to create an ordered factor from data consisting of the names of months.
30) Write a R program to concatenate two given factor in a single factor.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		0	0	3	1.5
	JAVA PROGRAMMING LAB				

Course Objectives:
The aim of this lab is to

- Practice programming in the Java
- Gain knowledge of object-oriented paradigm in the Java programming language
- Learn use of Java in a variety of technologies and on different platforms

Course Outcomes:
By the end of the course student will be able to write java program for

- Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings
- Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
- Construct Threads, Event Handling, implement packages, developing applets

Exercise - 1 (Basics)

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program to sort for an element in a given list of elements using merge sort.

d) Write a JAVA program using StringBuffer to delete, remove character.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Exercise - 3 (Class, Objects)

a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.

b) Write a JAVA program to implement constructor.

Exercise - 4 (Methods)

a) Write a JAVA program to implement constructor overloading.

b) Write a JAVA program implement method overloading.

Exercise - 5 (Inheritance)

a) Write a JAVA program to implement Single Inheritance

b) Write a JAVA program to implement multi level Inheritance

c) Write a java program for abstract class to find areas of different shapes

Exercise - 6 (Inheritance - Continued)

a) Write a JAVA program give example for "super" keyword.

b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise - 7 (Exception)

a) Write a JAVA program that describes exception handling mechanism

b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)

a) Write a JAVA program that implements Runtime polymorphism

b) Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise – 9 (User defined Exception)

a) Write a JAVA program for creation of Illustrating throw
b) Write a JAVA program for creation of Illustrating finally
c) Write a JAVA program for creation of Java Built-in Exceptions
d) d)Write a JAVA program for creation of User Defined Exception

Exercise – 10 (Threads)

a) Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

b) Write a program illustrating **isAlive** and **join** ()

c) Write a Program illustrating Daemon Threads.

Exercise - 11 (Threads continuity)

a) Write a JAVA program Producer Consumer Problem

b) Write a case study on thread Synchronization after solving the above producer consumer problem

Exercise – 12 (Packages)

a) Write a JAVA program illustrate class path

b) Write a case study on including in class path in your os environment of your package.

c) Write a JAVA program that import and use the defined your package in the previous Problem

Exercise - 13 (Applet)

a) Write a JAVA program to paint like paint brush in applet.

b) Write a JAVA program to display analog clock using Applet.
c) Write a JAVA program to create different shapes and fill colors using Applet.

Exercise - 14 (Event Handling)

a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.

b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - II Semester	Skill Oriented Course- II	L	T	P	C
		0	0	4	2
	APPLICATIONS OF PYTHON-Pandas				

Course Objectives:

The objective of this lab is to understand the fundamentals of the Pandas library in Python and how it is used to handle data and also develop basic skills in data analysis and visualization

Course Outcomes:

By the end of this lab the student is able to

- Use Pandas to create and manipulate data structures like Series and DataFrames.
- Work with arrays, queries, and dataframes
- Query DataFrame structures for cleaning and processing and manipulating files
- Understand best practices for creating basic charts

Perform the following:

1) Pandas Installation

2) Creating DataFrames

Exercises:

A) Pandas DataSeries:

1) Write a Pandas program to create and display a one-dimensional array-like object containing an array of data using Pandas module.
2) Write a Pandas program to convert a Panda module Series to Python list and it's type.
3) Write a Pandas program to add, subtract, multiple and divide two Pandas Series.
4) Write a Pandas program to convert a NumPy array to a Pandas series.
   Sample Series:
   NumPy array:
   [10 20 30 40 50]
   Converted Pandas series:
   0 10
   1 20
   2 30
   3 40
   4 50
   dtype: int64

B) Pandas DataFrames:

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Consider Sample Python dictionary data and list labels:
exam_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'],
'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19],
'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1],
'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}
labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']

1) Write a Pandas program to create and display a DataFrame from a specified dictionary data which has the index labels.
2) Write a Pandas program to change the name 'James' to 'Suresh' in name column of the DataFrame.
3) Write a Pandas program to insert a new column in existing DataFrame.
4) Write a Pandas program to get list from DataFrame column headers.
5) Write a Pandas program to get list from DataFrame column headers.

C) Pandas Index:

1) Write a Pandas program to display the default index and set a column as an Index in a given dataframe.
2) Write a Pandas program to create an index labels by using 64-bit integers, using floating-point numbers in a given dataframe.

D) Pandas String and Regular Expressions:

1) Write a Pandas program to convert all the string values to upper, lower cases in a given pandas series. Also find the length of the string values.
2) Write a Pandas program to remove whitespaces, left sided whitespaces and right sided whitespaces of the string values of a given pandas series.
3) Write a Pandas program to count of occurrence of a specified substring in a DataFrame column.
4) Write a Pandas program to swap the cases of a specified character column in a given DataFrame.

E) Pandas Joining and merging DataFrame:

1) Write a Pandas program to join the two given dataframes along rows and assign all data.
2) Write a Pandas program to append a list of dictioneries or series to a existing DataFrame and display the combined data.
3) Write a Pandas program to join the two dataframes with matching records from both sides where available.

F) Pandas Time Series:

1) Write a Pandas program to create
   a) Datetime object for Jan 15 2012.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

b) Specific date and time of 9:20 pm.

c) Local date and time.

d) A date without time.

e) Current date.

f) Time from a datetime.

g) Current local time.

2) Write a Pandas program to create a date from a given year, month, day and another date from a given string formats.
3) Write a Pandas program to create a time-series with two index labels and random values. Also print the type of the index.

G) Pandas Grouping Aggregate:

Consider dataset:

	school	class	name	date_Of_Birth	age	height	weight	address
S1	s001	V	Alberto Franco	15/05/2002	12	173	35	street1
S2	s002	V	Gino Mcneill	17/05/2002	12	192	32	street2
S3	s003	VI	Ryan Parkes	16/02/1999	13	186	33	street3
S4	s001	VI	Eesha Hinton	25/09/1998	13	167	30	street1
S5	s002	V	Gino Mcneill	11/05/2002	14	151	31	street2
S6	s004	VI	David Parkes	15/09/1997	12	159	32	street4

1) Write a Pandas program to split the following dataframe into groups based on school code. Also check the type of GroupBy object.
2) Write a Pandas program to split the following dataframe by school code and get mean, min, and max value of age for each school.

H) Pandas Styling:

1) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight the negative numbers red and positive numbers black.
2) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight the maximum value in each column.
3) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight dataframe's specific columns.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I) Excel:

1) Write a Pandas program to import excel data into a Pandas dataframe.
2) Write a Pandas program to find the sum, mean, max, min value of a column of file.

J) Plotting:

1) Write a Pandas program to create a horizontal stacked bar plot of opening, closing stock prices of any stock dataset between two specific dates.
2) Write a Pandas program to create a histograms plot of opening, closing, high, low stock prices of stock dataset between two specific dates.
3) Write a Pandas program to create a stacked histograms plot of opening, closing, high, low stock prices of stock dataset between two specific dates with more bins.

K) Pandas SQL Query:

1) Write a Pandas program to display all the records of a student file.
2) Write a Pandas program to select distinct department id from employees file.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - II Semester	Skill Oriented Course- II	L	T	P	C
		0	0	4	2

WEB APPLICATION DEVELOPMENT USING FULL STACK Frontend Development – Module -II

Course Objectives:

The objective of this lab is to build strong foundation of JavaScript which will help developer to apply JavaScript concepts for responsive web frontend development

Course Outcomes:

By the end of this lab the student is able to

- develop of the major Web application tier- Client side development
- participate in the active development of cross-browser applications through JavaScript
- Develop JavaScript applications that transition between states

Perform experiments related to the following concepts:

1) Introduction to JavaScript
2) Applying JavaScript (internal and external)
3) Understanding JS Syntax
4) Introduction to Document and Window Object
5) Variables and Operators
6) Data Types and Num Type Conversion
7) Math and String Manipulation
8) Objects and Arrays
9) Date and Time
10) Conditional Statements
11) Switch Case
12) Looping in JS
13) Functions

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3

COMPUTER NETWORKS

Course Objectives:
- To provide insight about networks, topologies, and the key concepts.
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
- To know the basic concepts of network services and various network applications.

Course Outcomes:
By the end of the course, the student will be able to
- Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards.
- Discuss different transmission media and different switching networks.
- Analyze data link layer services, functions and protocols like HDLC and PPP.
- Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
- Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.

UNIT I:
Introduction: Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP, Lack of OSI models success, Internet History.
Physical Layer –Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media: Wireless-Radio waves, microwaves, infrared.

UNIT II:
Data link layer: Design issues, **Framing**: fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer, **Elementary Data Link Layer protocols**: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.
Sliding window protocol: One bit, Go back N, Selective repeat-Stop and wait protocol, Data link layer in HDLC: configuration and transfer modes, frames, control field, point to point protocol (PPP): framing transition phase, multiplexing, multi link PPP.

UNIT – III:
Media Access Control: Random Access: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, **Controlled Access:** Reservation, Polling, Token Passing, **Channelization:** frequency division multiple Access(FDMA), time division multiple access(TDMA), code division multiple access(CDMA).
Wired LANs: Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet(100 Mbps), Gigabit Ethernet, 10 Gigabit Ethernet.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT – IV:
The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms-General principles of congestion control, Congestion prevention polices, Approaches to Congestion Control-Traffic Aware Routing- Admission Control-Traffic Throttling-Load Shedding. Traffic Control Algorithm-Leaky bucket & Token bucket.

Internet Working: How networks differ- How networks can be connected- Tunnelling, internetwork routing-, Fragmentation, network layer in the internet – IP protocols-IP Version 4 protocol-IPV4 Header Format, IP addresses, Class full Addressing, CIDR, NAT-, Subnets-IP Version 6-The main IPV6 header, Transition from IPV4 to IPV6, Comparison of IPV4 & IPV6- Internet control protocols- ICMP-ARP-DHCP

UNIT –V:
The Transport Layer: Transport layer protocols: Introduction-services- port number-User data gram protocol-User datagram-UDP services-UDP applications-Transmission control protocol: TCP services-TCP features- Segment- A TCP connection- windows in TCP- flow control-Error control, Congestion control in TCP.

Application Layer –- World Wide Web: HTTP, Electronic mail-Architecture- web based mail- email security- TELENET-local versus remote Logging-Domain Name System: Name Space, DNS in Internet ,-Resolution-Caching- Resource Records- DNS messages- Registrars-security of DNS Name Servers, SNMP.

Text Books:
1. Computer Networks — Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
2. Data Communications and Networks – Behrouz A. Forouzan, Fifth Edition TMH.

References Books:
1. Data Communications and Networks- Achut S Godbole, Atul Kahate
2. Computer Networks, Mayank Dave, CENGAGE

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
	DESIGN AND ANALYSIS OF ALGORITHMS				

Course Objectives:
Upon completion of this course, students will be able to do the following:
- Ability to understand, analyze and denote time complexities of algorithms
- To introduce the different algorithmic approaches for problem solving through numerous example problems
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

Course Outcomes: After the completion of the course, student will be able to
- Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
- List and describe various algorithmic approaches and Solve problems using divide and conquer &greedy Method
- Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations.
- Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches
- Demonstrate NP- Completeness theory ,lower bound theory and String Matching

UNIT I:
Introduction: Algorithm Definition, Algorithm Specification, performance Analysis, Performance measurement, asymptotic notation, Randomized Algorithms.

UNIT II:
Divide and Conquer: General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort.
The Greedy Method: The general Method, knapsack problem, minimum-cost spanning Trees, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT III:
Dynamic Programming: The general method, multistage graphs, All pairs-shortest paths, optimal Binary search trees, 0/1 knapsack, The traveling salesperson problem.

UNIT IV:
Backtracking: The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, knapsack problem.

UNIT V:
NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:

1. Ellis Horowitz, SartajSahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
2. Introduction to Algorithms Thomas H. Cormen, PHI Learning
3. Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press.

Reference Books:

1. Horowitz E. Sahani S: "Fundamentals of Computer Algorithms", 2nd Edition, Galgotia Publications, 2008.
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
	DATA WAREHOUSING AND DATA MINING				

Course Objectives:
The main objective of the course is to
- Introduce basic concepts and techniques of data warehousing and data mining
- Examine the types of the data to be mined and apply pre-processing methods on raw data
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

Course Outcomes:
By the end of the course student will be able to
- Illustrate the importance of Data Warehousing, Data Mining and its functionalities and Design schema for real time data warehousing applications.
- Demonstrate on various Data Preprocessing Techniques viz. data cleaning, data integration, data transformation and data reduction and Process raw data to make it suitable for various data mining algorithms.
- Choose appropriate classification technique to perform classification, model building and evaluation.
- Make use of association rule mining techniques viz. Apriori and FP Growth algorithms and analyze on frequent itemsets generation.
- Identify and apply various clustering algorithm (with open source tools), interpret, evaluate and report the result.

UNIT I:
Data Warehousing and Online Analytical Processing: Data Warehouse: Basic concepts, Data Warehouse Modelling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Introduction: Why and What is data mining, What kinds of data need to be mined and patterns can be mined, Which technologies are used, Which kinds of applications are targeted.

UNIT II:
Data Pre-processing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT III:
Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Attribute Selection Measures, Tree Pruning, Scalability and Decision Tree Induction, Visual Mining for Decision Tree Induction.

UNIT IV:
Association Analysis: Problem Definition, Frequent Item set Generation, Rule Generation: Confident Based Pruning, Rule Generation in Apriori Algorithm, Compact Representation of frequent item sets, FP-Growth Algorithm.

UNIT V:
Cluster Analysis: Overview, Basics and Importance of Cluster Analysis, Clustering techniques, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bi-secting K Means,

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:
1. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier,2011.
2. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson,2012.

Reference Books:
1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning.
2. Data Mining: VikramPudi and P. Radha Krishna, Oxford Publisher.
3. Data Mining and Analysis - Fundamental Concepts and Algorithms; Mohammed J. Zaki, Wagner Meira, Jr, Oxford
4. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH.
   http://onlinecourses.nptel.ac.in/noc18_cs14/preview
5. (NPTEL course by Prof.Pabitra Mitra)
   http://onlinecourses.nptel.ac.in/noc17_mg24/preview
6. (NPTEL course by Dr. Nandan Sudarshanam& Dr. Balaraman Ravindran)
     http://www.saedsayad.com/data_mining_map.htm

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3

OPTIMIZATION IN OPERATIONS RESEARCH
(Job Oriented Course)

Course Objectives:
- To define an objective function and constraint functions in terms of design variables, and then state the optimization problem.
- To state single variable and multi variable optimization problems, without and with constraints.
- To explain linear programming technique to an optimization problem, define slack and surplus variables, by using Simplex method.
- To state transportation and assignment problem as a linear programming problem to determine Simplex method.
- To study and explain nonlinear programming techniques, unconstrained or constrained, and define exterior and interior penalty functions for optimization problems.

Course Outcomes: At the end of the course, student will be able to
- State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.
- Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.
- Apply and Solve transportation and assignment problem by using Linear programming Simplex method.
- Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions
- Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.

UNIT I:
Introduction and Classical Optimization Techniques: Statement of an Optimization problem, design vector, design constraints, constraint surface, objective function, objective function surfaces, classification of Optimization problems.
Classical Optimization Techniques: Single variable Optimization, multi variable Optimization without constraints, necessary and sufficient conditions for minimum/maximum, multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers, multivariable Optimization with inequality constraints, Kuhn – Tucker conditions

UNIT II: Linear Programming : Standard form of a linear programming problem, geometry of linear programming problems, definitions and theorems, solution of a system of linear simultaneous equations, pivotal reduction of a general system of equations, motivation to the simplex method, simplex algorithm, Duality in Linear Programming, Dual Simplex method.

UNIT III: Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method, testing for optimality of balanced transportation problems, Special cases in transportation problem.

UNIT IV: Nonlinear Programming: Unconstrained cases, One – dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method, Univariate method, Powell's method and steepest descent method.
Constrained cases– Characteristics of a constrained problem, Classification, Basic approach of Penalty

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Function method; Basic approaches of Interior and Exterior penalty function methods, Introduction to convex Programming Problem.

UNIT V: Dynamic Programming: Dynamic programming multistage decision processes, types, concept of sub optimization and the principle of optimality, computational procedure in dynamic programming, examples illustrating the calculus method of solution, examples illustrating the tabular method of solution.

Text Books:
1. "Engineering optimization: Theory and practice", S. S.Rao, New Age International (P) Limited, 3rd edition, 1998.
2. "Introductory Operations Research", H.S. Kasene & K.D. Kumar, Springer (India), Pvt. LTd.

Reference Books:
1. "Optimization Methods in Operations Research and systems Analysis", by K.V. Mital and C. Mohan, New Age International (P) Limited, Publishers, 3rd edition, 1996.
2. Operations Research, Dr. S.D.Sharma, Kedarnath, Ramnath & Co

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
	ARTIFICIAL INTELLIGENCE **(Professional Elective –I)**				

Course Objectives: The student will be able to
- Know the methodology of Problem solving
- Implement basic AI algorithms
- Design and carry out an empirical evolution of different algorithms on a problem formalization

Course Outcomes (COs): At the end of the course, student will be able to
- Understand the fundamental concepts in Artificial Intelligence
- Analyze the applications of search strategies and problem   reductions
- Apply the mathematical logic concepts.
- Develop the Knowledge representations in Artificial Intelligence.
- Explain the Fuzzy logic systems.

UNIT I:
Introduction to artificial intelligence: Introduction ,history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI.

UNIT II:
Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem
Search Strategies: exhaustive searches, heuristic search techniques, iterative-deepening A*, constraint satisfaction

UNIT III:
Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, predicate logic

UNIT IV:
Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR
Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure.

UNIT V:
Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools.

Text Books:
1. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach , 2nd ed, Stuart Russel, Peter Norvig, PEA
3. Artificial Intelligence, Rich, Kevin Knight, Shiv Shankar B Nair, 3rd ed, TMH
4. Introduction to Artificial Intelligence, Patterson, PHI

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:
1. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5th ed, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3

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SOFTWARE PROJECT MANAGEMENT
(Professional Elective –I)

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Course Objectives:
At the end of the course, the student shall be able to:
- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course outcomes:
Upon the completion of the course students will be able to:-
- Apply the process to be followed in the software development life-cycle models
- Apply the concepts of project management & planning
- Implement the project plans through managing people, communications and change
- Conduct activities necessary to successfully complete and close the Software projects
- Implement communication, modeling, and construction & deployment practices in software development

UNIT-I:
Conventional Software Management: The waterfall model, conventional software Management performance.
Evolution of Software Economics: Software Economics, pragmatic software cost estimation.
Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.
The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT-II:
Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.
Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT- III:
Model based software architectures: A Management perspective and technical perspective.
Work Flows of the process: Software process workflows, Iteration workflows.
Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments.
Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

UNIT- IV:
Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.
Process Automation: Automation Building blocks, The Project Environment.
Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT-V:

Agile Methodology, ADAPTing to Scrum, Patterns for Adopting Scrum, Iterating towards Agility.

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

Text Books:

1. Software Project Management, Walker Royce, PEA, 2005.
2. Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.
3. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.

Reference Books:

1. Software Project Management, Bob Hughes,3/e, Mike Cotterell, TMH
2. Software Project Management, Joel Henry, PEA
3. Software Project Management in practice, Pankaj Jalote, PEA, 2005,
4. Effective Software Project Management, Robert K.Wysocki, Wiley,2006
5. Project Management in IT, Kathy Schwalbe, Cengage

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3

DISTRIBUTED SYSTEMS
(Professional Elective –I)

Course Objectives:
- To understand the foundations of distributed systems.
- To learn issues related to clock Synchronization and the need for global state in distributedsystems
- To learn distributed mutual exclusion and deadlock detection algorithms
- To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems
- To learn the characteristics of peer-to-peer and distributed shared memory systems

Course Outcomes:
At the end of the course, the students will be able to:
- Elucidate the foundations and issues of distributed systems
- Illustrate the various synchronization issues and global state for distributed systems
- Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems
- Describe the agreement protocols and fault tolerance mechanisms in distributed systems
- Describe the features of peer-to-peer and distributed shared memory systems

UNIT I:
Distributed Systems: Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues andchallenges.
A model of distributed computations: A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of process communications.
Logical Time: A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP.

UNIT II:
Message Ordering & Snapshots: Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order. Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels.

UNIT III:
Distributed Mutex & Deadlock: Distributed mutual exclusion algorithms: Introduction, Preliminaries, Lamport's algorithm, Ricart-Agrawala algorithm, Maekawa's algorithm, Suzuki–Kasami's broadcast algorithm. Deadlock detection in distributed systems: Introduction, System model, Preliminaries, Models of deadlocks, Knapp's classification, Algorithms forthe single resource model, the AND model and the OR model.

UNIT IV:
Recovery & Consensus: Check pointing and rollback recovery: Introduction, Background and definitions, Issues in failure recovery, Checkpoint-based recovery, Log-based rollback recovery, Coordinated check pointing algorithm, Algorithm for asynchronous check pointing and recovery. Consensus and agreement algorithms: Problem definition, Overview of results, Agreement in a failure, free system, Agreement in synchronous systems with failures.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V:
Peer-to-peer computing and overlay graphs: Introduction, Data indexing and overlays, Chord –Content addressable networks, Tapestry.
Distributed shared memory: Abstraction and advantages, Memory consistency models, Sharedmemory Mutual Exclusion.

Text Books:
1. Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and Tim Kindberg, Fifth Edition, Pearson Education, 2012.
2. Distributed computing: Principles, algorithms, and systems, Ajay Kshemkalyani and Mukesh Singhal, Cambridge University Press, 2011.

Reference Books:
1. Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall ofIndia, 2007.
2. Advanced concepts in operating systems. Mukesh Singhal and Niranjan G. Shivaratri,McGraw-Hill, 1994.
3. Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M.,Pearson Education, 2007.

e-Resources:
1) https://nptel.ac.in/courses/106/106/106106168/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3

ADVANCED UNIX PROGRAMMING
(Professional Elective –I)

Course Objectives:
Understating the shell commands, shell programming, system calls of files and processes, signals, inter-process communication concepts and programming, TCP and UDP.

Course Outcomes: After finishing this course student will be able to:
- Gain good knowledge on Unix commands and awareness of shell programming
- Know about different system calls for files and directories
- Ability to know the working of processes and signals
- Application of client server program for IPC
- Knowledge about socket programming

UNIT-I:
Introduction, Architecture of unix, Responsibilities of shell, unix file system, vi editor. **Unix commands**: Some Basic Commands, file utilities, process utilities, text processing utilities, network utilities, disk utilities, backup utilities , Security by file permissions.

UNIT-II:
Shell Programming: shell variables, The Export command, The Profile File a Script Run During starting, The First Shell Script, The read command, Positional Parameters, The $? Variable , Knowing the exit Status- More about the Set Command, The Exit command, Branching Control Structures, Loop Control Structures, The Continue and Break Statement- The Expr Command, Performing Integer Arithmetic- Real Arithmetic in Shell Programs- The here Document(<<), The Sleep Command, Debugging Scripts, The Script command, The Eval command, The Exec Command, Sample programs. **Files** - Introduction, file descriptors, open, creat, read, write, close, lseek, dup2, file status information-stat family, file and record locking- fcntl function, file permissions - chmod, fchmod, file ownership-chown, lchown, links-soft and hard links-symlink, link, unlink.

UNIT-III:
Directories-Creating, removing and changing Directories-mkdir, rmdir, chdir, obtaining current working directory-getcwd, Directory contents, Scanning Directories-opendir, readdir, closedir, rewinddir functions. **Process Control**: process identifiers, fork function, vfork function, exit function, wait and waitpid functions, exec functions, user identification. **Signals**: signal handling using signal function, kill and raise, alarm, pause, abort and sleep functions.

UNIT-IV:
IPC: introduction, pipes, FIFO's, client –server examples for pipes and FIFO's **message queues:** message queue structure in kernel, system calls of message queue, client-server example for message queue. **Semaphores:** definition, system calls of semaphores, semaphores structure in kernel, file locking using semaphores

UNIT-V:
Shared memory-system calls of shared memory, semaphore structure in kernel, client server example. **Sockets:** Introduction, overview, elementary socket system calls, TCP Echo program, UDP Echo program

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:
1. Unix the ultimate guide, 3rd edition, Sumitabha Das, TMH.
2. Advanced programming in the Unix environment by W. Richard Stevens.
3. Unix network programming by W. Richard Stevens.

Reference Books:
1. Introduction to Unix and shell programming, Venkateshmurhty
2. Unix and shell programming by B.M. Harwani, OXFORD university press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**
	DATA WAREHOUSING AND DATA MINING LAB				

Course Objectives: The main objective of the course is to
- Inculcate Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment
- Design a data warehouse or data mart to present information needed by management in a form that is usable
- Emphasize hands-on experience working with all real data sets.
- Test real data sets using popular data mining tools such as WEKA, Python Libraries
- Develop ability to design various algorithms based on data mining tools.

Course Outcomes: By the end of the course student will be able to
- Design a data mart or data warehouse for any organization
- Extract knowledge using data mining techniques and enlist various algorithms used in information analysis of Data Mining Techniques
- Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification for realistic data
- Implement and Analyze on knowledge flow application on data sets and Apply the suitable visualization techniques to output analytical results

Software Requirements: WEKA Tool/Python/R-Tool/Rapid Tool/Oracle Data mining

List of Experiments:
1. Creation of a Data Warehouse.
   ➢ Build Data Warehouse/Data Mart (using open source tools like Pentaho Data Integration Tool, Pentaho Business Analytics; or other data warehouse tools like Microsoft-SSIS, Informatica, Business Objects,etc.,)
   ➢ Design multi-dimensional data models namely Star, Snowflake and Fact Constellation schemas for any one enterprise (ex. Banking, Insurance, Finance, Healthcare, manufacturing, Automobiles, sales etc).
   ➢ Write ETL scripts and implement using data warehouse tools.
   ➢ Perform Various OLAP operations such slice, dice, roll up, drill up and pivot

2. Explore machine learning tool "WEKA"
   ➢ Explore WEKA Data Mining/Machine Learning Toolkit.
   ➢ Downloading and/or installation of WEKA data mining toolkit.
   ➢ Understand the features of WEKA toolkit such as Explorer, Knowledge Flow interface, Experimenter, command-line interface.
   ➢ Navigate the options available in the WEKA (ex. Select attributes panel, Preprocess panel, Classify panel, Cluster panel, Associate panel and Visualize panel)
   ➢ Study the arff file format Explore the available data sets in WEKA. Load a data set (ex. Weather dataset, Iris dataset, etc.)
   ➢ Load each dataset and observe the following:
      1. List the attribute names and they types
      2. Number of records in each dataset
      3. Identify the class attribute (if any)
      4. Plot Histogram
      5. Determine the number of records for each class.
      6. Visualize the data in various dimensions

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

3. Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets
   - Explore various options available in Weka for preprocessing data and apply Unsupervised filters like Discretization, Resample filter, etc. on each dataset
   - Load weather. nominal, Iris, Glass datasets into Weka and run Apriori Algorithm with different support and confidence values.
   - Study the rules generated. Apply different discretization filters on numerical attributes and run the Apriori association rule algorithm. Study the rules generated.
   - Derive interesting insights and observe the effect of discretization in the rule generation process.

4. Demonstrate performing classification on data sets
   - Load each dataset into Weka and run 1d3, J48 classification algorithm. Study the classifier output. Compute entropy values, Kappa statistic.
   - Extract if-then rules from the decision tree generated by the classifier, Observe the confusion matrix.
   - Load each dataset into Weka and perform Naïve-bayes classification and k-Nearest Neighbour classification. Interpret the results obtained.
   - Plot RoC Curves
   - Compare classification results of ID3, J48, Naïve-Bayes and k-NN classifiers for each dataset, and deduce which classifier is performing best and poor for each dataset and justify.

5. Demonstrate performing clustering of data sets
   - Load each dataset into Weka and run simple k-means clustering algorithm with different values of k (number of desired clusters).
   - Study the clusters formed. Observe the sum of squared errors and centroids, and derive insights.
   - Explore other clustering techniques available in Weka.
   - Explore visualization features of Weka to visualize the clusters. Derive interesting insights and explain.

6. Demonstrate knowledge flow application on data sets
   - Develop a knowledge flow layout for finding strong association rules by using Apriori, FP Growth algorithms
   - Set up the knowledge flow to load an ARFF (batch mode) and perform a cross validation using J48 algorithm
   - Demonstrate plotting multiple ROC curves in the same plot window by using j48 and Random forest tree
7. Demonstrate ZeroR technique on Iris dataset (by using necessary preprocessing technique(s)) and share your observations
8. Write a java program to prepare a simulated data set with unique instances.
9. Write a Python program to generate frequent item sets / association rules using Apriori algorithm
10. Write a program to calculate chi-square value using Python. Report your observation.
11. Write a program of Naive Bayesian classification using Python programming language.
12. Implement a Java program to perform Apriori algorithm
13. Write a program to cluster your choice of data using simple k-means algorithm using JDK
14. Write a program of cluster analysis using simple k-means algorithm Python programming language.
15. Write a program to compute/display dissimilarity matrix (for your own dataset containing at least four instances with two attributes) using Python
16. Visualize the datasets using matplotlib in python.(Histogram, Box plot, Bar chart, Pie chart etc.,)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		0	0	3	1.5
	COMPUTER NETWORKS LAB				

Course Objectives:
Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work

Course Outcomes:
By the end of the course student will be able to
- Know how reliable data communication is achieved through data link layer.
- Suggest appropriate routing algorithm for the network.
- Provide internet connection to the system and its installation.
- Work on various network management tools

List of Experiments:

1. Study of Network devices in detail and connect the computers in Local Area Network.
2. Write a Program to implement the data link layer farming methods such as
   i) Character stuffing ii) bit stuffing.
3. Write a Program to implement data link layer farming method checksum.
4. Write a program for Hamming Code generation for error detection and correction.
5. Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
6. Write a Program to implement Sliding window protocol for Goback N.
7. Write a Program to implement Sliding window protocol for Selective repeat.
8. Write a Program to implement Stop and Wait Protocol.
9. Write a program for congestion control using leaky bucket algorithm
10. Write a Program to implement Dijkstra's algorithm to compute the Shortest path through a graph.
11. Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).
12. Write a Program to implement Broadcast tree by taking subnet of hosts.
13. Wireshark
    i. Packet Capture Using Wire shark
    ii. Starting Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics & Filters.
14. How to run Nmap scan
15. Operating System Detection using Nmap
16. Do the following using NS2 Simulator
    i. NS2 Simulator-Introduction
    ii. Simulate to Find the Number of Packets Dropped
    iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    iv. Simulate to Find the Number of Packets Dropped due to Congestion
    v. Simulate to Compare Data Rate& Throughput.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		0	0	4	2

ANIMATION COURSE: ANIMATION DESIGN
(Skill Oriented Course)

Course Objectives:
The main objective of this course is to understand 2-D and 3-D animation using Adobe package

Course Outcomes:
At the end of the Course, Student will be able to:
- learn various tools of digital 2-D animation
- understand production pipeline to create 2-D animation.
- apply the tools to create 2D animation for films and videos
- understand different styles and treatment of content in 3D model creation
- apply tools to create effective 3D modelling texturing and lighting

List of Experiments:
1. Adobe Photoshop:
   a. Create your visiting card
   b. Create Title for any forthcoming film
2. Draw Cartoon Animation using reference
3. Creating Frame by Frame animation
4. Create a scene by using Mask layers animation
5. Adobe Illustrator:
   Packet Design(Toothpaste packet, Soap cover, any Food product)
6. Create any model of the male or female character
7. Create any Model of Cars or Bike
8. Create any Model of any animal.
9. Create any Model of any birds, fishes, and worms.
10. Create and Convert 2D objects into 3D objects
11. Create an animated 3D titling with sound
12. Create any Model some objects such as chairs, tables, fruits, utensils

List of Augmented Experiments: (Weeks 13 – Week 16)
(Any two of the following experiments can be performed)

1. Animate day and night scene of a street with the help of lighting
2. Create a human character using Character studio and animate the same
3. Create a natural outdoor or indoor scene.
4. Apply texture on various objects and characters

Reference Books:
1. Flash MX 2004, Thyagharajan Anbumani, TMH.
2. Brian Underdahl, The Complete Reference – Macromedia Flash Mx2004, 2nd edition – TMH.

Web Links:
1. https://onlinecourses.swayam2.ac.in/cec21_cs07/preview
2. https://onlinecourses.swayam2.ac.in/ugc19_cs09/preview
3. https://onlinecourses.swayam2.ac.in/ntr20_ed15/preview
4. https://youtube.com/playlist?list=PLfFk8y2fd3FjeE_CrFASNvDLBp3yF1Hwi

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		0	0	4	2
CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY USING DevOps **(Skill Oriented Course)**					

Course Outcomes:
At the end of the Course, Student will be able to:
 ➢ Understand the why, what and how of DevOps adoption
 ➢ Attain literacy on Devops
 ➢ Align capabilities required in the team
 ➢ Create an automated CICD pipeline using a stack of tools

List of Exercises:

Note: There are online courses indicated in the reference links section. Learners need to go through the contents in order to perform the given exercises

Exercise 1:

Reference course name :Software engineering and Agile software development
Get an understanding of the stages in software development lifecycle, the process models, values and principles of agility and the need for agile software development. This will enable you to work in projects following an agile approach to software development.
Solve the questions given in the reference course name to gauge your understanding of the topic

Exercise 2:

Reference course name: Development & Testing with Agile: Extreme Programming
Get a working knowledge of using extreme automation through XP programming practices of test first development, refactoring and automating test case writing.
Solve the questions in the "Take test" module given in the reference course name to gauge your understanding of the topic

Exercise 3:

Module name : DevOps adoption in projects
It is important to comprehend the need to automate the software development lifecycle stages through DevOps. Gain an understanding of the capabilities required to implement DevOps, continuous integration and continuous delivery practices.
Solve the questions given in Quiz1, Quiz2, Quiz 3

Exercise 4:

Module name :Implementation of CICD with Java and open source stack
Configure the web application and Version control using Git using Git commands and version control operations.

Exercise 5:

Module Name: Implementation of CICD with Java and open source stack
Configure a static code analyzer which will perform static analysis of the web application code and identify the coding practices that are not appropriate. Configure the profiles and dashboard of the static code analysis tool.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Exercise 6:

Module Name: Implementation of CICD with Java and open source stack
Write a build script to build the application using a build automation tool like Maven. Create a folder structure that will run the build script and invoke the various software development build stages. This script should invoke the static analysis tool and unit test cases and deploy the application to a web application server like Tomcat.

Exercise 7:

Module Name: Implementation of CICD with Java and open source stack
Configure the Jenkins tool with the required paths, path variables, users and pipeline views.

Exercise 8:

Module name: Implementation of CICD with Java and open source stack
Configure the Jenkins pipeline to call the build script jobs and configure to run it whenever there is a change made to an application in the version control system. Make a change to the background color of the landing page of the web application and check if the configured pipeline runs.

Exercise 9:

Module name: Implementation of CICD with Java and open source stack
Create a pipeline view of the Jenkins pipeline used in Exercise 8. Configure it with user defined messages.

Exercise 10 :

Module name: Implementation of CICD with Java and open source stack
In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for static analysis of code.

Exercise 11:

Module name :Implementation of CICD with Java and open source stack
In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for static unit testing.

Exercise 12:

Module name :Course end assessment
In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for code coverage.

Reference Books:
1. Learning Continuous Integration with Jenkins: A beginner's guide to implementing Continuous Integration and Continuous Delivery using Jenkins - Nikhil Pathania ,Packt publication
   [https://www.amazon.in/Learning-Continuous-Integration-Jenkins-Pathania/dp/1785284835]
2. Jenkins 2 – Up and Running: Evolve Your Deployment Pipeline for Next Generation Automation - Brent Laster, O'Reilly publication
   [https://www.amazon.in/Jenkins-2-Running-Brent-Laster/dp/
   1491979593]

Hardware and software configuration:
1. Git [GitHub or Gitlab]
2. Sonarqube
3. Jenkins
4. JUnit
5. Eclipse

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

6. Tomcat server
7. Maven
8. Cobertura or JaCoCo
9. Java SDK
10. All necessary drivers and jar files for connecting the software
11. Windows machine with 16GB RAM

Web Links: (Courses mapped to Infosys Springboard platform)

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013382690411003904735_shared/overview [Software Engineering and Agile software development]

2. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_01350157819497676810467 [Development & Testing with Agile: Extreme Programming]
3. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_01353898917192499226_shared [DevOps CICD]

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		2	0	0	0

EMPLOYABILITY SKILLS-I

Course Objectives:
The main objective of this course is to assist students in developing employability skills and personal qualities related to gaining and sustaining employment.

Course Outcomes: The end of the course student will be able to
- Understand the corporate etiquette.
- Make presentations effectively with appropriate body language
- Be composed with positive attitude
- Understand the core competencies to succeed in professional and personal life

UNIT I:
Analytical Thinking & Listening Skills: Self-Introduction, Shaping Young Minds - A Talk by Azim Premji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception.
Communication Skills: Verbal Communication; Non Verbal Communication (Body Language)

UNIT II:
Self-Management Skills: Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities
Etiquette: Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

UNIT III:
Standard Operation Methods: Note Making, Note Taking, Minutes Preparation, Email & Letter Writing
Verbal Ability: Synonyms, Antonyms, One Word Substitutes-Correction of Sentences-Analogies, Spotting Errors, Sentence Completion, Course of Action -Sentences Assumptions, Sentence Arguments, Reading Comprehension, Practice work

UNIT IV:
Job-Oriented Skills –I: Group Discussion, Mock Group Discussions

UNIT V:
Job-Oriented Skills –II: Resume Preparation, Interview Skills, Mock Interviews

Text Books and Reference Books:
1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
3. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
4. Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

e-resources:
1. www. Indiabix.com
2. www.freshersworld.com

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester	Minor Course	L	T	P	C
		3	0	2	4
	DATABASE MANAGEMENT SYSTEMS				

Course Objectives:

This Course will enable students to

- introduce about database management systems
- give a good formal foundation on the relational model of data and usage of Relational Algebra
- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers
- introduce the concepts of basic SQL as a universal Database language
- demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization

Course Outcomes:

By the end of the course, the student will be able to

- Describe a relational database and object-oriented database
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design
- Examine issues in data storage and query processing and can formulate appropriate solutions
- Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage
- Examine integrity constraints to build efficient databases
- Apply Queries using Advanced Concepts of SQL
- Build PL/SQL programs including stored procedures, functions, cursors and triggers

UNIT I

Introduction: Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

UNIT II

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).

UNIT III

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. operations.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT IV
SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set

UNIT V
Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).

List of Exercises:

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5.
    i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
    ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers

Text Books:
1) Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
2) Database System Concepts,5/e, Silberschatz, Korth, TMH
3) Oracle: The Complete Reference by Oracle Press
4) Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
5) Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:
1) Introduction to Database Systems, 8/e C J Date, PEA.
2) Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

e-Resources:
1) https://nptel.ac.in/courses/106/105/106105175/
2) https://www.geeksforgeeks.org/introduction-to-nosql/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		3	0	0	3

MACHINE LEARNING

Course Objectives:
- Identify problems that are amenable to solution by ANN methods, and which ML methods may be suited to solving a given problem.
- Formalize a given problem in the language/framework of different ANN methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).

Course Outcomes: After the completion of the course, student will be able to
- Explain the fundamental usage of the concept Machine Learning system
- Demonstrate on various regression Technique
- Analyze the Ensemble Learning Methods
- Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
- Discuss the Neural Network Models and Fundamentals concepts of Deep Learning

Unit I:
Introduction- Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning.
Statistical Learning: Introduction, Supervised and Unsupervised Learning, Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.

Unit II:
Supervised Learning(Regression/Classification):Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes, **Linear Models:** Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, **Binary Classification:** Multiclass/Structured outputs, MNIST, Ranking.

Unit III:
Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking.
Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification SVM Regression, Naïve Bayes Classifiers.

Unit IV:
Unsupervised Learning Techniques: Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures.
Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.

Unit V:
Neural Networks and Deep Learning: Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing TensorFlow 2, Loading and Preprocessing Data with TensorFlow.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:
1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Publications, 2019
2. Data Science and Machine Learning Mathematical and Statistical Methods,Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, Radislav Vaisman,25th November 2020

Reference Books:
1. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		3	0	0	3
	COMPILER DESIGN				

Course Objectives:
Understand the basic concept of compiler design, and its different phases which will be helpful to construct new tools like LEX, YACC, etc.

Course Outcomes: At the end of the course, student will be able to
- Demonstrate phases in the design of compiler
- Organize Syntax Analysis, Top Down and LL(1) grammars
- Design Bottom Up Parsing and Construction of LR parsers
- Analyze synthesized, inherited attributes and syntax directed translation schemes
- Determine algorithms to generate code for a target machine

UNIT I: Lexical Analysis: Language Processors, Structure of a Compiler, Lexical Analysis, The Role of the Lexical Analyzer, Bootstrapping, Input Buffering, Specification of Tokens, Recognition of Tokens, Lexical Analyzer Generator-LEX, Finite Automata, Regular Expressions and Finite Automata, Design of a Lexical Analyzer Generator.

UNIT II: Syntax Analysis: The Role of the Parser, Context-Free Grammars, Derivations, Parse Trees, Ambiguity, Left Recursion, Left Factoring, **Top Down Parsing:** Pre Processing Steps of Top Down Parsing, Backtracking, Recursive Descent Parsing, LL (1) Grammars, Non-recursive Predictive Parsing, Error Recovery in Predictive Parsing.

UNIT III: Bottom Up Parsing: Introduction, Difference between LR and LL Parsers, Types of LR Parsers, Shift Reduce Parsing, SLR Parsers, Construction of SLR Parsing Tables, More Powerful LR Parses, Construction of CLR (1) and LALR Parsing Tables, Dangling Else Ambiguity, Error Recovery in LR Parsing, Handling Ambiguity Grammar with LR Parsers.

UNIT III: Syntax Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's. **Intermediate Code Generation:** Variants of Syntax Trees, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking, Control Flow, Backpatching, Intermediate Code for Procedures.

UNIT IV: Run Time Environments: Storage Organization, Run Time Storage Allocation, Activation Records, Procedure Calls, Displays, **Code Optimization:** The Principle Sources of Optimization, Basic Blocks, Optimization of Basic Blocks, Structure Preserving Transformations, Flow Graphs, Loop Optimization, Data-Flow Analysis, Peephole Optimization

UNIT V: Code Generation: Issues in the Design of a Code Generator, Object Code Forms, Code Generation Algorithm, Register Allocation and Assignment.

Text Books:
1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson Publishers, 2007.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:
1. Compiler Construction, Principles and Practice, Kenneth C Louden,   Cengage Learning, 2006
2. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
3. Optimizing Compilers for Modern Architectures, Randy Allen, Ken Kennedy,   Morgan Kauffmann, 2001.
4. Levine, J.R., T. Mason and D. Brown, Lex and Yacc, edition, O'Reilly & Associates, 1990

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		3	0	0	3
CRYPTOGRAPHY AND NETWORK SECURITY					

Course Objectives:
The main objectives of this course are to explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, public key algorithms, design issues and working principles of various authentication protocols and various secure communication standards including Kerberos, IPsec, and SSL/TLS.

Course Outcomes : At the end of the course, student will be able to
- Explain different security threats and countermeasures and foundation course of cryptography mathematics.
- Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography
- Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more
- Design applications of hash algorithms, digital signatures and key management techniques
- Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL,TSL, and IPsec .

UNIT I:
Basic Principles : Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography.

UNIT II:
Symmetric Encryption: Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

UNIT III:
Asymmetric Encryption: Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography

UNIT IV:
Data Integrity, Digital Signature Schemes & Key Management : Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.

UNIT V:
Network Security-I: Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS, **Network Security-II :** Security at the Network Layer: IPSec, System Security

Text Books:
1. Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay, McGraw Hill,2015
2. Cryptography and Network Security,4th Edition, William Stallings, (6e) Pearson,2006
3. Everyday Cryptography, 1st Edition, Keith M.Martin, Oxford,2016

Reference Books:
1. Network Security and Cryptography, 1st Edition, Bernard Meneges, Cengage Learning,2018

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		3	0	0	3
	MOBILE COMPUTING **(Professional Elective-II)**				

Course Objectives:
- To understand the fundamentals of mobile communication
- To understand the architecture of various Wireless Communication Networks
- To understand the significance of different layers in mobile system Course Contents

Course Outcomes: Upon completion of the course, the students will be able to:
- Develop a strong grounding in the fundamentals of mobile Networks
- Apply knowledge in MAC, Network, and Transport Layer protocols of Wireless Network
- Comprehend, design, and develop a lightweight network stack
- Analyze the Mobile Network Layer system working
- Explain about the WAP Model

UNIT I: Introduction to Wireless Networks: Applications, History, Simplified Reference Model, Wireless transmission, Frequencies, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular Systems: Frequency Management and Channel Assignment, types of hand-off and their characteristics.

UNIT II: MAC – Motivation, SDMA, FDMA, TDMA, CDMA, Telecommunication Systems, GSM: Architecture Location tracking and call setup, Mobility management, Handover, Security, GSM, SMS, International roaming for GSM, call recording functions, subscriber and service data management, DECT, TETRA, UMTS, IMT-2000.

UNIT III: Wireless LAN: Infrared vs. Radio transmission, Infrastructure, Adhoc Network, IEEE 802.11WLAN Standards, Architecture, Services, HIPERLAN, Bluetooth Architecture & protocols.

UNIT IV: Mobile Network Layer: Mobile IP, Dynamic Host Configuration Protocol, Mobile Transport Layer, Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/Fast recovery, Transmission/Time-out freezing, Selective retransmission, Transaction Oriented TCP.

UNIT V: Support for Mobility: Wireless Application Protocol: Architecture, Wireless Datagram Protocol, Wireless Transport Layer Security, Wireless Transaction Protocol, Wireless Session Protocol, Wireless Application Environment, Wireless Markup Language, WML Scripts, Wireless Telephone Application.

Text Books:
1. Jochen Schiller, "Mobile Communication", Second Edition, Pearson Education, 2008.

Reference Books:
1. William Stallings, "Wireless Communications and Networks", Second Edition, Pearson Education, 2004.
2. C. Siva Ram Murthy, B. S. Manoj, "Adhoc Wireless Networks: Architectures and Protocols", Second Edition, Pearson Education, 2008.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		3	0	0	3
	BIG DATA ANALYTICS **(Professional Elective II)**				

Course Objectives:
- To optimize business decisions and create competitive advantage with Big Data analytics
- To learn to analyze the big data using intelligent techniques
- To introduce programming tools PIG & HIVE in Hadoop echo system

Course Outcomes:
At the end of the course, the students will be able to
- Illustrate big data challenges in different domains including social media, transportation, finance and medicine
- Use various techniques for mining data stream
- Design and develop Hadoop
- Identify the characteristics of datasets and compare the trivial data and big data for various applications
- Explore the various search methods and visualization techniques

UNIT I
Introduction: Introduction to big data: Introduction to Big Data Platform, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting.

UNIT II
Stream Processing: Mining data streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) Applications, Case Studies - Real Time Sentiment Analysis - Stock Market Predictions.

UNIT III
Introduction to Hadoop: Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analysing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment.

UNIT IV
Frameworks and Applications: Frameworks: Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and ZooKeeper.

UNIT V
Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, Multiple linear regression, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:
1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'reilly Media, Fourth Edition, 2015.
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.
3. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP, 2012

Reference Books:
1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley& sons, 2012.
2. Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, "Harness the Power of Big Data:The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.
3. Arshdeep Bahga and Vijay Madisetti, "Big Data Science & Analytics: A Hands On Approach ", VPT, 2016.
4. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons, 2014.

Software Links:
1. Hadoop:http://hadoop.apache.org/
2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home
3. Piglatin: http://pig.apache.org/docs/r0.7.0/tutorial.html

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		3	0	0	3
	OBJECT ORIENTED ANALYSIS AND DESIGN **(Professional Elective II)**				

Course Objectives: The main objective is the students to
- Become familiar with all phases of OOAD.
- Master the main features of the UML.
- Master the main concepts of Object Technologies and how to apply them at work   and develop the ability to analyze and solve challenging problem in various domains.
- Learn the Object design Principles and understand how to apply them towards Implementation.

Course Outcomes: After finishing this course student will be able to:
- Analyze the nature of complex system and its solutions.
- Illustrate & relate the conceptual model of the UML, identify & design the classes and relationships
- Analyze &Design Class and Object Diagrams that represent Static Aspects of a Software System and apply basic and Advanced Structural Modeling Concepts for designing real time applications.
- Analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams.
- Analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems.

UNIT I:
Introduction: The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems. **Case Study:** System Architecture: Satellite-Based Navigation

UNIT II:
Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle. **Basic Structural Modeling:** Classes, Relationships, common Mechanisms, and diagrams. **Case Study:** Control System: Traffic Management.

UNIT III:
Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. **Advanced Structural Modeling:** Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. **Case Study:** AI: Cryptanalysis.

UNIT IV:
Basic Behavioral Modeling-I: Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams. **Case Study:** Web Application: Vacation Tracking System

UNIT V:
Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams. **Architectural Modeling:** Component, Deployment, Component diagrams and Deployment diagrams
Case Study: Weather Forecasting

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:
1. Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston , "Object- Oriented Analysis and Design with Applications", 3rd edition, 2013, PEARSON.
2. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.

Reference Books:
1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.
3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		3	0	0	3
	NETWORK PROGRAMMING **(Professional Elective II)**				

Course Objectives:
Having successfully completed this course, the student will be able to:
- Demonstrate mastery of main protocols comprising the Internet.
- Develop skills in network programming techniques.
- Implement network services that communicate through the Internet.
- Apply the client-server model in networking applications.
- Practice networking commands available through the operating system

Course Outcomes: At the end of the course, student will be able to
- Identifying different models and sockets
- Demonstrate different TCP Echo server functions and I/O models
- Rationalize IPV4 and IPV6 Socket options
- Identifying daemon processing and Advanced input and output functions
- Analyze Broadcasting and multicasting

UNIT I:
Introduction to Network Programming: Introduction to Network Programming: OSI model, UNIX standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application Elementary Sockets: Sockets introduction, Elementary TCP sockets.

UNIT II:
TCP client server: Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.I/O Multiplexing: I/O Models, the select and poll functions, Batch input and buffering, shutdown function.

UNIT III:
UDP and Socket options: Elementary UDP sockets: Introduction UDP Echo server functions, lost datagram, summary of UDP example, Lack of flow control with UDP. **Socket options:** getsockopt and setsockopt functions. Socket states, Generic socket options IPV4 socket options, IPV6 socket options, ICMPV6 socket options and TCP socket options, SCTP socket options, fcntl function.

UNIT IV:
Advanced Sockets and Daemon Processes: IPV4 and IPV6 interoperability, introduction, IPV4 client: IPV6 server, IPV6 client: IPV4 Server, IPV6 Address-testing macros. Daemon Processes and inetdSuperserver –Introduction, syslogd Daemon, syslog Function, daemon_init Function, inetd Daemon, daemon_inetd. Advanced I/O functions: Socket timeouts, recv and send functions, ready and writev functions, recvmsg and send msg functions, Ancillary data.

UNIT V:
Broadcasting and Multicasting: Broadcasting introduction, broadcast addresses, unicast versus Broadcast, dg_cli function using broadcasting, race conditions, Multicasting addresses, multicasting versus broadcasting on a LAN, multicasting on a WAN, source-specific multicast, multcast socket options. **Raw Sockets**: Introduction, Raw Socket Creation, Raw Socket Output, Raw Socket Input, Ping Program, Traceroute Program

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:
1. UNIX Network Programming, by W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Pearson Education
2. UNIX Network Programming, 1st Edition, W. Richard Stevens. PHI.

Reference Books:
1. UNIX Systems Programming using C++ T CHAN, PHI.
2. UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education
3. Advanced UNIX Programming 2nd Edition M. J. ROCHKIND, Pearson Education

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		3	0	0	3

MEAN STACK DEVELOPMENT
(Job Oriented Course)

Course Outcomes:
At the end of the Course, Student will be able to:
- Build static web pages using HTML 5 elements.
- Apply JavaScript to embed programming interface for web pages and also to perform Client side validations.
- Build a basic web server using Node.js, work with Node Package Manager (NPM) and recognize the need for Express.js.
- Develop JavaScript applications using typescript and work with document database using MongoDB.
- Utilize Angular JS to design dynamic and responsive web pages.

UNIT-I:
HTML 5: Introduction to Web, Overview of Web Technologies, HTML - Introduction, HTML - Need, Case-insensitivity, Platform-independency, DOCTYPE Declaration, Types of Elements, HTML Elements - Attributes, Metadata Element, Sectioning Elements, Paragraph Element, Division and Span Elements, List Element, Link Element, Character Entities, HTML5 Global Attributes, Creating Table Elements, Table Elements : Colspan/ Rowspan Attributes, border, cellspacing and cellpadding attributes, Creating Form Elements, Input Elements - Attributes, Color and Date Pickers, Select and Datalist Elements, Editing Elements, Media, Iframe, Why HTML Security, HTML Injection, Clickjacking, HTML5 Attributes & Events Vulnerabilities, Local Storage Vulnerabilities, HTML5 - Cross-browser support, Best Practices For HTML Web Pages.

UNIT-II:
JavaScript: Why we need JavaScript, What is JavaScript, Environment Setup, Working with Identifiers, Type of Identifiers, Primitive and Non Primitive Data Types, Operators and Types of Operators, Types of Statements, Non - Conditional Statements, Types of Conditional Statements, If and Switch Statements, Types of Loops, Types of Functions, Declaring and Invoking Function, Arrow Function, Function Parameters, Nested Function, Built-in Functions, Variable Scope in Functions, Working With Classes, Creating and Inheriting Classes, In-built Events and Handlers, Working with Objects, Types of Objects, Creating Objects, Combining and cloning Objects using Spread operator, Destructuring Objects, Browser and Document Object Model, Creating Arrays, Destructuring Arrays, Accessing Arrays, Array Methods, Introduction to Asynchronous Programming, Callbacks, Promises, Async and Await, Executing Network Requests using Fetch API, Creating and consuming Modules.

UNIT-III:
Node.js: Why and What Node.js, How to use Node.js, Create a web server in Node.js, Node Package Manager, Modular programming in Node.js, Restarting Node Application, File Operations.
Express.js: Express Development Environment, Defining a route, Handling Routes, Route and Query Parameters, How Middleware works, Chaining of Middlewares, Types of Middlewares, Connecting to MongoDB with Mongoose, Validation Types and Defaults, Models, CRUD Operations, API Development, Why Session management, Cookies, Sessions, Why and What Security, Helmet Middleware, Using a Template Engine Middleware, Stylus CSS Preprocessor.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT-IV:
Typescript: Installing TypeScript, Basics of TypeScript, Function, Parameter Types and Return Types, Arrow Function, Function Types, Optional and Default Parameters, Rest Parameter, Creating an Interface, Duck Typing, Function Types, Extending Interfaces, Classes, Constructor, Access Modifiers, Properties and Methods, Creating and using Namespaces, Creating and using Modules, Module Formats and Loaders, Module Vs Namespace, What is Generics, What are Type Parameters, Generic Functions, Generic Constraints.

MongoDB: Introduction Module Overview, Document Database Overview, Understanding JSON, MongoDB Structure and Architecture, MongoDB Remote Management, Installing MongoDB on the local computer (Mac or Windows), Introduction to MongoDB Cloud, Create MongoDB Atlas Cluster, GUI tools Overview, Install and Configure MongoDB Compass, Introduction to the MongoDB Shell, MongoDB Shell JavaScript Engine, MongoDB Shell JavaScript Syntax, Introduction to the MongoDB Data Types, Introduction to the CRUD Operations on documents, Create and Delete Databases and Collections, Introduction to MongoDB Queries.

UNIT-V:
What is Angular, Features of Angular, Angular Application Setup, Components and Modules, Executing Angular Application, Elements of Template, Change Detection, Structural Directives - ngIf, ngFor, ngSwitch, Custom Structural Directive, Attribute Directives - ngStyle, ngClass, Custom Attribute Directive, Property Binding, Attribute Binding, Style and Event Binding, Built in Pipes, Passing Parameters to Pipes, Nested Components Basics, Passing data from Container Component to Child Component, Passing data from Child Component to ContainerComponent, Shadow DOM, Component Life Cycle, Template Driven Forms, Model Driven Forms or Reactive Forms, Custom Validators in Reactive Forms, Custom Validators in Template Driven forms, Dependency Injection, Services Basics, RxJS Observables, Server Communication using HttpClient, Communicating with different backend services using Angular HttpClient, Routing Basics, Router Links, Route Guards, Asynchronous Routing, Nested Routes.

Text Books:
1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
4. MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow,O'Reilly.

Reference Books:
1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book,1st Edition, Dream Tech.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda SKatila, Cengage Learning.

Web Links:
1. https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared/overview (HTML5)
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared/overview (Javascript)
3. https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview (Node.js & Express.js)
4. https://infyspringboard.onwingspan.com/en/app/toc/lex_9436233116512678000_shared/overview (Typescript)
5. https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview (Angular JS)
6. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview (MongoDB)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		0	0	3	1.5
	MACHINE LEARNING USING PYTHON LAB				

Course Objectives:
This course will enable students to learn and understand different Data sets in implementing the machine learning algorithms.

Course Outcomes (Cos): At the end of the course, student will be able to
- Implement procedures for the machine learning algorithms
- Design and Develop Python programs for various Learning algorithms
- Apply appropriate data sets to the Machine Learning algorithms
- Develop Machine Learning algorithms to solve real world problems

Requirements: Develop the following program using Anaconda/ Jupiter/ Spider and evaluate ML models.

Experiment-1:
Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

Experiment-2:
For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

Experiment-3:
Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Experiment-4:
Exercises to solve the real-world problems using the following machine learning methods: a) Linear Regression b) Logistic Regression c) Binary Classifier

Experiment-5: Develop a program for Bias, Variance, Remove duplicates , Cross Validation
Experiment-6: Write a program to implement Categorical Encoding, One-hot Encoding

Experiment-7:
Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

Experiment-8:
Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

Experiment-9: Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Experiment-10:
Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

Experiment-11: Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Experiment-12: Exploratory Data Analysis for Classification using Pandas or Matplotlib.

Experiment-13:
Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set

Experiment-14:
Write a program to Implement Support Vector Machines and Principle Component Analysis

Experiment-15:
Write a program to Implement Principle Component Analysis

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		0	0	3	1.5
	COMPILER DESIGN LAB				

Course Objectives:
To enlighten the student with knowledge base in compiler design and its applications

Course Outcomes: The end of the course student will be able to
- Design simple lexical analyzers
- Determine predictive parsing table for a CFG
- Apply Lex and Yacc tools
- Examine LR parser and generating SLR Parsing table
- Relate Intermediate code generation for subset C language

List of Experiments:
1. Write a C program to identify different types of Tokens in a given Program.
2. Write a Lex Program to implement a Lexical Analyzer using Lex tool.
3. Write a C program to Simulate Lexical Analyzer to validating a given input String.
4. Write a C program to implement the Brute force technique of Top down Parsing.
5. Write a C program to implement a Recursive Descent Parser.
6. Write C program to compute the *First* and *Follow* Sets for the given Grammar.
7. Write a C program for eliminating the left recursion and left factoring of a given grammar
8. Write a C program to check the validity of input string using Predictive Parser.
9. Write a C program for implementation of LR parsing algorithm to accept a given input string.
10. Write a C program for implementation of a Shift Reduce Parser using Stack Data Structure to accept a given input string of a given grammar.
11. Simulate the calculator using LEX and YACC tool.
12. Generate YACC specification for a few syntactic categories.
13. Write a C program for generating the three address code of a given expression/statement.
14. Write a C program for implementation of a Code Generation Algorithm of a given expression/statement.

Text Books & Reference Books :
1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson Publishers, 2007.
2. John R Levine, Tony Mason, Doug Brown, "Lex and Yacc", Orielly, 2nd Edition, 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		0	0	3	1.5
	CRYPTOGRAPHY NETWORK SECURITY LAB				

Course Objectives:
- To learn basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.
- To understand and implement encryption and decryption using Ceaser Cipher, Substitution Cipher, Hill Cipher.

Course Outcomes: At the end of the course, student will be able to
- Apply the knowledge of symmetric cryptography to implement encryption and decryption using Ceaser Cipher, Substitution Cipher, Hill Cipher
- Demonstrate the different algorithms like DES, BlowFish, and Rijndael, encrypt the text "Hello world" using Blowfish Algorithm.
- Analyze and implement public key algorithms like RSA, Diffie-Hellman Key Exchange mechanism, the message digest of a text using the SHA-1 algorithm

List of Experiments:
1. Write a C program that contains a string (char pointer) with a value \Hello World'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value \Hello World'. The program should AND or and XOR each character in this string with 127 and display the result
3. Write a Java program to perform encryption and decryption using the following algorithms:
   a) Ceaser Cipher
   b) Substitution Cipher
   c) Hill Cipher
4. Write a Java program to implement the DES algorithm logic
5. Write a C/JAVA program to implement the BlowFish algorithm logic
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Using Java Cryptography, encrypt the text "Hello world" using BlowFish. Create your own key using Java key tool.
8. Write a Java program to implement RSA Algorithm
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		0	0	4	2
	BIG DATA: SPARK **(Skill Oriented Course)**				

Course Objectives:

The main objective of the course is to process Big Data with advance architecture like spark and streaming data in Spark

Course Outcomes:

By the end of the course , the student will be able to

- ➢ Develop MapReduce Programs to analyze large dataset Using Hadoop and Spark
- ➢ Write Hive queries to analyze large dataset Outline the Spark Ecosystem and its components
- ➢ Perform the filter, count, distinct, map, flatMap RDD Operations in Spark.
- ➢ Build Queries using Spark SQL
- ➢ Apply Spark joins on Sample Data Sets
- ➢ Make use of sqoop to import and export data from hadoop to database and vice-versa

List of Experiments:

1.

EXPERIMENT-1:
To Study of Big Data Analytics and Hadoop Architecture
(i) know the concept of big data architecture
(ii) know the concept of Hadoop architecture
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01256841991858585686_shared/overview

2. Loading DataSet in to HDFS for Spark Analysis

EXPERIMENT-2:
Installation of Hadoop and cluster management
(i) Installing Hadoop single node cluster in ubuntu environment
(ii) Knowing the differencing between single node clusters and multi-node clusters
(iii) Accessing WEB-UI and the port number
(iv) Installing and accessing the environments such as hive and sqoop
(We can restrict to standalone or if the facilities available can try for pseudo-distribution mode {or} fully distribution mode)
https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01329503531746099243539_shared?collectionId=lex_auth_01329503580490137643544_shared&collectionType=Collection

EXPERIMENT-3:
File management tasks & Basic linux commands
(i) Creating a directory in HDFS
(ii) Moving forth and back to directories
(iii) Listing directory contents
(iv) Uploading and downloading a file in HDFS
(v) Checking the contents of the file

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

(vi) Copying and moving files
(vii) Copying and moving files between local to HDFS environment
(viii) Removing files and paths
(ix) Displaying few lines of a file
(x) Display the aggregate length of a file
(xi) Checking the permissions of a file
(xii) Zipping and unzipping the files with & without permission pasting it to a location
(xiii) Copy, Paste commands
https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01257430580733542457_shared?collectionId=lex_auth_01256841991858585686_shared&collectionType=Course

EXPERIMENT-4:
Map-reducing
(i) Definition of Map-reduce
(ii) Its stages and terminologies
(iii) Word-count program to understand map-reduce
(Mapper phase, Reducer phase, Driver code)
https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01257421539761356848_shared?collectionId=lex_auth_01256841991858585686_shared&collectionType=Course

EXPERIMENT-5:
Implementing Matrix-Multiplication with Hadoop Map-reduce

EXPERIMENT-6:
Compute Average Salary and Total Salary by Gender for an Enterprise.

EXPERIMENT-7:
(i) Creating hive tables(External and internal)
(ii) Loading data to external hive tables from sql tables(or)Structured c.s.v using scoop
(iii) Performing operations like filterations and updations
(iv) Performing Join(inner, outer etc)
(v) Writing User defined function on hive tables
https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_auth_01257841711418572848_shared?collectionId=lex_auth_01258388119638835242_shared&collectionType=Course

EXPERIMENT-8:
Create a sql table of employees
Employee table with id,designation
Salary table (salary ,dept id)
Create external table in hive with similar schema of above tables,Move data to hive using scoop and load the contents into tables,filter a new table and write a UDF to encrypt the table with AES-algorithm, Decrypt it with key to show contents

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012606909641981952143_shared?collectionId=lex_auth_0126052684230082561692_shared&collectionType=Course

EXPERIMENT-9:
(i) Pyspark Definition(Apache Pyspark) and difference between Pyspark, Scala, pandas
(ii) Pyspark files and class methods
(i) get(file name)
(ii) get root directory()

EXPERIMENT-10 :
Pyspark -RDD'S
(i) what is RDD's?
(ii) ways to Create RDD
(i) parallelized collections
(ii) external dataset
(iii) existing RDD's
(iv) Spark RDD's operations
(Count, foreach(), Collect, join,Cache()
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_3509975869549336000_shared/overviw

EXPERIMENT-11 :

Perform pyspark transformations
(i) map and flatMap
(ii) to remove the words, which are not necessary to analyze this text.
(iii) groupBy
(iv) What if we want to calculate how many times each word is coming in corpus ?
(v) .How do I perform a task (say count the words 'spark' and 'apache' in rdd3) separately on each partition and get the output of the task performed in these partition ?
(vi) unions of RDD
(vii) join two pairs of RDD Based upon their key
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01330150584451891225182_shared/overview

EXPERIMENT-12:
Pyspark sparkconf-Attributes and applications
(i) What is Pyspark spark conf ()
(ii) Using spark conf create a spark session to write a dataframe to read details in a c.s.v and later move that c.s.v to another location

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Hardware and software configuration:

Hardware Configuration for each Node (Suggested)
>**Operating System:**
>>NAME="Red Hat Enterprise Linux Server", VERSION="7.9 (Maipo)"
>
>**CPU Architecture**:　　　x86_64
>**CPU op-mode(s):**　　32-bit, 64-bit
>**CPU(s):**　　　　　32
>**RAM**:　　　　　　64G

Software Required
>Java: openjdk version "1.8.0_202" (installed in all nodes)
>For Hive metastore – we have installed MySQL
>MySQL: Ver 8.0.19 for Linux on x86_64 (MySQL Community Server - GPL)

Resource Links for installation
- Hadoop Installation steps: Apache Hadoop 3.3.2 – Hadoop: Setting up a Single Node Cluster. & Apache Hadoop 3.3.2 – Hadoop Cluster Setup
- Links to download different versions of Hadoop : Index of /hadoop/ common (apache.org) &Index of /dist/hadoop/core (apache.org)

Text Books:
1. Spark in Action, Marko Bonaci and Petar Zecevic, Manning.
2. PySpark SQL Recipes: With HiveQL, Dataframe and Graphframes, Raju Kumar Mishra and Sundar Rajan Raman, Apress Media.

Web Links:	
1.	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0133015058445189122518 2_shared/overview
2.	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01258388119638835242_s hared/overview
3.	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126052684230082561692 _shared/overview

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

		L	T	P	C
III Year – II Semester		0	0	4	2

MEAN STACK TECHNOLOGIES-MODULE I
(HTML 5, JAVASCRIPT, EXPRESS.JS, NODE.JS AND TYPESCRIPT)
(Skill Oriented Course)

Course Outcomes:

At the end of the Course, Student will be able to:

- Develop professional web pages of an application using HTML elements like lists, navigations, tables, various form elements, embedded media which includes images, audio, video and CSS Styles.
- Utilize JavaScript for developing interactive HTML web pages and validate form data.
- Build a basic web server using Node.js and also working with Node Package Manager (NPM).
- Build a web server using Express.js
- Make use of Typescript to optimize JavaScript code by using the concept of strict type checking.

List of Exercises

1.a	**Course Name:** HTML5 - The Language
	Module Name: Case-insensitivity, Platform-independency, DOCTYPE Declaration, Types of Elements, HTML Elements - Attributes, Metadata Element
	Include the Metadata element in Homepage.html for providing description as "IEKart's is an online shopping website that sells goods in retail. This company deals with various categories like Electronics, Clothing, Accessories etc.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28320667711144660000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
1.b	**Course Name:** HTML5 - The Language
	Module Name: Sectioning Elements
	Enhance the Homepage.html of IEKart's Shopping Application by adding appropriate sectioning elements.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6372291347110857000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
1.c	**Course Name:** HTML5 - The Language
	Module Name: Paragraph Element, Division and Span Elements, List Element
	Make use of appropriate grouping elements such as list items to "About Us" page of IEKart's Shopping Application
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32785192040894940000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
1.d	**Course Name:** HTML5 - The Language
	Module Name: Link Element
	Link "Login", "SignUp" and "Track order" to "Login.html", "SignUp.html" and "Track.html" page respectively. Bookmark each category to its details of IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15515105953273338000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
1.e	**Course Name:** HTML5 - The Language
	Module Name: Character Entities
	Add the © symbol in the Home page footer of IEKart's Shopping application.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_547667376938096260_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
1.f	**Course Name:** HTML5 - The Language
	Module Name: HTML5 Global Attributes
	Add the global attributes such as contenteditable, spellcheck, id etc. to enhance the Signup Page functionality of IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28723566050321920000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
2.a	**Course Name:** HTML5 - The Language
	Module Name: Creating Table Elements, Table Elements : Colspan/Rowspan Attributes, border, cellspacing, cellpadding attributes
	Enhance the details page of IEKart's Shopping application by adding a table element to display the available mobile/any inventories.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013168035284033536113_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
2.b	**Course Name:** HTML5 - The Language
	Module Name: Creating Form Elements, Color and Date Pickers, Select and Datalist Elements
	Using the form elements create Signup page for IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13975270903118459000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
2.c	**Course Name:** HTML5 - The Language
	Module Name: Input Elements - Attributes
	Enhance Signup page functionality of IEKart's Shopping application by adding attributes to input elements.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_14048414537062347000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
2.d	**Course Name:** HTML5 - The Language
	Module Name: Media, Iframe
	Add media content in a frame using audio, video, iframe elements to the Home page of IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_30738402225794945000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
3.a	**Course Name:** Javascript
	Module Name: Type of Identifiers
	Write a JavaScript program to find the area of a circle using radius (var and let - reassign and observe the difference with var and let) and PI (const)
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013053264414818304732_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
3.b	**Course Name:** Javascript
	Module Name: Primitive and Non Primitive Data Types
	Write JavaScript code to display the movie details such as movie name, starring, language, and ratings. Initialize the variables with values of appropriate types. Use template literals wherever necessary.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-

	module/lex_2152832224523240200_shared?collectionId=lex_181096983663328100 00_shared&collectionType=Course
3.c	**Course Name:** Javascript
	Module Name: Operators and Types of Operators
	Write JavaScript code to book movie tickets online and calculate the total price, considering the number of tickets and price per ticket as Rs. 150. Also, apply a festive season discount of 10% and calculate the discounted amount.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13808338384481720000_shared?collectionId=lex_181096983663328100 00_shared&collectionType=Course
3.d	**Course Name:** Javascript
	Module Name: Types of Statements, Non - Conditional Statements, Types of Conditional Statements, if Statements, switch Statements
	Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If se
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_16257498471333610000_shared?collectionId=lex_181096983663328100 00_shared&collectionType=Course
3.e	**Course Name:** Javascript
	Module Name: Types of Loops
	Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_62385368882929700000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
4.a	**Course Name:** Javascript
	Module Name: Types of Functions, Declaring and Invoking Function, Arrow Function, Function Parameters, Nested Function, Built-in Functions, Variable Scope in Functions
	Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15455199570613326000_shared?collectionId=lex_181096983663328100 00_shared&collectionType=Course
4.b	**Course Name:** Javascript
	Module Name: Working With Classes, Creating and Inheriting Classes
	Create an Employee class extending from a base class Person. Hints: (i) Create a class Person with name and age as attributes. (ii) Add a constructor to initialize the values (iii) Create a class Employee extending Person with additional attributes role
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012599811117760512458_shared?collectionId=lex_181096983663 32810000_shared&collectionType=Course
4.c	**Course Name:** Javascript
	Module Name: In-built Events and Handlers
	Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If se
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_41921883725730270000_shared?collectionId=lex_18109698366332810000

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	0_shared&collectionType=Course
4.d	**Course Name:** Javascript
	Module Name: Working with Objects, Types of Objects, Creating Objects, Combining and cloning Objects using Spread operator, Destructuring Objects, Browser Object Model, Document Object Model
	If a user clicks on the given link, they should see an empty cone, a different heading, and a different message and a different background color. If user clicks again, they should see a re-filled cone, a different heading, a different message, and a diffe
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13197025862804100000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
5.a	**Course Name:** Javascript
	Module Name: Creating Arrays, Destructuring Arrays, Accessing Arrays, Array Methods
	Create an array of objects having movie details. The object should include the movie name, starring, language, and ratings. Render the details of movies on the page using the array.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013053270191734784711_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
5.b	**Course Name:** Javascript
	Module Name: Introduction to Asynchronous Programming, Callbacks, Promises, Async and Await, Executing Network Requests using Fetch API
	Simulate a periodic stock price change and display on the console. Hints: (i) Create a method which returns a random number - use Math.random, floor and other methods to return a rounded value. (ii) Invoke the method for every three seconds and stop when
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012599811633905664460_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
5.c	**Course Name:** Javascript
	Module Name: Creating Modules, Consuming Modules
	Validate the user by creating a login module. Hints: (i) Create a file login.js with a User class. (ii) Create a validate method with username and password as arguments. (iii) If the username and password are equal it will return "Login Successful" else w
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013052857053585408667_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
6.a	**Course Name:** Node.js
	Module Name: How to use Node.js
	Verify how to execute different functions successfully in the Node.js platform.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19002830632103186000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
6.b	**Course Name:** Node.js
	Module Name: Create a web server in Node.js
	Write a program to show the workflow of JavaScript code executable by creating web server in Node.js.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28177338996267815000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

6.c	**Course Name:** Node.js
	Module Name: Modular programming in Node.js
	Write a Node.js module to show the workflow of Modularization of Node application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28865394191004004000_shared?collectionId=lex_324078356719467600 00_shared&collectionType=Course
6.d	**Course Name:** Node.js
	Module Name: Restarting Node Application
	Write a program to show the workflow of restarting a Node application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9174073856000159000_shared?collectionId=lex_3240783567194676000 0_shared&collectionType=Course
6.e	**Course Name:** Node.js
	Module Name: File Operations
	Create a text file src.txt and add the following data to it. Mongo, Express, Angular, Node.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33376440180246100000_shared?collectionId=lex_324078356719467600 00_shared&collectionType=Course
7.a	**Course Name:** Express.js
	Module Name: Defining a route, Handling Routes, Route Parameters, Query Parameters
	Implement routing for the AdventureTrails application by embedding the necessary code in the routes/route.js file.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_29394215542149950000_shared?collectionId=lex_324078356719467600 00_shared&collectionType=Course
7.b	**Course Name:** Express.js
	Module Name: How Middleware works, Chaining of Middlewares, Types of Middlewares
	In myNotes application: (i) we want to handle POST submissions. (ii) display customized error messages. (iii) perform logging.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13930661312009580000_shared?collectionId=lex_324078356719467600 00_shared&collectionType=Course
7.c	**Course Name:** Express.js
	Module Name: Connecting to MongoDB with Mongoose, Validation Types and Defaults
	Write a Mongoose schema to connect with MongoDB.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01303558877548544069_shared?collectionId=lex_324078356719 46760000_shared&collectionType=Course
7.d	**Course Name:** Express.js
	Module Name: Models
	Write a program to wrap the Schema into a Model object.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01303559389686988662_shared?collectionId=lex_324078356719 46760000_shared&collectionType=Course
8.a	**Course Name:** Express.js
	Module Name: CRUD Operations
	Write a program to perform various CRUD (Create-Read-Update-Delete) operations using Mongoose library functions.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035684270129152696_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
8.b	**Course Name:** Express.js
	Module Name: API Development
	In the myNotes application, include APIs based on the requirements provided. (i) API should fetch the details of the notes based on a notesID which is provided in the URL. Test URL - http://localhost:3000/notes/7555 (ii) API should update the details bas
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035745250975744755_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
8.c	**Course Name:** Express.js
	Module Name: Why Session management, Cookies
	Write a program to explain session management using cookies.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24299316914857090000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
8.d	**Course Name:** Express.js
	Module Name: Sessions
	Write a program to explain session management using sessions.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_905413034723449100_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
8.e	**Course Name:** Express.js
	Module Name: Why and What Security, Helmet Middleware
	Implement security features in myNotes application
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_31677453061177940000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
9.a	**Course Name:** Typescript
	Module Name: Basics of TypeScript
	On the page, display the price of the mobile-based in three different colors. Instead of using the number in our code, represent them by string values like GoldPlatinum, PinkGold, SilverTitanium.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28910354929502245000_shared?collectionId=lex_94362331165126780000_shared&collectionType=Course
9.b	**Course Name:** Typescript
	Module Name: Function
	Define an arrow function inside the event handler to filter the product array with the selected product object using the productId received by the function. Pass the selected product object to the next screen.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10783156469383723000_shared?collectionId=lex_94362331165126780000_shared&collectionType=Course
9.c	**Course Name:** Typescript
	Module Name: Parameter Types and Return Types
	Consider that developer needs to declare a function - getMobileByVendor which accepts string as input parameter and returns the list of mobiles.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712912427057152901_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

9.d	**Course Name:** Typescript
	Module Name: Arrow Function
	Consider that developer needs to declare a manufacturer's array holding 4 objects with id and price as a parameter and needs to implement an arrow function - myfunction to populate the id parameter of manufacturers array whose price is greater than or equ
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271291087550054904_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
9.e	**Course Name:** Typescript
	Module Name: Optional and Default Parameters
	Declare a function - getMobileByManufacturer with two parameters namely manufacturer and id, where manufacturer value should passed as Samsung and id parameter should be optional while invoking the function, if id is passed as 101 then this function shoul
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712914940641280906_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
10.a	**Course Name:** Typescript
	Module Name: Rest Parameter
	Implement business logic for adding multiple Product values into a cart variable which is type of string array.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712921860915200909_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
10.b	**Course Name:** Typescript
	Module Name: Creating an Interface
	Declare an interface named - Product with two properties like productId and productName with a number and string datatype and need to implement logic to populate the Product details.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712925244276736910_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
10.c	**Course Name:** Typescript
	Module Name: Duck Typing
	Declare an interface named - Product with two properties like productId and productName with the number and string datatype and need to implement logic to populate the Product details.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712925995458560912_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
10.d	**Course Name:** Typescript
	Module Name: Function Types
	Declare an interface with function type and access its value.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712948945346560918_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
11.a	**Course Name:** Typescript
	Module Name: Extending Interfaces
	Declare a productList interface which extends properties from two other declared interfaces like Category,Product as well as implementation to create a variable of this interface type.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	on/lex_auth_012712951652139008920_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
11.b	**Course Name:** Typescript
	Module Name: Classes
	Consider the Mobile Cart application, Create objects of the Product class and place them into the productlist array.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3705824317381604400_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
11.c	**Course Name:** Typescript
	Module Name: Constructor
	Declare a class named - Product with the below-mentioned declarations: (i) productId as number property (ii) Constructor to initialize this value (iii) getProductId method to return the message "Product id is <<id value>>".
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712954616782848927_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
11.d	**Course Name:** Typescript
	Module Name: Access Modifiers
	Create a Product class with 4 properties namely productId, productName, productPrice, productCategory with private, public, static, and protected access modifiers and accessing them through Gadget class and its methods.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712953517170688931_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
12.a	**Course Name:** Typescript
	Module Name: Properties and Methods
	Create a Product class with 4 properties namely productId and methods to setProductId() and getProductId().
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9356738095572543000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
12.b	**Course Name:** Typescript
	Module Name: Creating and using Namespaces
	Create a namespace called ProductUtility and place the Product class definition in it. Import the Product class inside productlist file and use it.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_20787271128051925000_shared?collectionId=lex_94362331165126780000_shared&collectionType=Course
12.c	**Course Name:** Typescript
	Module Name: Creating and using Modules
	Consider the Mobile Cart application which is designed as part of the functions in a module to calculate the total price of the product using the quantity and price values and assign it to a totalPrice variable.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24788158187785620000_shared?collectionId=lex_94362331165126780000_shared&collectionType=Course
12.d	**Course Name:** Typescript
	Module Name: What is Generics, What are Type Parameters, Generic Functions, Generic Constraints
	Create a generic array and function to sort numbers as well as string values.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

module/lex_446287045482942800_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

Software configuration and installation

1. HTML & Javascript
   - Simple editors such as Notepad or go for IDEs like Visual Studio Code(recommended), Eclipse etc. which makes coding easier.
   - And, to execute application, you can use any commonly used browser such as Google Chrome(recommended), Mozilla Firefox etc
   - Setup details: Environmental Setup for HTML5 - Viewer Page | Infosys Springboard (onwingspan.com)
   - Environment Setup: Internal - Viewer Page | Infosys Springboard (onwingspan.com)
2. Node JS
   Download **Node.js** from the official site
   Setup details : How to use Node.js - Viewer Page | Infosys Springboard (onwingspan.com)
3. Typescript
   Installing TypeScript - Internal - Viewer Page | Infosys Springboard (onwingspan.com)

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning.

Web Links:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared/overview (HTML5)
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared/overview (Javascript)
3. https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview (Node.js & Express.js)
4. https://infyspringboard.onwingspan.com/en/app/toc/lex_9436233116512678000_shared/overview (Typescript)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		2	0	0	0
	EMPLOYABILITY SKILLS-II				

Course Objectives:
The main objective of this course is to assist students in developing employability skills and personal qualities related to gaining and sustaining employment.

Course Outcomes: After completion of this course
- Solve various Basic Mathematics problems by following different methods
- Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems
- Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.
- Analyze, summarize and present information in quantitative forms including table, graphs and formulas

UNIT I:
Numerical ability l: Number system, HCF & LCM, Average, Simplification, Problems on numbers
Numerical ability II: Ratio & Proportion, Partnership, Percentages, Profit & Loss

UNIT II:
Arithmetical ability l: Problems on ages, Time & Work, Pipes & Cistern, Chain Rule.
Arithmetical ability ll: Time & Distance, Problems on boats &Steams, Problems on Trains

UNIT III:
Arithmetical ability lll: Allegation, Simple interest and compound interest, Races & Games of skills, Calendar and Clock,
Logical ability: Permutations and Combination and Probability.

UNIT IV:
Mensuration: Geometry, Areas, Volumes

UNIT V:
Data interpretation: Tabulation, Bar graphs, Pie charts, line graphs

Text Books And Reference Books:
1. R. S. Aggarwal "Quantitative Aptitude", Revised ed., S Chand publication, 2017 ISBN:8121924987

E- resources:
1. https://blog.feedspot.com/aptitude_youtube_channels/
2. https://www.tutorialspoint.com/quantitative_aptitude/
3. https://www.careerbless.com/aptitude/qa/home.php

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester	Minor Course	L	T	P	C
		3	0	2	4

DATA STRUCTURES AND ALGORITHMS

Course Objectives:
The objective of the course is to
- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
- Demonstrate the different data structures implementation

Course Outcomes:
After completing this course a student will be able to:
- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

UNIT I:
Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.
Searching - Linear search, Binary search, Fibonacci search.
Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II:
Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation
,Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III:
Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues- Circular Queues, Deques, Priority Queues, Multiple Queues.
Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.

UNIT IV:
Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals,

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V:
Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's shortest path

Exercise -1 (Searching):
a) Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.
b) Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

Exercise -2 (Sorting-I):
a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order
b) Write C program that implement Quick sort, to sort a given list of integers in ascending order
c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order

Exercise -3(Sorting-II):
a) Write C program that implement radix sort, to sort a given list of integers in ascending order
b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4(Singly Linked List):
a) Write a C program that uses functions to create a singly linked list
b) Write a C program that uses functions to perform insertion, deletion operations on a singly linked list
c) Write a C program to reverse elements of a single linked list.

Exercise -5(Queue)
a) Write C program that implement Queue (its operations) using arrays.
b) Write C program that implement Queue (its operations) using linked lists

Exercise -6(Stack)
a) Write C program that implement stack (its operations) using arrays
b) Write C program that implement stack (its operations) using Linked list
c) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7(Binary Tree)
    Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.

Exercise -8(Binary Search Tree)
a) Write a C program to Create a BST
b) Write a C program to insert a node into and delete a node from a BST.

Text Books:
1) Data Structures Using C. 2nd Edition.Reema Thareja, Oxford.
2) Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:
1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2) Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
3) Data Structures with C, Seymour Lipschutz TMH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

e-Resources:
1) http://algs4.cs.princeton.edu/home/
2) https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3
	CLOUD COMPUTING **(Professional Elective-III)**				

Course Objectives:
- To explain the evolving computer model caned cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.
- To motivate students to do programming and experiment with the various cloud computing environments.

Course Outcomes: At the end of the course, student will be able to
- Illustrate the key dimensions of the challenge of Cloud Computing
- Classify the Levels of Virtualization and mechanism of tools.
- Analyze Cloud infrastructure including Google Cloud and Amazon Cloud.
- Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud
- Assess control storage systems and cloud security, the risks involved its impact and develop cloud application

UNIT I: Systems Modeling, Clustering and Virtualization: Scalable Computing over the Internet-The Age of Internet Computing, Scalable computing over the internet, Technologies for Network Based Systems, System models for Distributed and Cloud Computing, , Performance, Security and Energy Efficiency

UNIT II: Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, Virtualization Structures/ Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.
UNIT III: Cloud Platform Architecture: Cloud Computing and Service Models, Public Cloud Platforms, Service Oriented Architecture, Programming on Amazon AWS and Microsoft Azure

UNIT IV: Cloud Resource Management and Scheduling: Policies and Mechanisms for Resource Management, Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds-Fair Queuing, Start Time Fair Queuing.

UNIT V: Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system.

Text Books:
1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.

Reference Books:
1. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press
2. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
3. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3

NEURAL NETWORKS AND SOFT COMPUTING
(Professional Elective-III)

Course Objectives: The main objective of the course is
- To introduce the foundations of Artificial Neural Networks.
- To acquire the knowledge on Soft Computing Concepts.
- To learn various types of Genetic algorithms and its applications.
- To gain knowledge to apply optimization strategies.

Course Outcomes: At the end of the course, student will be able to
- Understand the concepts of Artificial intelligence and soft computing techniques
- Analyze the concepts of Neural Networks and select the Learning Networks in modeling real world systems.
- Implement the concepts of Fuzzy reasoning and concepts of Genetic algorithm and its applications to soft computing.
- Classify Biologically inspired algorithm such as neural networks, genetic algorithms, ant colony optimization, and bee colony optimization.
- Design hybrid system incorporating neural network, genetic algorithms, fuzzy systems.

UNIT I: Soft Computing and Artificial Intelligence: Introduction of Soft Computing, Soft Computing vs. Hard Computing, Various Types of Soft Computing Techniques, Applications of Soft Computing, AI Search Algorithm, Predicate Calculus, Rules of Interference, Semantic Networks, Frames, Objects, Hybrid Models.

UNIT II: Artificial Neural Networks and Paradigms: Introduction to Neuron Model, Neural Network Architecture, Learning Rules, Perceptrons, Single Layer Perceptrons, Multilayer Perceptrons, Back propagation Networks, Kohnen's self organizing networks, Hopfield network, Applications of NN.

UNIT III: Fuzzy Logic: Introduction, Fuzzy sets and Fuzzy reasoning, Basic functions on fuzzy sets, relations, rule based models and linguistic variables, fuzzy controls, Fuzzy decision making, applications of fuzzy logic.

UNIT IV: Genetic Algorithms and Swarm Optimizations: Introduction, Genetic Algorithm, Fitness Computations, Cross Over, Mutation, Evolutionary Programming, Classifier Systems, Genetic Programming Parse Trees, Variants of GA, Applications, Ant Colony Optimization, Particle Swarm Optimization, Artificial Bee Colony Optimization.

UNIT V: Hybrid Systems: Neuro fuzzy hybrid systems, Adaptive neuro fuzzy inference systems, Fuzzy backpropagation network, Genetic neuro hybrid system, Genetic algorithm based backpropagation network, Genetic-fuzzy hybrid systems.

Text Books:
1. Simon S. Haykin, Neural Networks, Prentice Hall, 2nd edition.
2. S. Rajasekaran & G. A. Vijayalakshmi Pai "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications", PHI,2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:
1. S. N. Sivanandam & S. N. Deepa "Principles of Soft Computing" Wiley – India, 2nd Edition, 2007.
2. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall, 1998.
3. Jacek M. Zurada, Introduction to Artificial Neural Systems, Jaico Publishing House,1994
4. Zimmermann, "Fuzzy Set Theory and its Application", 3rd Edition.
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y, 1989.
6. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 3rd edition 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3

AD-HOC AND SENSOR NETWORKS
(Professional Elective-III)

Course Objectives:

From the course the student will learn

- Architect sensor networks for various application setups.
- Devise appropriate data dissemination protocols and model links cost.
- Understanding of the fundamental concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers.
- Evaluate the performance of sensor networks and identify bottlenecks.

Course Outcomes: At the end of the course, student will be able to

- Evaluate the principles and characteristics of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks.
- Determine the principles and characteristics of wireless sensor networks.
- Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc sensor networks.
- Illustrate the various sensor network Platforms, tools and applications.
- Demonstrate the issues and challenges in security provisioning and also familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs.

UNIT I: Introduction to Ad Hoc Wireless Networks- Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet, MAC protocols for Ad hoc Wireless Networks-Issues, Design Goals and Classifications of the MAC Protocols.

UNIT II: Routing Protocols for Ad Hoc Wireless Networks- Issues in Designing a Routing Protocol, Classifications of Routing Protocols, Topology-based versus Position-based Approaches, Issues and design goals of a Transport layer protocol, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Solutions for TCP over Ad Hoc Wireless Networks, Other Transport layer protocols.

UNIT III: Security protocols for Ad hoc Wireless Networks- Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks, Cooperation in MANETs, Intrusion Detection Systems.

UNIT IV: Basics of Wireless Sensors and Applications- The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

UNIT V: Security in WSNs- Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote, Sensor Network Operating Systems–TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language-nesC, **Dataflow Style Language-**TinyGALS, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:
1. Ad Hoc Wireless Networks – Architectures and Protocols, 1st edition, C. Siva Ram Murthy, B. S. Murthy, Pearson Education, 2004
2. Ad Hoc and Sensor Networks – Theory and Applications, 2nd edition *Carlos Corderio Dharma P.Aggarwal,* World Scientific Publications / Cambridge University Press, March 2006

Reference Books:
1. Wireless Sensor Networks: An Information Processing Approach, 1st edition, *Feng Zhao, Leonidas Guibas*, Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp2009
2. Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, 1st edition, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008
3. Ad hoc Networking, 1st edition, *Charles E.Perkins*, Pearson Education, 2001
4. Wireless Ad hoc Networking, 1st edition, *Shih-Lin Wu, Yu-Chee Tseng,* Auerbach Publications, Taylor & Francis Group, 2007
5. Wireless Sensor Networks – Principles and Practice, 1st edition, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3
	CYBER SECURITY & FORENSICS **(Professional Elective-III)**				

Course Objectives:
The aim of the course is to
- identify security risks and take preventive steps
- understand the forensics fundamentals
- understand the evidence capturing process
- understand the preservation of digital evidence

Course Outcomes: At the end of the course, student will be able to
- Explain the Cybercrime Fundamentals
- Describe the types of attacks on networks
- Analyze various tools available for Cybercrime Investigation
- Explain the Computer Forensics and Investigation Fundamentals and tools
- Analyze the legal perspectives of Cybercrime

UNIT I: Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.

UNIT II: Tools and Methods : Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration.

UNIT III: Cyber Crime Investigation: Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

UNIT IV: Computer Forensics and Investigations: Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics.

UNIT V: Cyber Crime Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:
1. Sunit Belapure Nina Godbole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY, 2011.
2. Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.

Reference Books:
1. Michael T. Simpson, Kent Backman and James E. Corley, "Hands on Ethical Hacking and Network Defence", Cengage, 2019.
2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3. Alfred Basta, Nadine Basta,Mary Brown and Ravinder Kumar "Cyber Security and Cyber Laws" , Cengage,2018.

E-Resources:
1. CERT-In Guidelines- http://www.cert-in.org.in/
2. https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks [Online Course]
3. https://computersecurity.stanford.edu/free-online-videos [Free Online Videos]
4. Nickolai Zeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu License: Creative Commons BY-NC-SA.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3
	DEEP LEARNING TECHNIQUES **(Professional Elective-IV)**				

Course Objectives: The main objective of the course is to make students:
- Learn deep learning methods for working with sequential data,
- Learn deep recurrent and memory networks,
- Learn deep Turing machines,
- Apply such deep learning mechanisms to various learning problems.
- Know the open issues in deep learning, and have a grasp of the current research directions.

Course Outcomes: After the completion of the course, student will be able to
- Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning.
- Discuss the Neural Network training, various random models**.**
- Explain the Techniques of Keras, TensorFlow, Theano and CNTK
- Classify the Concepts of CNN and RNN
- Implement Interactive Applications of Deep Learning.

UNIT I:
Fundamentals of Deep Learning: Artificial Intelligence, History of Machine learning: Probabilistic Modeling, Early Neural Networks, Kernel Methods, Decision Trees, Random forests and Gradient Boosting Machines, **Fundamentals of Machine Learning:** Four Branches of Machine Learning, Evaluating Machine learning Models, Overfitting and Underfitting. **[Text Book 2]**

UNIT II: Introducing Deep Learning: Biological and Machine Vision, Human and Machine Language, Artificial Neural Networks, Training Deep Networks, Improving Deep Networks. **[Text Book3]**

UNIT III: Neural Networks: Anatomy of Neural Network, Introduction to Keras: Keras, TensorFlow, Theano and CNTK, Setting up Deep Learning Workstation, Classifying Movie Reviews: Binary Classification, Classifying newswires: Multiclass Classification. **[Text Book 2]**

UNIT IV:
Convolutional Neural Networks: Nerual Network and Representation Learing, Convolutional Layers, Multichannel Convolution Operation, **Recurrent Neural Networks:** Introduction to RNN, RNN Code, PyTorch Tensors: Deep Learning with PyTorch, CNN in PyTorch. **[Text Book 3]**

UNIT V:
Interactive Applications of Deep Learning: Machine Vision, Natural Language processing, Generative Adversial Networks, Deep Reinforcement Learning. **[Text Book 1]**
Deep Learning Research: Autoencoders**,** Deep Generative Models: Boltzmann Machines Restricted Boltzmann Machines, Deep Belief Networks. **[Text Book 1]**

Text Books:
1. Deep Learning- Ian Goodfellow, Yoshua Bengio and Aaron Courvile, MIT Press, 2016
2. Deep Learning with Python - Francois Chollet, Released December 2017, Publisher(s): Manning Publications, ISBN: 9781617294433
3. Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence - Jon Krohn, Grant Beyleveld, Aglaé Bassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 9780135116821

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

4. Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc., ISBN: 9781492041412

Reference Books:

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.

Web Link:

1. Swayam NPTEL: Deep Learning: https://onlinecourses.nptel.ac.in/noc22_cs22/preview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3
	SOCIAL NETWORKS & SEMANTIC WEB **(Professional Elective-IV)**				

Course Objectives:
- To learn Web Intelligence
- To learn Knowledge Representation for the Semantic Web
- To learn Ontology Engineering
- To learn Semantic Web Applications, Services and Technology
- To learn Social Network Analysis and semantic web

Course Outcomes: After the completion of the course, student will be able to
- Demonstrate social network analysis and measures.
- Analyze random graph models and navigate social networks data
- Apply the network topology and Visualization tools.
- Analyze the experiment with small world models and clustering models.
- Compare the application driven virtual communities from social network Structure.

UNIT I: Web Intelligence: Thinking and Intelligent Web Applications, The Information Age ,The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

UNIT II: Knowledge Representation for the Semantic Web: Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web –Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema.

UNIT III: Ontology Engineering: Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.

UNIT IV: Semantic Web Applications, Services and Technology: Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods,

UNIT V: Social Network Analysis and semantic web: What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks, Building Semantic Web Applications with social network features.

Text Books:
1. Thinking on the Web – Berners Lee, Godel and Turing, Wiley inter science, 2008.
2. Social Networks and the Semantic Web, Peter Mika, Springer, 2007.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:
1. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J. Davies, R. Studer, P. Warren, John Wiley & Sons.
2. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)
3. Information sharing on the semantic Web – Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
4. Programming the Semantic Web, T. Segaran, C. Evans, J. Taylor, O'Reilly, SPD.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3

COMPUTER VISION
(Professional Elective-IV)

Course Objectives:
To introduce students the fundamentals of image formation; To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition; To develop an appreciation for various issues in the design of computer vision and object recognition systems; and To provide the student with programming experience from implementing computer vision and object recognition applications.

Course Outcomes: After completing the course Student will be able to:
1. Identify basic concepts, terminology, theories, models and methods in the field of computer vision,
2. Describe known principles of feature detection and matching,
3. Describe basic methods of computer vision related to image stitching, photography like high dynamic range imaging and blur removal.
4. Suggest a design of a computer vision system for a 3D Reconstruction, Albedos, image based rendering views and depths.

UNIT I: Introduction: Image Formation: Geometric Primitives and Transformation, Photometric Image Formation, Digital Camera, Image Processing: Point Operators, Linear Filtering, More Neighborhood Operators, Fourier Transforms, Pyramids and Wavelets, Geometric Transformations, Global Optimization.

UNIT II: Feature Detection and Matching: Points and Patches, Edges, Lines, Segmentation: Active Contours, Split and Merge, Mean Shift and Mode Finding, Normalized Cuts, Feature-Based Alignment: 2D and 3D Feature-based Alignment, Pose Estimation, Geometric Intrinsic Calibration.

UNIT III: Structure and Motion: Triangular, Two-frame Structure from Motion, Factorization, Bundle Adjustment, Constrained Structure and Motion, Dense Motion Estimation: Translation Alignment, Parametric Motion, Spline-based Motion, Optical Flow, Layered motion

UNIT IV: Image Stitching: Motion Models, Global Alignment, Composing, Computational Photography: Photometric Calibration, High Dynamic Range Imaging, Super-Resolution and Blur Removal, image Matting and Compositing, Texture Analysis and Synthesis.

UNIT V: 3D Reconstruction: Shape From X, Active Range Finding, Surface Representation, Point-based Representation, Volumetric Representation, Model-based Reconstruction, Recovering Texture Maps and Albedos, Image- based Rendering: View Interpolation, Layered Depth Images, Light Fields and Lumigraphs, Environment Mattes, Video-based Rendering.

Text Books:
1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited, 2011.
2. Simon J.D Prince, Computer Vision: Models, Learning and Inference, 1st Edition, 2012.

Reference Books:
1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2. Haralick& Shapiro, "Computer and Robot Vision", Vol II
3. G_erardMedioni and Sing Bing Kang "Emerging topics in computer vision"166

NPTEL LINK: https://onlinecourses.nptel.ac.in/noc22_ee48/preview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3
	BLOCK-CHAIN TECHNOLOGIES **(Professional Elective-V)**				

Course Objectives:
To understand block chain technology and Cryptocurrency works

Course Outcomes:
After the completion of the course, student will be able to
- Demonstrate the block chain basics, Crypto currency
- To compare and contrast the use of different private vs. public block chain and use cases
- Design an innovative Bit coin Block chain and scripts, Block chain Science on varies coins
- Classify Permission Block chain and use cases – Hyper ledger, Corda
- Make Use of Block-chain in E-Governance, Land Registration, Medical Information Systems and others

UNIT I: Introduction: Introduction, basic ideas behind block chain, how it is changing the landscape of digitalization, introduction to cryptographic concepts required, Block chain or distributed trust, Currency, Cryptocurrency, How a Cryptocurrency works, Financial services, Bitcoin prediction markets.

UNIT II: Hashing, public key cryptosystems, private vs public block chain and use cases, Hash Puzzles, Extensibility of Block chain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Block chain Environment

UNIT III: Introduction to Bitcoin : Bitcoin Block chain and scripts, Use cases of Bitcoin Blockchain scripting language in micropayment, escrow etc Downside of Bit coin mining, Block chain Science: Grid coin, Folding coin, Block chain Genomics, Bit coin MOOCs.

UNIT IV: Ethereum continued, IOTA, The real need for mining, consensus, Byzantine Generals Problem, and Consensus as a distributed coordination problem, Coming to private or permissioned block chains, Introduction to Hyper ledger, Currency, Token, Campus coin, Coin drop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency

UNIT V: Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations, Uses of Block chain in E-Governance, Land Registration, Medical Information Systems.

Text Books:
1. Blockchain Blue print for Economy by Melanie Swan

Reference Books:
1. Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition, by Daniel Drescher

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3
	WIRELESS NETWORK SECURITY **(Professional Elective-V)**				

Course Objectives:
The objective of this course is to understand the importance of Wireless networks security and its application

Course Outcomes: After the completion of the course, student will be able to
- Explain the Threats in networks and provide Authentication to real time problems.
- Identify and investigate in-depth both early and contemporary threats to wireless networks security
- Ability to analyze and determine for any organization the database security requirements and appropriate solutions
- Determined IP Security Issues and solve real time problems.
- Build wireless Development Strategies in real time issues

UNIT I: Introduction to Wireless: History of Wireless Technologies, History of Wireless Security, State of the Wireless Security Industry, 2001 **Wireless Threats:** Uncontrolled Terrain, Communications Jamming, DoS Jamming, Injections and Modifications of Data, Man-in-the-Middle (MITM) Attack, Rogue Client, Rogue Network Access Points, Attacker Equipment,

UNIT II: Introduction to Wireless Security Protocols and Cryptography: Recovery the FUD, OSI Model, OSI Simplified, Internet Model, Wireless LAN Security Protocols, Cryptography, SSL/TLS, Secure Shell Protocols, Terminal Access and File Transfer, Port Forwarding a Word of Caution, Man-in-the-Middle of SSL/TLS and SSH, WTLS, WEP,802.1x, IP Security

UNIT III:
Security Considerations to Wireless Devices: Wireless Device Security Issues, Physical Security, Information Leakage, Device Security Features, Application Security, Detailed Device Analysis, Laptops, Personal Digital Assistants (PDAS), Wireless Infrastructure **Wireless Technologies and Applications:** Introduction to Cellular Networks- FDMA, TDMA, CDMA, Spread Spectrum Primer, Analogy, TDMA Vs CDMA, PDC, Security Threats

UNIT IV:
Introduction to Wireless Data Networks: Cellular Digital Packet Data (CDPD), CDPD Architecture, CDPD Security, Mobitex- Mobitex Architecture, Mobitex Security Architecture, Security Issues, Gateway, Security Model **Wireless Standards and Technologies:** Current and Future Technologies-Infrared, Radio, Spread Spectrum, OFDM, Current and Future Standards- IEEE 802 Standards, ETSI, Home RF, Ultra-wide band Radio (UWB)

UNIT V: Wireless Deployment Strategies: Implementing Wireless LAN's- Security Considerations Common Wireless Network Applications, Enterprise Campus Designs, Wireless IST Design, Retail and Manufacturing Design, Small Office/Home Office Design (SOHO)

Text Books:
1. Wireless Security, Merritt Maxim and David Pollino, Osborne/McGraw Hill, New Delhi, 2005
2. Wireless Security Models: Threats and Solutions, Nichols and Lekka, Tata McGraw Hill, New Delhi 2006

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:
1. Behrouz A.Forouzan, ―Cryptography & Network Security‖, Tata McGraw Hill, India, New Delhi, 2009
2. William Stallings, ―Cryptography and Network Security, Prentice Hall, New Delhi, 2006
3. Bruce Schneier, "Applied Cryptography", John Wiley & Sons, New York, 2004

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3
	ETHICAL HACKING **(Professional Elective-V)**				

Course Objectives:
- The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.
- The course includes-Impacts of Hacking; Types of Hackers; Information Security Models, Information Security Program, Business Perspective, Planning a Controlled Attack
- Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration)

Course Outcomes: At the end of the course, student will be able to
- Explain the concepts related to hacking, ports and protocols, pen testing and virtualization
- Determine the applicable footprinting techniques and scanning methods
- Explain the process of system hacking and Explain the concepts Trojans, backdoors, worms and virus and it's countermeasures
- Demonstrate systematic understanding of the concepts of Sniffing and Social Engineering and it's attacks
- Determine the applicable methods of cryptography, stegnography and Vulnerability Assessment

UNIT I:
Introduction to Hacking: Hacking, Types and phases of hacking, **Introduction to Ports & Protocols**: Ports, Protocols, Primary Network Types, **Virtualization & Introduction to Kali Linux:** Virtualization, Virtualization software, supported platforms, **Introduction to Penetration Testing:** Penetration test, Categories and Types of Penetration tests, Structure of Penetration Test Report.

UNIT II:
Footprinting: Footprinting, Types, Using ping and ns Lookup commands in Windows command line, **Scanning:** Scanning, Basics of Scanning, Basic Techniques of Scanning, Enumerating DNS using dns enum, Performing flag scan using hping3.

UNIT III:
Hacking into System: System Hacking, Password Cracking, Default password databases, Manual and Automated Password Cracking, Process of System Hacking, Using Keyloggers, **Trojans & Backdoors:** Trojans, Working of Trojan, Infection Techniques, Attack, Lifecycle and Classification of Virus, Worms, Virus Construction Kit.

UNIT IV:
Sniffing, Packet Analysis & Session Hijacking: Sniffing, Packet Analysis, Types of Sniffing, Active and Passive Sniffing Techniques, Session Hijacking, **Social Engineering:** Social Engineering, Process, Identity Theft, Human and Computer Based Social Engineering Techniques, Phishing Process, Types of Phishing Attacks, Social Engineering Toolkit (SET)

UNIT V:
Cryptography: Cryptography, Digital Signature, Hash Functions, **Steganography:** Steganography Process, watermarking, Steganography Methods and Attacks, Steganography tools, **Vulnerability Assessment:** Vulnerability, The Open Web Application Security Project (OWASP), Prevention, Damn Vulnerable Web Application (DVWA), installation and testing of DVWA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:
1. Hacking: Be a Hacker with Ethics, Harsh Bothra, Khanna Publications, 2019
2. Ethical Hacking and Penetration Testing Guide, Rafay Baloch, 2014

Reference Books:
1. Kali Linux Wireless Penetration Testing Beginner's Guide, Vivek Ramachandran, Cameron Buchanan, Packt Publishing, 2015
2. SQL Injection Attacks and Defense, 1st Edition, Justin Clarke-Salt, Syngress Publication
3. Mastering Modern Web Penetration Testing, Prakhar Prasad, Packt Publishing, October 2016

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3

API AND MICROSERVICES
(Job Oriented Course)

Course Outcomes:

At the end of this course, the student will be able to
- Develop a Spring Data JPA application with Spring Boot
- Implement CRUD operations using Spring Data JPA
- Implement pagination and sorting mechanism using Spring Data JPA
- Implement query methods for querying the database using Spring Data JPA
- Implement a custom repository to customize a querying mechanism using Spring Data JPA
- Understand update operation using query approaches in Spring Data JPA
- Implement Spring Transaction using Spring Data JPA
- Develop RESTful endpoints using Spring REST Processing URI parameters
- Write RESTful services using Spring REST that consumes and produces data in different formats
- Handle exceptions and errors in Spring REST endpoints
- Write Spring based REST clients to consume RESTful services programmatically
- Create secure RESTful endpoints using Spring Security Document and version the Spring REST endpoints Implement CORS in a Spring REST application

UNIT I:

Spring 5 Basics : Why Spring, What is Spring Framework, Spring Framework - Modules, Configuring IoC container using Java-based configuration, Introduction To Dependency Injection, Constructor Injection, Setter Injection, What is AutoScanning

UNIT II:

Spring Boot: Creating a Spring Boot Application, Spring Boot Application Annotation, What is Autowiring , Scope of a bean, Logger, Introduction to Spring AOP, Implementing AOP advices, Best Practices : Spring Boot Application

UNIT III:

Spring Data JPA with Boot: Limitations of JDBC API, Why Spring Data JPA, Spring Data JPA with Spring Boot, Spring Data JPA Configuration, Pagination and Sorting, Query Approaches, Named Queries and Query, Why Spring Transaction, Spring Declarative Transaction, Update Operation in Spring Data JPA, Custom Repository Implementation, Best Practices - Spring Data JPA

UNIT IV:

Web Services: Why Web services, SOA - Service Oriented Architecture, What are Web Services, Types of Web Services, SOAP based Web Services, RESTful Web Services, How to create RESTful Services

UNIT V:

Spring REST: Spring REST - An Introduction, Creating a Spring REST Controller, @RequestBody and ResponseEntity, Parameter Injection, Usage of @PathVariable, @RequestParam and @MatrixVariable, Exception Handling, Data Validation, Creating a REST Client, Versioning a Spring REST endpoint, Enabling CORS in Spring REST, Securing Spring REST endpoints

Hardware and software configuration

- 4 or 8 GB RAM/126 GB ROM
- Swagger tool suite(opensource)
- OpenJDK 17 or Java 11,Maven 3.2 or above and MySQL 8.0 or above,Spring Tool suite, Postman

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:
1. Spring in action, 5th Edition, Author: Craig Walls, Ryan Breidenbach, Manning books

Web Links [Courses mapped to Infosys Springboard platform]:

Infosys Springboard courses:
1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01296689056211763272_shared/overview [Spring 5 Basics with Spring Boot]
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_4313461831752789500_shared/overview [Spring Data JPA with Boot]
3. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012731900963905536190_shared/overview [Spring REST]

Web references:

1.	Dependency Injection in spring - javatpoint
2.	Autowiring in Spring - javatpoint
3.	https://docs.spring.io/spring-boot/docs/2.0.x/reference/html/using-boot-using-springbootapplication-annotation.html
4.	Autowiring in Spring - javatpoint,https://www.baeldung.com/spring-bean-scopes
5.	Spring Boot Logging	How does logging works in spring boot with example (educba.com)
6.	Spring AOP Tutorial	Aspect Oriented Programming - javatpoint
7.	Spring Boot Best Practices (javaguides.net)
8.	Introduction to Spring Data JPA	SpringHow
9.	https://asbnotebook.com/spring-data-jpa-crud-example/ ,https://www.bezkoder.com/spring-boot-jpa-crud-rest-api/
10.	Pagination and Sorting using Spring Data JPA - PagingAndSortingRepository (javaguides.net)
11.	https://www.javaguides.net/2018/11/spring-data-jpa-query-creation-from-method-names.html,https://www.javaguides.net/2022/02/spring-data-jpa-namedqueries-example.html
12.	https://javadeveloperzone.com/spring/spring-declarative-transaction-management/
13.	https://javadeveloperzone.com/spring/spring-declarative-transaction-management/
14.	https://javabeat.net/spring-data-custom-repository/
15.	https://www.jrebel.com/blog/jpa-application-performance-best-practices
16.	https://www.javatpoint.com/service-oriented-architecture,https://www.javatpoint.com/web-services-tutorial
17.	https://www.javatpoint.com/soap-web-services,https://www.javatpoint.com/restful-web-services
18.	RESTful Web Services - javatpoint
19.	https://www.javatpoint.com/restful-web-services-spring-boot
20.	https://www.javatpoint.com/restful-web-services-spring-boothttps://dzone.com/articles/lifecycle-of-a-request-response-process-for-a-spri
21.	https://www.ibm.com/docs/en/was/8.5.5?topic=applications-defining-uri-patterns-resources-in-restful
22.	https://www.baeldung.com/exception-handling-for-rest-with-spring
23.	https://howtodoinjava.com/spring-boot2/resttemplate/spring-restful-client-resttemplate-example/
24.	https://www.javatpoint.com/restful-web-services-versioning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

25.	https://spring.io/guides/gs/rest-service-cors/
26.	https://www.javatpoint.com/restful-web-services-basic-authentication-with-spring-security
27.	https://www.springboottutorial.com/rest-api-best-practices-with-java-and-spring

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3
	SECURE CODING TECHNIQUES **(Job Oriented Course)**				

Course Outcomes:

At the end of the Course, student will be able to:
- Differentiate the objectives of information security
- Understand the trend, reasons and impact of the recent Cyber attacks
- Understand OWASP design principles while designing a web application
- Understand Threat modelling
- Importance of security in all phases of SDLC
- Write secure coding using some of the practices in C/C++/Java and Python programming languages

UNIT I:

Network and Information security Fundamentals: Network Basics, Network Components, Network Types, Network Communication Types, Introduction to Networking Models, Cyber Security Objectives and Services, Other Terms of Cyber Security, Myths Around Cyber Security, Myths Around Cyber Security, Recent Cyber Attacks, Generic Conclusion about Attacks, Why and What is Cyber Security, Categories of Attack

UNIT II:

Introduction to Cyber security: Introduction to OWASP Top 10, A1 Injection, A1 Injection Risks Root Causes and its Mitigation, A1 Injection, A2 Broken Authentication and Session Management, A7 Cross Site Scripting XSS,A3 Sensitive Data Exposure, A5 Broken Access Control, A4 XML External Entity (XEE), A6 Security Misconfiguration, A7 Missing Function Level Access Control, A8 Cross Site Request Forgery CSRF, A8 Insecure Deserialization, A9 Using Components With Known Vulnerabilities, A10 Unvalidated Redirects and Forwards, A10 Insufficient Logging and Monitoring, Secure Coding Practices, Secure Design Principles, Threat Modeling, Microsoft SDL Tool

UNIT III:

Secure coding practices and OWASP Top 10: Declarative Security, Programmatic Security, Concurrency, Configuration, Cryptography, Input and Output Sanitization, Error Handling, Input Validation, Logging and auditing, Session Management, Exception Management, Safe APIs, Type Safety, Memory Management, Tokenizing, Sandboxing, Static and dynamic testing, vulnerability scanning and penetration testing

UNIT IV:

Secure coding practices in C/C++ and Java: Potential Software Risks in C/C++, Defensive coding, Preventative Planning, Clean Code, Iterative Design, Assertions, Pre Post Conditions, Low level design inspections, Unit Tests
Java- Managing Denial of Service, Securing Information, Data Integrity, Accessibility and Extensibility, Securing Objects, Serialization Security

UNIT V:

Secure coding in Python: Interactive Python Scripting, Python Variables, Conditionals, Loops, Functions, External Modules, File operations, Web requests

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:
1. Networking Fundamentals, 2019 edition, Packt, Author: Gordon Davies
2. Principles of Information Security, Authors: Michael E. Whitman and Herbert J. Mattord, Course technology incorp.
3. CSSLP SECURE SOFTWARE LIFECYCLE PROFESSIONAL ALL-IN-ONE EXAM GUIDE, Third Edition, 3rd Edition, Authors: Wm. Arthur Conklin, Daniel Paul Shoemaker, Released February 2022,Publisher(s): McGraw-Hill,ISBN: 9781264258215
4. OCP Oracle Certified Professional Java SE 11 Programmer II Study Guide: Exam 1Z0-816 and Exam 1Z0-817 Paperback – 6 August 2020, Authors: Scott Selikoff , Jeanne Boyarsky
5. OWASP 2017 Handbook,
https://owasp.org/www-pdf-archive/OWASP_Top_10_2017_RC2_Final.pdf

Web Links:
Infosys Springboard courses
1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012683751296065536354_shared/contents [Network Fundamentals]
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_3388902307073574000_shared/overview [Introduction to cybersecurity]
3. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_0135015696571596809160 [Certified Secure Software Lifecycle Professional (CSSLP) 2019: Secure Coding Practices]
4. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_0135015689927557129660 [OWASP Top 10: Web Application Security]
5. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_0135015930409779201 3093 [Defensive coding fundamentals in C and C++]
6. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_0135015917296926721 3125 [Java SE 11 Programmer II: Secure Coding in Java SE 11 Applications]
7. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_0135015816449310721 1192/overview [Security Programming: Python Scripting Essentials]

Web references:
1. https://www.stealthlabs.com/blog/infographic-top-15-cybersecurity-myths-vs-reality/
2. https://microage.ca/cybersecurity-layering-approach/
3. https://www.synopsys.com/glossary/what-is-threat-modeling.html#:~:text=Threat%20modeling%20is%20a%20structured,An%20abstraction%20of%20the%20system
4. https://www.microsoft.com/en-us/securityengineering/sdl/threatmodeling
5. https://www.checkpoint.com/cyber-hub/threat-prevention/what-is-sandboxing/
6. https://www.skillsoft.com/course/defensive-coding-fundamentals-for-cc-f44c02f9-1bcc-11e7-b15b-0242c0a80b07#:~:text=Defensive%20Programming%20is%20a%20methodology,%2C%20testing%2C%20and%20input%20validation.
7. https://www.oracle.com/java/technologies/javase/seccodeguide.html
8. https://www.skillsoft.com/course/security-programming-python-scripting-essentials-be99adad-1f65-47a8-a4b5-6b5346072b8e

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3

UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY

Human Values Courses

This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester forwhich the foundation course named as "H-102 Universal Human Values 2: Understanding Harmony"is designed which may be covered in their III or IV semester. During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.

Universal Human Values 2: Understanding Harmony
Course code: HSMC (H-102)
Credits: L-T-P-C 2-1-0-3 or 2L:1T:0P 3 credits
Pre-requisites: None. Universal Human Values 1 (desirable)

1. Objective:
The objective of the course is four fold:
1. Development of a holistic perspective based on self-exploration about themselves (human being),family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

2. Course Topics:
The course has 28 lectures and 14 practice sessions in 5 modules:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education
1. Purpose and motivation for the course, recapitulation from Universal Human   Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.
Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than asarbitrariness in choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!
   4. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
   5. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
   6. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
   7. Understanding the characteristics and activities of 'I' and harmony in 'I'
   8.   Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
   9. Programs to ensureSanyam and Health.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

10. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
11. Understanding the meaning of Trust; Difference between intention and competence
12. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
13. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
14. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family**.**

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence
18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
21. Holistic perception of harmony at all levels of existence.
Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics
22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
28. Sum up.
Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

3. READINGS:

3.1 Text Book
1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books,New Delhi, 2010

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

3.2 Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

4. MODE OF CONDUCT (L-T-P-C 2-1-0-3 or 2L:1T:0P 3 credits)

Lectures hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorial hours are to be used for practice sessions.

While analysing and discussing the topic, the faculty mentor's role is in pointing to essentialelements to help in sorting them out from the surface elements. In other words, help the studentsexplore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration. Scenarios may be used to initiate discussion. The student is encouraged to take up" ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working basedon basic humanvalues.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses.

This course is to be taught by faculty from every teaching department, including HSS faculty. Teacher preparation with a minimum exposure to at least one 8-day FDP on Universal Human Values is deemed essential.

5. ASSESSMENT:

This is a compulsory credit course. The assessment is to provide a fair state of development of thestudent, so participation in classroom discussions, self-assessment, peer assessment etc. will be used in evaluation. Example:

      Assessment by faculty mentor: 10 marks

      Self-assessment: 10 marks

      Assessment by peers: 10 marks

      Socially relevant project/Group Activities/Assignments: 20 marks

      Semester End Examination: 50 marks

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

The overall pass percentage is 40%. In case the student fails, he/she must repeat the course**.**

6. OUTCOME OF THE COURSE:

By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

This is only an introductory foundational input. It would be desirable to follow it up by

a) faculty-student or mentor-mentee programs throughout their time with the institution

b) Higher level courses on human values in every aspect of living. E.g. as a professional

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		0	0	4	2
	PYTHON: DEEP LEARNING **(Skill Oriented Course)**				

Course Outcomes:

At the end of the Course, Student will be able to:
- Demonstrate the basic concepts fundamental learning techniques and layers.
- Discuss the Neural Network training, various random models.
- Apply various optimization algorithms to comprehend different activation
- functions to understand hyper parameter tuning
- Build a convolutional neural network, and understand its application to build a
- recurrent neural network, and understand its usage to comprehend auto encoders to briefly explain transfer learning

Pre-requisite knowledge :
- Exploratory data analysis: Collecting, importing, pre-processing, organizing, exploring, analyzing data and deriving insights from data
  https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01266690942812979 2728_shared/overview
- Data visualization using Python: Data visualization functions and plots
  https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012605191343693 8241455_shared/overview
- Regression analysis: Regression, types, linear, polynomial, multiple linear, Generalized linear regression models
  https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013204080133365 76065_shared/overview
- Clustering using Python: Clustering, techniques, Assessment and evaluation
  https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013044179942342 6561190_shared/overview
- Machine learning using Python: Machine learning fundamentals, Regression, classification, clustering, introduction to artificial neural networks
  https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012600400790749 184237_shared/overview
- Time series analysis : Patterns, decomposition models, smoothing time, forecasting data
  https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012605180474425 3441280_shared/overview

List of Exercises:

Note: There are online courses indicated in the reference links section. Learners need to go through the contents in order to perform the given exercises

Exercise 1:

Course name : .Build a Convolution Neural Network for Image Recognition.
Go through the modules of the course mentioned and answer the self-assessment questions given in the link below at the end of the course.
Self Assessment - Deep Learning - Viewer Page | Infosys Springboard (onwingspan.com)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Exercise 2:

Module name : Understanding and Using ANN : Identifying age group of an actor
Exercise : Design Artificial Neural Networks for Identifying and Classifying an actor using Kaggle Dataset.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01277649241666355259_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course

Exercise 3:

Module name : Understanding and Using CNN : Image recognition
Exercise: Design a CNN for Image Recognition which includes hyperparameter tuning.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01278569444316774910_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course

Exercise 4:

Module name : Predicting Sequential Data
Exercise: Implement a Recurrence Neural Network for Predicting Sequential Data.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01279144948849868822_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course

Exercise 5:

Module Name: Removing noise from the images
Exercise: Implement Multi-Layer Perceptron algorithm for Image denoising hyperparameter tuning.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01279205825881702472_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course

Exercise 6:

Module Name: Advanced Deep Learning Architectures
Exercise: Implement Object Detection Using YOLO.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01310292337329766873_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course

Exercise 7:

Module Name: Optimization of Training in Deep Learning
Exercise Name: Design a Deep learning Network for Robust Bi-Tempered Logistic Loss.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01310791722668032018 4_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course

Exercise 8:

Module name: Advanced CNN
Exercise: Build AlexNet using Advanced CNN.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01311184442541312984_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Exercise 9:

Module name: Autoencoders Advanced
Exercise: Demonstration of Application of Autoencoders.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013116455128989696962081_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course

Exercise 10 :

Module name: Advanced GANs
Exercise:Demonstration of GAN.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013115545666664289281901_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course

Exercise 11:

Module name : Capstone project
Exercise : Complete the requirements given in capstone project
Description: In this capstone, learners will apply their deep learning knowledge and expertise to a real world challenge.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013119291805696000651_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course

Exercise 12:

Module name : Capstone project
Exercise : Complete the requirements given in capstone project
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013119291805696000651_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course

Reference Books:
1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.
2. Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 2006.
3. Navin Kumar Manaswi, "Deep Learning with Applications Using Python", Apress, 2018.

Hardware and software configuration:

Experimental Environment	Configuration Instructions	
Hardware Environment	CPU	Intel® Core ™ i7-6700 CPU 4GHz
	GPU	Nvidia GTX 750, 4GB
	Memory	8 GB
Software Environment	Operating System	Ubuntu 14.04, 64 bit
	Programming Environment	Tensorflow deep learning framework and Python language

Web Links: [Courses mapped to Infosys Springboard platform]
1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012782105116811264219_shared/contents   [Introduction to Deep Learning]
2. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013119291805696000651_shared [Deep learning for Developers]

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		0	0	4	2

MEAN STACK TECHNOLOGIES-MODULE II- ANGULAR JS, MONGODB
(Skill Oriented Course)

Course Outcomes:
- Build a component-based application using Angular components and enhance their functionality using directives.
- Utilize data binding for developing Angular forms and bind them with model data.
- Apply Angular built-in or custom pipes to format the rendered data.
- Develop a single page applic
- ation by using synchronous or asynchronous Angular routing.
- Make use of MongoDB queries to perform CRUD operations on document database.

List of Exercises:

1.a	**Course Name:** Angular JS
	Module Name: Angular Application Setup
	Observe the link http://localhost:4200/welcome on which the mCart application is running. Perform the below activities to understand the features of the application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24049616594198490000_shared?collectionId=lex_208585155432546000 00_shared&collectionType=Course
1.b	**Course Name:** Angular JS
	Module Name: Components and Modules
	Create a new component called hello and render Hello Angular on the page
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28217843279641040000_shared?collectionId=lex_208585155432546000 00_shared&collectionType=Course
1.c	**Course Name:** Angular JS
	Module Name: Elements of Template
	Add an event to the hello component template and when it is clicked, it should change the courseName.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19226434057992030000_shared?collectionId=lex_208585155432546000 00_shared&collectionType=Course
1.d	**Course Name:** Angular JS
	Module Name: Change Detection
	progressively building the PoolCarz application
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_25609816371207710000_shared?collectionId=lex_2085851554325460000 0_shared&collectionType=Course
2.a	**Course Name:** Angular JS
	Module Name: Structural Directives - ngIf
	Create a login form with username and password fields. If the user enters the correct credentials, it should render a "Welcome <<username>>" message otherwise it should render "Invalid Login!!! Please try again..." message
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012763740226043904 2595_shared?collectionId=lex_20858515543 254600000_shared&collectionType=Course

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

2.b	**Course Name:** Angular JS
	Module Name: ngFor
	Create a courses array and rendering it in the template using ngFor directive in a list format.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32795774277593590000_shared?collectionId=lex_208585155432546000 00_shared&collectionType=Course
2.c	**Course Name:** Angular JS
	Module Name: ngSwitch
	Display the correct option based on the value passed to ngSwitch directive.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_23388127475984175000_shared?collectionId=lex_208585155432546000 00_shared&collectionType=Course
2.d	**Course Name:** Angular JS
	Module Name: Custom Structural Directive
	Create a custom structural directive called 'repeat' which should repeat the element given a number of times.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24073319904331424000_shared?collectionId=lex_208585155432546000 00_shared&collectionType=Course
3.a	**Course Name:** Angular JS
	Module Name: Attribute Directives - ngStyle
	Apply multiple CSS properties to a paragraph in a component using ngStyle.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24037156998765367000_shared?collectionId=lex_208585155432546000 00_shared&collectionType=Course
3.b	**Course Name:** Angular JS
	Module Name: ngClass
	Apply multiple CSS classes to the text using ngClass directive.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_34596102970741820000_shared?collectionId=lex_208585155432546000 0_shared&collectionType=Course
3.c	**Course Name:** Angular JS
	Module Name: Custom Attribute Directive
	Create an attribute directive called 'showMessage' which should display the given message in a paragraph when a user clicks on it and should change the text color to red.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_14783742359773809000_shared?collectionId=lex_208585155432546000 00_shared&collectionType=Course
4.a	**Course Name:** Angular JS
	Module Name: Property Binding
	Binding image with class property using property binding.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_8951964709153619000_shared?collectionId=lex_208585155432546000 0_shared&collectionType=Course
4.b	**Course Name:** Angular JS
	Module Name: Attribute Binding
	Binding colspan attribute of a table element to the class property.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_7154252883180625000_shared?collectionId=lex_208585155432546000 0_shared&collectionType=Course

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

4.c	**Course Name:** Angular JS
	Module Name: Style and Event Binding
	Binding an element using inline style and user actions like entering text in input fields.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_7417401021103822000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
5.a	**Course Name:** Angular JS
	Module Name: Built in Pipes
	Display the product code in lowercase and product name in uppercase using built-in pipes.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_11810543990912035000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
5.b	**Course Name:** Angular JS
	Module Name: Passing Parameters to Pipes
	Apply built-in pipes with parameters to display product details.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_21187073707540988000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
5.c	**Course Name:** Angular JS
	Module Name: Nested Components Basics
	Load CourseslistComponent in the root component when a user clicks on the View courses list button.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24231999287700136000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
6.a	**Course Name:** Angular JS
	Module Name: Passing data from Container Component to Child Component
	Create an AppComponent that displays a dropdown with a list of courses as values in it. Create another component called the CoursesList component and load it in AppComponent which should display the course details. When the user selects a course from the
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15758356947336235000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
6.b	**Course Name:** Angular JS
	Module Name: Passing data from Child Component to ContainerComponent
	Create an AppComponent that loads another component called the CoursesList component. Create another component called CoursesListComponent which should display the courses list in a table along with a register .button in each row. When a user clicks on th
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24949806899916818400_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
6.c	**Course Name:** Angular JS
	Module Name: Shadow DOM
	Apply ShadowDOM and None encapsulation modes to components.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10312243404892470000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
6.d	**Course Name:** Angular JS
	Module Name: Component Life Cycle

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	Override component life-cycle hooks and logging the corresponding messages to understand the flow.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10818939635948007000_shared?collectionId=lex_208585155432546000 00_shared&collectionType=Course
7.a	**Course Name:** Angular JS
	Module Name: Template Driven Forms
	Create a course registration form as a template-driven form.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2810668513603024400_shared?collectionId=lex_2085851554325460000 0_shared&collectionType=Course
7.b	**Course Name:** Angular JS
	Module Name: Model Driven Forms or Reactive Forms
	Create an employee registration form as a reactive form.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33704702617536004000_shared?collectionId=lex_208585155432546000 00_shared&collectionType=Course
7.c	**Course Name:** Angular JS
	Module Name: Custom Validators in Reactive Forms
	Create a custom validator for an email field in the employee registration form (reactive form)
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33728128192769250000_shared?collectionId=lex_208585155432546000 00_shared&collectionType=Course
8.a	**Course Name:** Angular JS
	Module Name: Custom Validators in Template Driven forms
	Create a custom validator for the email field in the course registration form.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_27688491925133280000_shared?collectionId=lex_208585155432546000 00_shared&collectionType=Course
8.b	**Course Name:** Angular JS
	Module Name: Services Basics
	Create a Book Component which fetches book details like id, name and displays them on the page in a list format. Store the book details in an array and fetch the data using a custom service.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32584403823635940000_shared?collectionId=lex_208585155432546000 00_shared&collectionType=Course
8.c	**Course Name:** Angular JS
	Module Name: RxJS Observables
	Create and use an observable in Angular.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_62096093639052560000_shared?collectionId=lex_2085851554325460000 0_shared&collectionType=Course
9.a	**Course Name:** Angular JS
	Module Name: Server Communication using HttpClient
	Create an application for Server Communication using HttpClient
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012763739531706368261 5_shared?collectionId=lex_20858515543 254600000_shared&collectionType=Course
9.b	**Course Name:** Angular JS
	Module Name: Communicating with different backend services using Angular

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	HttpClient
	Create a custom service called ProductService in which Http class is used to fetch data stored in the JSON files.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_4266333361795059700_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
10. a	**Course Name:** Angular JS
	Module Name: Routing Basics, Router Links
	Create multiple components and add routing to provide navigation between them.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3782024852517635000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
10. b	**Course Name:** Angular JS
	Module Name: Route Guards
	Considering the same example used for routing, add route guard to BooksComponent. Only after logging in, the user should be able to access BooksComponent. If the user tries to give the URL of Bookscomponent in another tab or window, or if the user tries
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3030332573187647000_shared?collectionId=lex_2085851554325460000_00_shared&collectionType=Course
10. c	**Course Name:** Angular JS
	Module Name: Asynchronous Routing
	Apply lazy loading to BookComponent. If lazy loading is not added to the demo, it has loaded in 1.14 s. Observe the load time at the bottom of the browser console. Press F12 in the browser and click the Network tab and check the Load time
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9878739890118246000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
10. d	**Course Name:** Angular JS
	Module Name: Nested Routes
	Implement Child Routes to a submodule.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012768043900444672140_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
11. a	**Course Name:** MongoDB Essentials - A Complete MongoDB Guide
	Module Name: Installing MongoDB on the local computer, Create MongoDB Atlas Cluster
	Install MongoDB and configure ATLAS
	https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821437313024030083_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course
11. b	**Course Name:** MongoDB Essentials - A Complete MongoDB Guide
	Module Name: Introduction to the CRUD Operations
	Write MongoDB queries to perform CRUD operations on document using insert(), find(), update(), remove()
	https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821874166169630118_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course
12. a	**Course Name:** MongoDB Essentials - A Complete MongoDB Guide
	Module Name: Create and Delete Databases and Collections
	Write MongoDB queries to Create and drop databases and collections.
	https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821654

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	119219230121_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course
12. b	**Course Name:** MongoDB Essentials - A Complete MongoDB Guide
	Module Name: Introduction to MongoDB Queries
	Write MongoDB queries to work with records using find(), limit(), sort(), createIndex(), aggregate().
	https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01328908162 64519682505_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
4. MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow, O'Reilly

Software configuration and installation:

1. Angular
   Setup details: Angular Application Setup - Internal - Viewer Page | Infosys Springboard (onwingspan.com)
2. MongoDB
   TOC - MongoDB Essentials - A Complete MongoDB Guide | Infosys Springboard (onwingspan.com)

Web Links:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview (Angular JS)

2. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview (MongoDB)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester	Minor Course	L	T	P	C
		3	0	2	4

SOFTWARE ENGINEERING

Course Objectives:
This course is designed to acquire the generic software development skill through various stages of software life cycle and also to ensure the quality of software through software development with various protocol based environment

Course Outcomes:
Students taking this subject will gain software engineering skills in the following areas:
- Ability to transform an Object-Oriented Design into high quality, executable code
- Skills to design, implement, and execute test cases at the Unit and Integration level
- Compare conventional and agile software methods
- Prepare SRS document, design document, test cases and software configuration management and risk management related document.
- Develop function oriented and object oriented software design using tools like rational rose.
- Use modern engineering tools necessary for software project management, estimations, time management and software reuse
- Generate test cases for software testing

UNIT I
The Nature of Software, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

UNIT II
Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge, Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

UNIT III
Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modelling,.

UNIT IV
Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles,
Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, Components, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component- Based Development.

UNIT V
The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation, Elements of Software Qualtiy Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing.

List of Experiments:

1) Perform the following, for the following experiments:
    i.   Do the Requirement Analysis and Prepare SRS
    ii. Draw E-R diagrams, DFD, CFD and structured charts for the project.
1) Course Registration System
2) Students Marks Analyzing System
3) Online Ticket Reservation System
4) Stock Maintenance
5) Draw the UML Diagrams for the problem 1,2, 3, 4.
6) Design the test cases for e-Commerce application (Flipcart, Amazon)
7) Design and Implement ATM system through UML Diagrams.

Text Books:

1) Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
2) Software Engineering, Ian Sommerville, Ninth Edition, Pearson.

Reference Books:

1) Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
2) Software Engineering, Ugrasen Suman, Cengage.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105182/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

MINOR COURSES

PART –B

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

PART B	Minor Course	L	T	P	C
		4	0	0	4
	COMPUTATIONAL THINKING				

Course Objective:

- The subject is aimed at students with little or no programming experience.
- It aims to provide students with an understanding of the role computation can play in solving problems.
- It also aims to help students, regardless of their major, to feel justifiably confident of their ability to write small programs that allow them to accomplish useful goals.

Course Outcomes:

After studying this course, Student should be able to:

1. Describe the skills that are involved in computational thinking
2. Demonstrate the concepts of Boolean Logic and Software Development.
3. Analyze the concepts of algorithmic thinking as modeling and abstraction as encapsulation.
4. Illustrate the distinctive nature of data organization, White box and Black box testing.
5. Student will be aware of a range of applications of computational thinking in different disciplines, Authentication and authorization.

UNIT I:
Introduction: Computers, Computational Thinking, Abacus to Machine, The First Software, The First Modern Computer, Moore's Law, **Real-World Information Becomes Computable Data,** Information and Data, Converting Information into Data, Data Capacity, Data Compression

UNIT II:
Logic: Boolean Logic, Applications of Propositional Logic, **Solving Problems,** Logical Reasoning, Decomposition: Software Design, Decomposition: Other Uses, Abstraction: Class Diagrams, Abstraction: Use Case Diagrams

UNIT III:
Algorithmic Thinking: Algorithms, Software and Programming, Languages, Actions, **Modeling Solutions:** Activity Diagrams, Selection in Activity Diagrams, Repetition in Activity Diagrams, Control Abstraction in Activity Diagrams, States and State Diagrams, Behavior in State Diagrams,

UNIT IV:
Data Organization: Names, Lists, Graphs, Hierarchies, **Algorithmic Thinking:** Von Neumann Architecture, Spreadsheets, Text Processing, Patterns, Computer Errors, Software Correctness, Verification, Software Testing, White Box Testing, Black Box Testing with Equivalence Partitioning, Boundary Value Analysis

UNIT V:
Concurrent Activity: Parallelism or Concurrency, Scheduling, Sorting Networks, **Information Security:** Security, Foundations, Common Forms of Cybercrime, Secure- Step 1: Authenticate, Secure- Step 2: Authorization, All a Matter of Risk

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Book:
1. David Riley, Kenny A. Hunt, Computational Thinking for the Modern Problem Solver, 2014.
2. G Venkatesh, Madhavan Mukund, Computational Thinking: A Primer for Programmers and Data Scientists, 2021.

Reference Books:
1. Paolo Ferragina, Fabrizio Luccio, Computational Thinking: First Algorithms, then coding, Springer, 2018.
2. Karl Beecher, computational thinking: A beginner's guide to problem-solving and programming, 2017.

NPTEL Link: Physics through Computational Thinking:
https://onlinecourses.nptel.ac.in/noc22_ph12/preview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

PART B	Minor Course	L	T	P	C
		3	0	2	4
	OBJECT ORIENTED PROGRAMMING THROUGH JAVA				

Course Objectives:

The learning objectives of this course are:

- To identify Java language components and how they work together in applications
- To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- Practice programming in the Java
- Gain knowledge of object-oriented paradigm in the Java programming language

Course Outcomes:

By the end of the course, the student will be

- Evaluate default value of all primitive data type, Operations, Expressions, Control- flow, Strings
- Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrating   simple   inheritance, multi-level inheritance, Exception handling mechanism
- Construct Threads, Event Handling, implement packages, developing applets

UNIT I

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

dimensional Arrays, Arrays of Varying Lengths, Three- dimensional Arrays, Arrays as Vectors.
Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.
Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV
Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Random Class, Time Package, Formatting for Date/Time in Java,
Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.

UNIT V
String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class String Builder.

List of Experiments:

Exercise - 1 (Basics)
a) Write a JAVA program to display default value of all primitive data type of JAVA
b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)
a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
b) Write a JAVA program to sort for an element in a given list of elements using bubble sort
c) Write a JAVA program using StringBuffer to delete, remove character.

Exercise - 3 (Class, Objects)
a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
b) Write a JAVA program to implement constructor.

Exercise - 4 (Methods)
a) Write a JAVA program to implement constructor overloading.
b) Write a JAVA program implement method overloading.

Exercise - 5 (Inheritance)
a) Write a JAVA program to implement Single Inheritance
b) Write a JAVA program to implement multi level Inheritance

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Exercise - 6 (Inheritance - Continued)
a) Write a JAVA program give example for "super" keyword.
b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise - 7 (Exception)
a) Write a JAVA program that describes exception handling mechanism
b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)
Write a JAVA program that implements Runtime polymorphism

Exercise – 9 (User defined Exception)
a) Write a JAVA program for creation of Illustrating throw
b) Write a JAVA program for creation of Illustrating finally

Text Books:
1) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2) The complete Reference Java, 8th edition, Herbert Schildt, TMH.

References Books:
1) Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
2) Murach's Java Programming, Joel Murach

e-Resources:
1) https://nptel.ac.in/courses/106/105/106105191/
2) https://www.w3schools.com/java/java_data_types.asp

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

PART B	Minor Course	L	T	P	C
		3	0	2	4
DATA ANALYTICS USING PYTHON					

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

PART B	Minor Course	L	T	P	C
		4	0	0	4
	ARTIFICIAL INTELLIGENCE				

Course Objectives: The student will be able to
- Know the methodology of Problem solving
- Implement basic AI algorithms
- Design and carry out an empirical evolution of different algorithms on a problem formalization

Course Outcomes (COs): At the end of the course, student will be able to
- Understand the fundamental concepts in Artificial Intelligence
- Analyze the applications of search strategies and problem   reductions
- Apply the mathematical logic concepts.
- Develop the Knowledge representations in Artificial Intelligence.
- Explain the Fuzzy logic systems.

UNIT I:
Introduction to artificial intelligence: Introduction ,history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI.

UNIT II:
Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem
Search Strategies: exhaustive searches, heuristic search techniques, iterative-deepening A*, constraint satisfaction

UNIT III:
Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, predicate logic

UNIT IV:
Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR
Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure.

UNIT V:
Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools.

Text Books:
1. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach , 2nd ed, Stuart Russel, Peter Norvig, PEA
3. Artificial Intelligence, Rich, Kevin Knight, Shiv Shankar B Nair, 3rd ed, TMH
4. Introduction to Artificial Intelligence, Patterson, PHI

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:

1. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5th ed, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

PART B	Minor Course	L	T	P	C
		3	0	2	4
	UNIX AND SHELL PROGRAMMING				

Course Objectives:
Understating the shell commands, shell programming, system calls of files and processes, signals, inter-process communication concepts and programming, TCP and UDP.

Course Outcomes: After finishing this course student will be able to:
- Gain good knowledge on Unix commands and awareness of shell programming
- Know about different system calls for files and directories
- Ability to know the working of processes and signals
- Application of client server program for IPC
- Knowledge about socket programming

UNIT-I:
Introduction, Architecture of unix, Responsibilities of shell, unix file system, vi editor. **Unix commands**: Some Basic Commands, file utilities, process utilities, text processing utilities, network utilities, disk utilities, backup utilities , Security by file permissions.

UNIT-II:
Shell Programming: shell variables, The Export command, The Profile File a Script Run During starting, The First Shell Script, The read command, Positional Parameters, The $? Variable , Knowing the exit Status- More about the Set Command, The Exit command, Branching Control Structures, Loop Control Structures, The Continue and Break Statement- The Expr Command, Performing Integer Arithmetic- Real Arithmetic in Shell Programs- The here Document(<<), The Sleep Command, Debugging Scripts, The Script command, The Eval command, The Exec Command, Sample programs.

UNIT-III:
Files - Introduction, file descriptors, open, creat, read, write, close, lseek, dup2, file status information-stat family, file and record locking- fcntl function, file permissions - chmod, fchmod, file ownership-chown, lchown, links-soft and hard links-symlink, link, unlink.

UNIT IV:
Directories-Creating, removing and changing Directories-mkdir, rmdir, chdir, obtaining current working directory-getcwd, Directory contents, Scanning Directories-opendir, readdir, closedir, rewinddir functions.

UNIT V:
Process Control: process identifiers, fork function, vfork function, exit function, wait and waitpid functions, exec functions, user identification. **Signals**: signal handling using signal function, kill and raise, alarm, pause, abort and sleep functions.

List of Experiments:
1)a) Study of Unix/Linux general purpose utility command list: man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.
   b) Study of vi editor
   c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system
   d) Study of Unix/Linux file system (tree structure)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

e)Study of .bashrc, /etc/bashrc and Environment variables.

2)Write a C program that makes a copy of a file using standard I/O, and system calls

3)Write a C program to emulate the UNIX ls –l command.

4)Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls –l | sort

5) Implementation of fork (), wait (), exec() andexit (), System calls

Text Books:
4. Unix the ultimate guide, 3rd edition, Sumitabha Das, TMH.
5. Advanced programming in the Unix environment by W. Richard Stevens.
6. Unix network programming by W. Richard Stevens.

Reference Books:
1. Introduction to Unix and shell programming, Venkateshmurhty
2. Unix and shell programming by B.M. Harwani, OXFORD university press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

PART B	Minor Course	L	T	P	C
		4	0	0	4
	CLOUD COMPUTING				

Course Objectives:
- To explain the evolving computer model caned cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.
- To motivate students to do programming and experiment with the various cloud computing environments.

Course Outcomes: At the end of the course, student will be able to
- Illustrate the key dimensions of the challenge of Cloud Computing
- Classify the Levels of Virtualization and mechanism of tools.
- Analyze Cloud infrastructure including Google Cloud and Amazon Cloud.
- Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud
- Assess control storage systems and cloud security, the risks involved its impact and develop cloud application

UNIT I:
Systems Modeling, Clustering and Virtualization: Scalable Computing over the Internet-The Age of Internet Computing, Scalable computing over the internet, Technologies for Network Based Systems, System models for Distributed and Cloud Computing, , Performance, Security and Energy Efficiency

UNIT II:
Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, Virtualization Structures/ Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

UNIT III:
Cloud Platform Architecture: Cloud Computing and Service Models, Public Cloud Platforms, Service Oriented Architecture, Programming on Amazon AWS and Microsoft Azure

UNIT IV:
Cloud Resource Management and Scheduling: Policies and Mechanisms for Resource Management, Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds-Fair Queuing, Start Time Fair Queuing.

UNIT V:
Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system.

Text Books:
3. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
4. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:

4. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press
5. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
6. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Suggested Courses for Honors Program

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - II Semester	Honors Course	L	T	P	C
		4	0	0	4
	MATHEMATICS FOR MACHINE LEARNING **(AI & ML)**				

Course Objectives:
The main objectives of this course is to make student understand and apply the basic mathematical concepts that are essential for machine learning algorithms

Course Outcomes:
By the end of the course, the student will be able to
- understand the basic notions of machine learning and of the related basic mathematical tools;
- comprehend the basic concepts and techniques of convex optimization
- have a good knowledge of the statistical and computational properties of some well known machine learning algorithms;
- implement machine learning algorithms on synthetic and real data sets using mathematical concepts like linear algebra, probability and calculus

UNIT-I
Linear Algebra: Systems of Linear Equations, Matrices, Solving Systems of Linear Equations, Vector Spaces, Linear Independence, Basis and Rank, Linear Mappings, Affine Spaces

UNIT-II
Analytic Geometry: Norms, Inner Products, Lengths and Distances, Angles and Orthogonality, Orthonormal Basis, Orthogonal Complement, Inner Product of Functions, Orthogonal Projections, Rotations

UNIT-III
Matrix Decompositions: Determinant and Trace, Eigenvalues and Eigenvectors, Cholesky Decomposition, Eigendecomposition and Diagonalization, Singular Value Decomposition, Matrix Approximation, Matrix Phylogeny

UNIT-IV
Vector Calculus : Differentiation of Univariate Functions, Partial Differentiation and Gradients, Gradients of Vector-Valued Functions, Gradients of Matrices, Useful Identities for Computing Gradients, Backpropagation and Automatic Differentiation, Higher-Order Derivatives, Linearization and Multivariate Taylor Series

UNIT-V
Probability and Distributions: Construction of a Probability Space, Discrete and Continuous Probabilities, Sum Rule, Product Rule, and Bayes' Theorem, Summary Statistics and Independence, Gaussian Distribution, Conjugacy and the Exponential Family, Change of Variables/Inverse Transform
Continuous Optimization: Optimization Using Gradient Descent, Constrained Optimization and Lagrange Multipliers, Convex Optimization

Text Books:
1. "Mathematics for Machine Learning", Marc Peter Deisenroth, A. Aldo Faisal and Cheng Soon Ong, Cambridge University Press.
2. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, 2nd Edition, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer 2017.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:

1. Machine Learning: An Applied Mathematics Introduction, Paul Wilmott, Panda Ohana Publishing 2019.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	Honors Course	L	T	P	C
		4	0	0	4
	TEXT MINING AND TIME SERIES ANALYSIS (AI & ML)				

Course Objectives: This course will cover the major techniques for mining and analyzing text data to discover interesting patterns, extract useful knowledge, and support decision making, with an emphasis on statistical approaches that can be generally applied to arbitrary text data in any natural language with no or minimum human effort. Develop the skills needed to do empirical research in fields operating with time series data sets. The course aims to provide students with techniques and receipts for estimation and assessment of quality of economic models with time series data.

Course Outcomes:
After completing the course Student will be able to:
- Student will be aware of fundamental concepts of text mining, unsupervised information extraction.
- Student will be aware of text clustering algorithms like feature selection, distance-based clustering and latent semantic indexing.
- Student will be aware of Text classification algorithm and text mining techniques.
- Student should aware of all the characteristics of time series and measures of dependencies.
- Student will be able to understand the ARIMA Models.

UNIT I:
Introduction to Text Mining: Introduction, Algorithms for Text Mining, Information Extraction from Text: Introduction, Named Entity Recognition, Relation Extraction, Unsupervised Information Extraction. Text Summarization Techniques: Extractive Summarization, Topic Representation Approaches, Influence of Context, Indicator Representation and Machine Learning for Summarization.

UNIT II:
Text Clustering Algorithms: Introduction, Feature Selection and Transformation Methods for Text Clustering, Distance-Based Clustering Algorithms, Word and Phrase-based Clustering, Probabilistic Document Clustering and Topic Modelling. Dimensionality Reduction and Topic Modelling: Latent Semantic Indexing, Topic Models and Dimension Reduction.

UNIT III:
Text Classification Algorithms: Introduction, Feature Selection for Text Classification, Decision Tree Classifiers, Rule-based Classifier, Probabilistic and Naïve Bayes Classifiers, Linear Classifier, Proximity-based Classifier, Meta-Algorithms for Text Classification, Probabilistic Models for Text Mining: Mixture models, Stochastic Processes in Bayesian Nonparametric Models, Graphical Models.

UNIT IV:
Characteristics of Time Series: Introduction, Nature of Time Series Data, Time Series Statistical Models, Measures of Dependence: Autocorrelation and Cross-Correlation, Stationary Time Series, Time Series Regression and Exploratory Data Analysis: Classical Regression, Exploratory Data Analysis, Smoothing.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V:
ARIMA Models: Introduction, Autoregressive Moving Average Models, Difference Equations, Autocorrelation and Partial Autocorrelation, Building ARIMA Models, Multiplicative Seasonal ARIMA Models, Spectral Analysis and Filtering: Cyclical Behaviour and Periodicity, Spectral Density, Periodogram and Discrete Fourier Transform, Nonparametric and Parametric Spectral Estimation, Linear Filters, Dynamic Fourier Analysis and Wavelets.

Text Books:
1. Charu C. Aggarwal, Chengxing Zhai, "Mining Text Data", Kluver Academic Publishers, Springer, 2012.
2. Robert H. Shumway and David S. Stoffer, "Time Series Analysis and Its Applications with R Examples", Springer, 2016.

Reference Books:
1. James D. Hamilton, Time Series Analysis, Princeton University Press, 2004.
2. Avishek Pal and PKS Prakash, Practical Time Series Analysis, Birmingham - Mumbai, 2017.
3. Box, G.E.P., G.M. Jenkins and G.C. Reinsel. n Time Series Analysis, Forecasting, and Control, 3rd ed. Englewood Cliffs, NJ: Prentice Hall, 1994.
4. Chan, N.H. Time Series: Applications to Finance. 2002, New York: Wiley.
5. Fuller, W.A. Introduction to Statistical Time Series, 2nd ed. New York: Wiley, 1996.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	L	T	P	C
Honors Course	4	0	0	4
NATURAL LANGUAGE PROCESSING **(AI & ML)**				

Course Objectives:
- This course introduces the fundamental concepts and techniques of natural language processing (NLP).
- Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
- The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
- Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

Course Outcomes: After completion of this course
- Demonstrate a given text with basic Language features
- To design an innovative application using NLP components
- Explain a rule based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To compare and contrast the use of different statistical approaches for different types of NLP applications.

UNIT I:
Introduction : Origins and challenges of NLP, Language Modeling: Grammar-based LM, Statistical LM, Regular Expressions, Finite-State Automata, English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT II:
Word Level Analysis: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging, Hidden Markov and Maximum Entropy models.

UNIT III:
Syntactic Analysis : Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar, Dependency Grammar, Syntactic Parsing, Ambiguity, Dynamic Programming parsing, Shallow parsing, Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs, Feature structures, Unification of feature structures

UNIT IV:
Semantics And Pragmatics: Requirements for representation, First-Order Logic, Description Logics, Syntax-Driven Semantic analysis, Semantic attachments, Word Senses, Relations between Senses, Thematic Roles, selectional restrictions, Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods, Word Similarity using Thesaurus and Distributional methods.

UNIT V:
Discourse Analysis And Lexical Resources : Discourse segmentation, Coherence, Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm, Coreference Resolution, Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:

1. Daniel Jurafsky, James H. Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, Natural Language Processing with Python, First Edition, OReilly Media, 2009.

Reference Books:

1. Breck Baldwin, Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, Natural Language Processing with Java, OReilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, Handbook of Natural Language Processing, Second, Chapman and Hall/CRC Press, 2010. Edition
4. Tanveer Siddiqui, U.S. Tiwary, Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Honors Course	L	T	P	C
	4	0	0	4
REINFORCEMENT LEARNING **(AI & ML)**				

Course Objectives:

By the end of the class students should be able to:

- Define the key features of reinforcement learning that distinguishes it from AI and non-interactive machine learning.
- Given an application problem (e.g. from computer vision, robotics, etc), decide if it should be formulated as a RL problem; if yes be able to define it formally (in terms of the state space, action space, dynamics and reward model), state what algorithm (from class) is best suited for addressing it and justify your answer.

Course Outcomes:

By the end of this course, students should be able to do the following:

1. Learn how to define RL problems like Tic-Tac-Toe, Multi-arm.
2. Student will be able to understand the finite markov decision processes.
3. Student will be to Understand Monte Carlo Methods and how it is work with tabular methods to solve classical control problems
4. Student should aware of Eligibility Traces and Understand how to find with approximate solutions.
5. Explore imitation learning tasks and solutions
6. Recognize current advanced techniques and applications in RL

UNIT I:
Reinforcement Learning Problem: Introduction, Elements of Reinforcement Learning, Limitations and Scope, Tic-Tac-Toe, Multi-arm Bandits: *n*-Armed Bandit Problem, Action-Value Methods, Incremental Implementation, Tracking Nonstationary Problem, Optimistic Initial Values, Upper-Confidence-Bound Action Selection, Gradient Bandit, Associative Search.

UNIT II:
Finite Markov Decision Processes: Agent-Environment Interface, Markov Property, Markov Decision Processes, Value Functions, Optimal Value Functions, Optimality and Approximation, Dynamic Programming: Policy- Evaluation, Improvement, Iteration, Value Iteration, Asynchronous Dynamic Programming, Generalized Policy Iteration, Efficiency of Dynamic Programming.

UNIT III:
Monte Carlo Methods: Monte Carlo- Prediction, Estimation of Action Values, Control, Control without Exploring Start, Temporal- Difference learning: TD Prediction, Advantages of TD Prediction Methods, Optimality of TD(0), Sarsa: On-Policy TD Control, Q-Learning, Games, Afterstates.

UNIT IV:
Eligibility Traces: *n*-Step TD Prediction, Forward and Backward View of TD(λ), Equivalences of Forward and Backward Views, saras(λ), Watkin's Q(λ), Off-policy Eligibility Traces using Important Sampling, Variable λ.

UNIT V:
Planning and Learning with Tabular Methods: Models and Planning, Integrating Planning, Acting and Learning, Prioritized Sweeping, Full vs. Sample Backups, Trajectory Sampling, Heuristic Search, Monte Carlo Tree Search.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Book:
1. Rich S. Sutton, Andrew G. Barto, Reinforcement Learning: An Introduction, Second Edition, MIT Press, 2015.
2. Boris Belousov, Hany Abdulsamad, Pascal Klink, Simone parisi, Reinforcement Learning Algorithms: Analysis and Applications, 1st Edition, Springer, 2021.

Reference Books:
1. Phil Winder, Reinforcement Learning: Industrial Applications of Intelligent Agent, 1st Edition, O'Reilly, 2020.
2. Kyriakos G. Vamvoudakis, Yan Wan, Frank, L. Lewis, Derya Cansever, Handbook of Reinforcement Learning and Control, 1st Edition, Springer, 2021.

NPTEL Link: Reinforcement Learning: https://onlinecourses.nptel.ac.in/noc22_cs34/preview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - II Semester	Honors Course	L	T	P	C
		4	0	0	4
	INTERNET OF THINGS **(Systems Engineering)**				

Course Objectives:

The main objectives of this course are

- Vision and Introduction to Internet of Things (IoT).
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Understand Real World IoT Design Constraints, Industrial Automation and Commercial.

Course Outcomes (COs):

At the end of the course, student will be able to

- Explain in a concise manner how the general Internet as well as Internet of Things work.
- Understand constraints and opportunities of wireless and mobile networks for Internet of Things.
- Use basic sensing and measurement and tools to determine the real-time performance of network of devices.
- Develop prototype models for various applications using IoT technology.

UNIT I:

The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

UNIT II:

Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT III:

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT IV:

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT V:

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press,2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things, CunoPfister , Oreilly

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

		L	T	P	C
	Honors Course	4	0	0	4
	DATA COMMUNICATIONS AND INFORMATION CODING THEORY **(Systems Engineering)**				

Course Objective:
The objective of this course is to introduce the basic concepts of information theory and coding, including information, source coding, channel model, channel capacity, channel coding and so on.

Course Outcomes:
The students at the end of the course will be able to:
- Understand and explain the basic concepts of information theory, source coding, channel and channel capacity, channel coding and relation among them.
- Describe the real life applications based on the fundamental theory.
- Calculate entropy, channel capacity, bit error rate, code rate, steady-state probability and so on.
- Implement the encoder and decoder of one block code or convolutional code using any program language

UNIT I:
Overview; Basic Concepts - Entropy and Mutual information; Lossless Source Coding – Source entropy rate; Kraft inequality; Huffman code; Asymptotic equipartition property; Universal coding; Noisy Channel Coding - Channel capacity

UNIT II:
Random channel codes; Noisy channel coding theorem for discrete memory-less channels; Typical sequences; Error exponents; Feedback; Continuous and Gaussian channels; Lossy Source Coding - Rate-Distortion functions; Random source codes; Joint source-channel coding and the separation theorem.

UNIT III:
Source coding- Text, Audio and Speech: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 - Speech: Channel Vocoder, Linear Predictive Coding

UNIT IV:
Source coding- Image and Video: Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Image compression: READ, JPEG – Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation, H.261, MPEG standard

UNIT V:
Error control coding- Block codes: Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, Cyclic codes - Syndrome calculation, Encoder and decoder – CRC Error control coding

Text books:
1. Mark Kelbert(Author), Yuri Suhov, Information Theory and Coding by Example, Cambridge University Press,2013

Reference books:
1. Simon Haykin and Michael Moher, Communication Systems, 5th Edition, Wiley, 2010
2. T.M. & Thomas, J.A. (2006). Elements of information theory. New York: Wiley.
3. Ad´amek, Foundations of coding, Wiley Interscience, 1991.
4. T. M. Cover and J. A. Thomas, Elements of information theory, Wiley, 1991.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Honors Course	L	T	P	C
	4	0	0	4

SERVICE ORIENTED ARCHITECTURES
(Systems Engineering)

Course Objectives:
- To gain understanding of the basic principles of service orientation
- To learn service oriented analysis techniques
- To learn technology underlying the service design
- To learn the concepts such as SOAP, Registering and Discovering Services.

Course Outcomes: At the end of this course, students are expected to gain the following learning:
1. Get the foundations and concepts of service based computing
2. Advocate the importance and means of technology alignment with business
3. Understanding the basic operational model of web services,
4. Gain the knowledge of key technologies in the service oriented computing arena
5. Apply and practice the learning through a real or illustrative project/case study.

UNIT I
Software Architecture: Need for Software Architecture, Objectives of Software Architecture, Types of Information Technology (IT) Architecture, Architectural Patterns and Styles
Architecting Process for Software Applications: Architectural Considerations, Architecting Process for Software Applications, Level 0: High-Level Architecture, Level 1: Solution Architecture Detailed Design

UNIT II
SOA and MSA Basics: Service Orientation in Daily Life, Evolution of SOA and MSA Service-oriented Architecture and Microservices architecture –Drivers for SOA, Dimensions of SOA, Conceptual Model of SOA, Standards And Guidelines for SOA, Emergence of MSA
Service-Oriented Architecture: Considerations for Enterprise-wide SOA, Strawman Architecture for Enterprise-wide SOA, Enterprise SOA Reference Architecture, Object-oriented Analysis and Design (OOAD) Process, Service-oriented Analysis and Design (SOAD) Process

UNIT III
Service-Oriented Applications: Considerations for Service-oriented Applications, Patterns for SOA, Pattern-based Architecture for Service-oriented Applications, Composite Applications, Composite Application Programming Model
Service-Oriented Analysis and Design: Need for Models, Principles of Service Design Non-functional Properties for Services, Design of Activity Services (or Business Services) Design of Data Services, Design of Client Services, Design of Business Process Services

UNIT IV
Microservices Architecture:
Trend in SOA – Microservices Architecture (MSA): Services Model for Cloud and Mobile Solutions, API Adoption on the Rise, Challenges and Takeways from SOA Implementations Architecture Trend – Microservices Architecture, Microservices Architecture in Action
Cloud and MSA: Cloud Services, Hybrid Cloud Services, Considerations for Hybrid Cloud Services, Cloud Services and MSA, MSA for SMAC Solutions

UNIT V
Mobile and MSA: Mobile Technologies, Types of Mobile Applications, MSA for mobile solutions Case Study: SOA – Loan Management System (LMS) PoC, MSA – APIary PoC

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Book:
1. Shankar Kambhampaty, Service - Oriented Architecture & Microservices Architecture, 3ed: For Enterprise, Cloud, Big Data and Mobile , ISBN: 9788126564064,Wiley.
2. Mark Richards, Microservices vs Service-Oriented Architecture, O'Reilly Media, Inc., 2016.

Reference Books:
1. Thomas Erl, Services-Oriented Architecture: Concepts, Technology and Design, Prentice Hall, 2005.
2. Guido Schmutz, Peter Welkenbach, Daniel Liebhart, Service-Oriented Architecture: An Integration Blueprint, Packt Publisher, 2010.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Honors Course	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**
DESIGN OF SECURE PROTOCOLS **(Systems Engineering)**				

Course Objectives:
The main objective of this course is that to explore various protocols and design of various protocols with deeper security.

Course Outcomes:
By the end of the course Student will
- Get the exposure to various protocols.
- Gain knowledge on various secure mechanisms through set of protocols.
- Efficiently design new set of protocols.
- Learn Security issues and overcome means with protocols.

UNIT – I:
OSI:ISO Layer Protocols: Application Layer Protocols, TCP/IP, HTTP, SHTTP, LDAP, MIME, POP & POP3, RMON, SNTP, SNMP. Presentation Layer Protocols, Light Weight Presentation Protocol Session layer protocols.

UNIT – II:
RPC protocols, transport layer protocols, ITOT, RDP, RUDP, TALI, TCP/UDP, compressed TCP. Network layer Protocols, routing protocols, border gateway protocol-exterior gateway protocol, internet protocol IPv4, IPv6, Internet Message Control Protocol, IRDP Transport Layer Security, TSL, SSL, DTLS

UNIT – III :
Data Link layer Protocol, ARP, In ARP, IPCP, IPv6CP, RARP, SLIP .Wide Area and Network Protocols, ATM protocols, Broadband Protocols, Point to Point Protocols, Other WAN Protocols, security issues.

UNIT – IV:
Local Area Network and LAN Protocols, ETHERNET Protocols, VLAN protocols, Wireless LAN Protocols, Metropolitan Area Network Protocol, Storage Area Network and SAN

UNIT – V :
Protocols, FDMA, WIFI and WIMAX Protocols, security issues. Mobile IP, Mobile Support Protocol for IPv4 and IPv6, Resource Reservation Protocol. Multicasting Protocol, VGMP, IGMP, MSDP .Network Security and Technologies and Protocols, AAA Protocols, Tunneling Protocols, Secured Routing Protocols, GRE- Generic Routing Encapsulation, IPSEC– Security.

Text Books:
1. Jawin: "Networks Protocols Handbook", 3rd Edition, Jawin Technologies Inc., 2005.
2. Bruce Potter and Bob Fleck : "802.11 Security", 1st Edition, O'Reilly Publications, 2002.

Reference Books:
1. Ralph Oppliger :"SSL and TSL: Theory and Practice", 1st Edition, Arttech House, 2009.
2. Lawrence Harte: "Introduction to CDMA- Network services Technologies and Operations", 1st Edition, Althos Publishing, 2004.
3. Lawrence Harte: "Introduction to WIMAX", 1st Edition, Althos Publishing, 2005

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	L	T	P	C
Honors Course	4	0	0	4
NETWORK CODING **(Systems Engineering)**				

Course Objectives:
- Students will gain the understanding of core network programming by using sockets and transport layer protocols like TCP and UDP
- Students will gain the understanding of inter process communication and implementation of different forms of IPC in client-server environment
- Students will get an exposure to various application layer protocols which are designed using sockets and transport layer protocols

Course Outcomes:
By the end of the course, the student will be able to
- Explain the client-server paradigm and socket structures.
- Describe the basic concepts of TCP sockets and TCP echo client-server programs.
- Discuss the UDP sockets and UDP echo client-server programs.
- Explain Socket options and ability to understand IPC
- Apply the applications of sockets and demonstrate skill to design simple applications like FTP, TELNET etc.

UNIT-I:
Introduction to Network Programming: OSI model, transport layer protocols: TCP, UDP and SCTP, network architecture: client-server and peer-to-peer systems, Sockets-socket Address structures: IPv4, IPv6 and Generic-value result arguments, Byte ordering functions, Byte manipulation functions, Address conversion functions

UNIT-II:
TCP: introduction to TCP, TCP connection establishment and termination TIME_WAIT State. Elementary TCP sockets, Socket, connect, bind, listen, accept, fork, exec function, concurrent servers, Close function, read and write functions

UNIT-III:
TCP echo client server program, getsockname and getpeername functions I/O multiplexing: I/O models, Select function, TCP echo server using select function, shutdown function, Poll function

UNIT-IV:
UDP: Introduction to UDP, difference between TCP and UDP, recvfrom( ) and sendto( ) functions, UDP echo client server program, UDP echo client server using select function. Socket Options: IPv4 socket options, IPv6 socket options

UNIT-V:
Socket Options: Generic socket options, TCP socket options. IPC: Introduction to IPC, forms of IPC, UNIX kernel support for pipes, FIFO, message queues, semaphores and shared memory Network programming concepts Implementation: FTP, ping, arp, SMTP, TELNET

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:
1. Unix Network programming, the socket networking API, W.Richard Stevens, bill fenner, Andrew m.rudoff ,PHI.

References Books:
1. Advanced programming in the UNIX environment, W.Richard Stevens, pearson education

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - II Semester	Honors Course	L	T	P	C
		4	0	0	4

PRINCIPLES OF CYBER SECURITY
(Information Security)

Course Objectives:
- To learn threats and risks within context of the cyber security architecture.
- Student should learn and Identify security tools and hardening techniques.
- To learn types of incidents including categories, responses and timelines for response.

Course Outcomes: At the end of the course, student will be able to
- Apply cyber security architecture principles.
- Demonstrate the risk management processes and practices.
- Appraise cyber security incidents to apply appropriate response
- Distinguish system and application security threats and vulnerabilities.
- Identify security tools and hardening techniques

UNIT–I:
Introduction to Cyber Security-Cyber security objectives, roles, differences between information security and cyber security, Cyber security principles-confidentiality, integrity, availability, authentication and non repudiation

UNIT–II:
Information Security within Lifecycle Management-Lifecycle management landscape, Security architecture processes, Security architecture tools, Intermediate lifecycle management concepts, **Risks & Vulnerabilities-**Basics of risk management, Operational threat environments, Classes of attacks

UNIT–III:
Incident Response-Incident categories, Incident response, Incident recovery, **Operational security protection**-Digital and data assets, ports and protocols, Protection technologies, Identity and access Management, configuration management

UNIT–IV:
Threat Detection and Evaluation Monitoring-Vulnerability management, Security logs and alerts, Monitoring tools and appliances, **Analysis-**Network traffic analysis, packet capture and analysis

UNIT–V:
Introduction to backdoor System and security-Introduction to metasploit, backdoor, demilitarized zone (DMZ), Digital signature, Brief study on Harding of operating system.

Text Books:
1. NASSCOM: Security Analyst Student Hand Book, Dec 2015
2. Information Security Management Principles, Updated Edition, David Alexander, Amanda Finch, David Sutton, BCS publishers, June 2013

Reference Books:
1. Cyber Security Fundamentals-Cyber Security, Network Security and Data Governance Security, 2nd Edition, ISACA Publishers, 2019

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	L	T	P	C
Honors Course	4	0	0	4
COMPUTATIONAL NUMBER THEORY **(Information Security)**				

Course Objectives: This course will focus on designing efficient algorithms (and providing complexity analysis) for the most important problems from number theory, with major applications in coding theory and cryptography.

Course Outcomes:
Upon completing the course the student will be able to
- understand with basics of number theory and its applications.
- demonstrate the arithmetic of finite fields, polynomials.
- analyze the elliptic curves, testing and factorization.
- Student will be able to solve the discrete logarithms and large sparse linear systems.
- Student will be able to apply the skills for writing programs of cryptography algorithms.

UNIT I:
Arithmetic of Integers: Basic Arithmetic Operations, GCD, Congruences and Modular Arithmetic, Linear Congruences, Polynomial Congruences, Quadratic Congruences, Multiplicative Orders, Continued Fractions, Prime Number Theorem and Riemann Hypothesis, Running Times of Arithmetic Algorithms.

UNIT II:
Arithmetic of Finite Fields: Existence and Uniqueness of Finite Fields, Representation of Finite Fields, Implementation of Finite Field Arithmetic, Arithmetic of Polynomials: polynomials over Finite Fields, Finding Roots of Polynomials over Finite Fields, Factoring Polynomials over Finite Fields, Properties of Polynomials with Integer Coefficients, Factoring Polynomials with Integer Coefficients.

UNIT III:
Arithmetic of Elliptic Curves: Elliptic Curve, Elliptic-Curve Group, Elliptic Curve over Finite Fields, Pairing on Elliptic Curves, Elliptic-Curve Point Counting, Primality Testing: Introduction, Probabilistic Primality Testing, Deterministic Primality Testing, Primality Testing for Number of Special Forms.

UNIT IV:
Integer Factorization: Trial Division, Pollard's Rho Method, Pollard's *p-1* Method, Dixon's Method, CFRAC Method, Quadratic Sieve Method, Cubic Sieve Method, Elliptic Curve Method, Number-Field Sieve Method, Discrete Logarithms: Square-Root Methods, Algorithms: Prime Fields, Fields of Characteristic Two, General Extension Fields, Elliptic Curves(ECDLP).

UNIT V:
Large Sparse Linear Systems: Structured Gaussian Elimination, Lanczos Method, Wiedemann Method, Block Metods

Text Books:
1. Abhijit Das, Computational Number Theory, CRC Hall, 1st Edition, 2013.
2. T. H. Cormen, C. E. Leiserson, R. Rivest and C. Stein, Introduction to Algorithms, Prentice Hall India, 2nd Edition, 2002.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:

1. Victor Shoup, A Computational Introduction to Number Theory and Algebra, 2nd Edition, Cambridge Iniversity Press, 2008.
2. R. Lidl and H. Niederreiter, Introduction to finite fields and their applications, Cambridge University Press, 2021.
3. M. Mignotte, Mathematics for computer algebra, Springer-Verlag, 1992.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

		L	T	P	C
Honors Course		**4**	**0**	**0**	**4**
CRYPTANALYSIS **(Information Security)**					

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Honors Course		L	T	P	C
		4	0	0	4
ELLIPTIC CURVE CRYPTOGRAPHY **(Information Security)**					

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Honors Course		L	T	P	C
		4	0	0	4
INTRODUCTION TO QUANTUM COMPUTING AND QUANTUM CRYPTOGRAPHY **(Information Security)**					

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	Honors Course	**L**	**T**	**P**	**C**
		4	**0**	**0**	**4**
	PUBLIC KEY INFRASTRUCTURE AND TRUST MANAGEMENT **(Information Security)**				

Course objectives:
The course is designed to train the graduates in depth understanding of Public Key Cryptography, Public key Infrastructure, security credentials and design new or modify existing cryptographic techniques.

Course Outcomes:
Graduates after completing the course shall gain:
- In depth understanding of Public key cryptography and Infrastructure.
- Ability to design and analyze Public Key cryptographic techniques.
- Ability to solve network security issues in real time applications.
- Ability to take up doctoral level research work in security.

UNIT I:
Public key infrastructure: components and architecture. PKI interoperability, deployment and assessment PKI data structures – certificates, validation, revocation, authentication, cross-certification. Repository, Certification Authority (CA) and Registration Authority (RA), trusted third party, digital certificates.

UNIT II:
PKI Services: Authentication, Integrity and Confidentiality, Mechanisms, Secure Communication, Secure Time Stamping, Non-Repudiation, Privilege Management, Certificate policies, Certificate Authority, Registration Authority.

UNIT III:
Key and Certificate Management: Key/Certificate Life Cycle Management, Certificate Revocation: Periodic Public Mechanisms, performance, Scalability and Timeliness, Multiple Key pairs, Key Pair Uses, Real-World Difficulties, Independent Certificate Management.

UNIT IV:
Trust Models: Strict Hierarchy of Certification Authorities, Distributed Trust Architecture, Web Model, User-Centric Trust, Cross-Certification, Entity Naming, Certificate Path processing, PKI Information Dissemination: Repositories and Techniques, private Dissemination, Public and Repositories, In-Band Protocol Exchange.

UNIT V:
PKI Standards: Introduction, Major Standards Activities, X.509, PKIX, X.500, LDAP, ISO TC68, ANSI X9f, S/MIME, IPsec, TLS, SPKI, OpenPGP, EDIFACT.

Text Books:
1. Carlisle Adams, Steve Lloyd, Understanding Public-Key Infrastructure: Concepts, Standards, and Deployment Considerations, Sams, 1999.
2. John R. Vacca, Public Key Infrastructure, Building Trusted Applications and Web Services, Auerbach Publications, 2004.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:

1. Messaoud Benantar, Introduction to the Public Key Infrastructure for the Internet, Pearson Education, Prentice Hall, 2011.
2. Ashutosh Saxena, Public Key Infrastructure, Tata McGraw Hill.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Honors Course	L	T	P	C
	4	0	0	4

INFORMATION SECURITY ANALYSIS AND AUDIT
(Information Security)

Course Objectives:
- Understanding and knowledge of Security Auditing, and introduce the Threats and defense in the systems.
- Acquiring the knowledge on Evidence collection and evaluation techniques.

Course Outcomes:
At the end of the course, student will be able to
- Illustrate the fundamental concepts of information security and systems auditing
- Analyze the latest trend of computer security threats and defense
- Identify security weaknesses in information systems, and rectify them with appropriate security mechanisms
- Explain the security controls in the aspects of physical, logical and operational security control and case studies
- Evaluate the security of information systems

UNIT–I:
Overview of Information System Auditing- Effect of Computers on Internal Controls, Effects of Computers on Auditing, Foundations of information Systems Auditing, Conducting an Information Systems Audit.

UNIT–II:
The management Control Framework-I- Introduction, Evaluating the planning Function, Leading Function, Controlling Function, Systems Development Management Controls, Approaches to Auditing Systems Development, Normative Models of the Systems Development Process, Evaluating the Major phases in the Systems Development Process, Programming Management Controls, Data Resource Management Controls.

UNIT–III:
The Management Control Framework-II- Security Management Controls, Operations management Controls Quality assurance Management Controls, Case Studies.

UNIT–IV:
Evidence Collection- Audit Software, Code Review, Test Data, and Code Comparison, Concurrent Auditing techniques, Interviews, Questionnaires, and Control Flowcharts. Performance Management tools- Case Studies.

UNIT–V:
Evidence Evaluation- Evaluating Asset Safeguarding and Data Integrity, Evaluating System, Effectiveness, Evaluating System Efficiency, Information Systems Audit and Management: Managing the Information Systems Audit Function.

Text Book:
1. Information Systems Control and Audit, 1st Edition, Ron Weber, Pearson Education, 2013

Reference Book:
1. Information System Audit and Assurance, D P Dube, TMH, New Delhi, 2008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	L	T	P	C
Honors Course	4	0	0	4
CLOUD AND IOT SECURITY **(Information Security)**				

Course Outcomes: At the end of the course, student will be able to
- Discuss about Security Requirements in IoT Architecture
- Explain Random number generation
- Demonstrate Authorization with Publish / Subscribe schemes
- Identify Lightweight and robust schemes for Privacy protection
- Explain about IoT cloud security architecture

UNIT I:
Introduction: Securing Internet of Things: Security Requirements in IoT Architecture, Security in Enabling Technologies, Security Concerns in IoT Applications. Security Architecture in the Internet of Things, Security Requirements in IoT, Insufficient Authentication /Authorization, Insecure Access Control, Threats to Access Control, Privacy, and Availability, Attacks Specific to IoT. Vulnerabilities, Secrecy and Secret-Key Capacity, Authentication/Authorization for Smart Devices, Transport Encryption, Attack, Fault trees

UNIT II:
Cryptographic Fundamentals for IoT: Cryptographic primitives and its role in IoT, Encryption and Decryption, Hashes, Digital Signatures, Random number generation, Cipher suites, key management fundamentals, cryptographic controls built into IoT messaging and communication protocols.

UNIT III:
Identity & Access Management Solutions for IoT: Identity lifecycle, authentication credentials, IoT IAM infrastructure, Authorization with Publish / Subscribe schemes and access control

UNIT IV:
Privacy Preservation and Trust Models for IoT: Concerns in data dissemination, Lightweight and robust schemes for Privacy protection, Trust and Trust models for IoT, self-organizing Things, Preventing unauthorized access.

UNIT V:
Cloud Security for IoT: Cloud services and IoT, offerings related to IoT from cloud service providers, Cloud IoT security controls, enterprise IoT cloud security architecture, New directions in cloud enabled IoT computing

Text Books:
1. Practical Internet of Things Security (Kindle Edition) by Bria Russell, Drew VanDuren

References Books:
1. Securing the Internet of Things, Elsevier
2. Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

		L	T	P	C
Honors Course		4	0	0	4
WEB SECURITY **(Information Security)**					

Course Objectives:
- Underlying security principles of the web
- Overview of concrete threats against web applications
- Insights into common attacks and countermeasures
- Current best practices for secure web applications

Course Outcomes: At the end of the course, student will be able to
- Demonstrate security concepts, security professional roles, and security resources in the context of systems and security development life cycle
- Justify applicable laws, legal issues and ethical issues regarding computer crime
- Explain the business need for security, threats, attacks, top ten security vulnerabilities, and secure software development
- Apply information security policies, standards and practices, the information security blueprint
- Analyze and describe security requirements for typical web application scenario

UNIT–I:
Introduction-A web security forensic lesson, Web languages, Introduction to different web attacks, Overview of N-tier web applications, Web Servers-Apache, IIS.

UNIT-II:
Securing the Communication Channel- Understanding the dangers of an insecure communication channel. Practical advice on deploying HTTPS, and dealing with the impact on your application, Insights into the latest evolutions for HTTPS deployments.

UNIT–III:
Web Hacking Basics- HTTP & HTTPS URL, Web under the Cover Overview of Java security Reading the HTML source, Applet Security Servlets Security Symmetric and Asymmetric Encryptions, Network security Basics, Firewalls & IDS.

UNIT–IV:
Securely Handling Untrusted Data-Investigation of injection attacks over time, Understanding the cause behind both server-side and client-side injection attacks, Execution of common injection attacks, and implementation of various defenses.

UNIT–V:
Preventing Unauthorized Access-Understanding the interplay between authentication, authorization and session management. Practical ways to secure the authentication process prevent authorization bypasses and harden session management mechanisms, Securing Large Applications, Cyber Graffiti.

Text Books:
1. Web Hacking: Attacks and Defense, Latest Edition , McClure, Stuart, Saumil Shah, and Shreeraj Shah, Addison Wesley, 2003
2. Professional Java Security, 1.3 Edition, Garms, Jess and Daniel Somerfield, Wrox, 2001

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Honors Course	L	T	P	C
	4	0	0	4
BLOCK CHAIN ARCHITECTURE DESIGN AND USE CASES **(Information Security)**				

Course Objectives:

By the end of the course, students will be able to
- Understand how block chain systems (mainly Bit coin and Ethereum) work and to securelyinteract with them,
- Design, build, and deploy smart contracts and distributed applications,
- Integrate ideas from block chain technology into their own projects.

Course Outcomes:

At the end of the course, student will be able to
- Demonstrate the foundation of the Block chain technology and understand the processes inpayment and funding.
- Identify the risks involved in building Block chain applications.
- Review of legal implications using smart contracts.
- Choose the present landscape of Blockchain implementations and Understand Crypto currencymarkets
- Examine how to profit from trading crypto currencies.

UNIT I

Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain.
Evolution of Blockchain : Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

UNIT II

Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

UNIT III

Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.

UNIT IV

Ethereum Blockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEtherWallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, OpenZeppelin Contracts

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V
Hyperledger Blockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.

Advanced Concepts in Blockchain: Introduction, InterPlanetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

Text Books:
1) Ambadas, Arshad Sarfarz Ariff, Sham "Blockchain for Enterprise Application Developers", Wiley
2) Andreas M. Antonpoulos, "Mastering Bitcoin: Programming the Open Blockchain" , O'Reilly

Reference Books:
1) Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill.
2) Blockchain: Blueprint for a New Economy, Melanie Swan, O'Reilly

e-Resources:
1) https://github.com/blockchainedindia/resources

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - II Semester	Honors Course	L	T	P	C
		4	0	0	4
	DATA VISUALIZATION **(Data Science)**				

Course Objectives:
The main objective of this course is to make it easier to identify patterns, trends and outliers in large data sets

Course Outcomes:
On completion of this course, the student will be able to
- Identify and recognize visual perception and representation of data.
- Illustrate about projections of different views of objects.
- Apply various Interaction and visualization techniques.
- Analyze various groups for visualization.
- Evaluate visualizations

UNIT-I:
Introduction to Data Visualizations and Perception: Introduction of visual perception, visual representation of data, Gestalt principles, Information overload.

UNIT-II :
Visual Representations: Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

UNIT-III :
Classification of Visualization Systems: Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

UNIT-IV :
Visualization of Groups: Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization. Various visualization techniques, data structures used in data visualization.

UNIT-V :
Visualization of Volumetric Data And Evaluation of Visualizations: Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, evaluating visualizations

Text Books:
1. Ward, Grinstein, Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick, 2nd edition,A K Peters, Ltd 2015.

Reference Books:
1. Tamara Munzner,Visualization Analysis & Design ,1st edition,AK Peters Visualization Series 2014
2. Scott Murray,Interactive Data Visualization for the Web ,2nd Edition, 2017

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Honors Course	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**
STATISTICAL FOUNDATIONS FOR DATA SCIENCE **(Data Science)**				

Course Objectives:
The course will introduce the fundamental concepts of probability and statistics required for a program in data science

Course outcomes:
By the end of the course, the student will be able to
- Use the statistical concepts in the field of data science.
- Employ the techniques and methods related to the area of data science in variety of applications.
- Apply logical thinking to understand and solve the problem in context.
- Explore statistical learning methods and their application to modern problems in science, industry, and society.
- Build analytics pipelines for regression problems and classification problems

UNIT I:
Basics of Data Science: Introduction; Typology of problems; Importance of linear algebra, statistics and optimization from a data science perspective; Structured thinking for solving data science problems.

UNIT II:
Probability, Statistics and Random Processes: Probability theory and axioms; Random variables; Probability distributions and density functions (univariate and multivariate); Expectations and moments; Covariance and correlation; Statistics and sampling distributions; Hypothesis testing of means, proportions, variances and correlations; Confidence (statistical) intervals; Correlation functions; White-noise process

UNIT III:
Probabilistic formulations of prediction problems: Plug-in estimators, empirical risk minimization, Linear threshold functions, perceptron algorithm, Risk bounds, Concentration inequalities, Uniform convergence, Rademacher averages; combinatorial dimensions, Convex surrogate losses for classification, Linear regression, Regularization and linear model selection, Feature Selection
Methods, Cross Validation methods.

UNIT IV:
Game-theoretic formulations of prediction problems, High Dimensional methods, Lasso, Ridge Regression, Dimensionality Reduction, Minimax strategies for log loss, linear loss, and quadratic loss, Universal portfolios, Online convex optimization.

UNIT V:
Neural networks: Stochastic gradient methods, Combinatorial dimensions and Rademacher averages, Hardness results for learning, Efficient learning algorithms.

Text Books:
1. Bendat, J. S. and A. G. Piersol. Random Data: Analysis and Measurement Procedures. 4th Edition. John Wiley & Sons, Inc., NY, USA, 2010
2. Montgomery, D. C. and G. C. Runger. Applied Statistics and Probability for Engineers. 5th Edition. John Wiley & Sons, Inc., NY, USA, 2011.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

3. James, G., Witten, D., Hastie, T., Tibshirani, R. An Introduction to Statistical Learning with Applications in R, Springer, 2013.

Reference Books:

1. Hastie, T., Tibshirani, R. and Friedman, J. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Second Edition, Springer, 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	Honors Course	**L**	**T**	**P**	**C**
		4	**0**	**0**	**4**
	MINING MASSIVE DATA SETS **(Data Science)**				

Course Objective: The course will discuss data mining and machine learning algorithms for analyzing very large amounts of data. The emphasis will be on MapReduce and Spark as tools for creating parallel algorithms that can process very large amounts of data.

Course Outcomes:

Upon completion of this course, the student will be able to:

1. Discuss research directions in Mining Massive Datasets, such as similarity search, streaming data, clustering, and graph mining.
2. Analyze policy, focusing on methods for mining massive datasets and potential policy and management applications, by synthesizing and summarizing the current state of the art, and facilitating discussion by posing questions, preliminary conclusions, and ideas to explore.
3. Develop a research project relevant to Mining Massive Datasets and produce a report describing the project's background, methods, results, and conclusions.
4. Knowledge of basic computer science principles and skills, at a level sufficient to write a reasonably non-trivial computer program.
5. Good knowledge of Java and Python will be extremely helpful since most assignments will require the use of Spark

UNIT I:

Data Mining: Data Mining, Statistical Limits on Data Mining, MapReduce: Distributed File Systems, MapReduce, Algorithms Using MapReduce, Extensions to MapReduce.

UNIT II:

Finding Similar Items: Applications of Near-Neighbor Search, Shingling of Documents, Distance Measures, Theory of Locality-Senstive Functions, Applications of LSH Hashing.

UNIT III:

Mining Data Streams: Stream Data Model, Sampling Data in Streams, Filtering Streams, Link Analysis: PageRank, Efficient Computational of PageRank, Link Spam, Hubs and Authorities.

UNIT IV:

Frequent Itemsets: Market-Based Model, Market Based and A-Priori Algorithm, Limited- Pass Algorithms, Clustering: Introduction, Hierarchical Clustering and K-means Algorithm, CURE Algorithm.

UNIT V:

Dimensionality Reduction: Eigenvalues and Eigenvectors, Principal-Component Analysis, CUR Decomposition, Large-Scale Machine Learning: Machine Learning Model, Perceptrons, SVM's, Nearest Neighbors.

Text Books:

1. Jure Leskovec, Anand Rajaraman, Jeffery D. ULLman, Mining of Massive Datasets, Cambridge University Press, 2014.
2. Pattern Recognition and Machine Learning. Christopher Bishop. Springer-Verlag New York. 2006.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:

1. Machine Learning: A Probabilistic Perspective. Kevin Murphy. MIT Press. 2012
2. The Elements of Statistical Learning: Data Mining, Inference, and Prediction. Trevor Hastie, Robert Tibshirani, Jerome Friedman. Springer. 2013

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	L	T	P	C
Honors Course	4	0	0	4
MEDICAL IMAGE DATA PROCESSING **(Data Science)**				

Course Objectives:
The course will provide the participants with an up-to-date background in current state-of-the-art in medical imaging and medical image analysis. The aim of the course is to show how to extract, model, and analyze information from medical data and applications in order to help diagnosis, treatment and monitoring of diseases through computer science.

Course Outcomes: At the End of the Course:
1. Student will be able to explain the basic concepts of Medical Imaging Technologies, Systems and Formation Principles.
2. Student will be able to analyze the Medical Image Storage and Processing.
3. Student will be able to visualize the MRI, NMR and Artifacts.
4. Student should expertise the Segmentation and Classification techniques on Medical Image Data.
5. Student will be able to analyze the Nuclear Imaging like PET, SPECT and 3D Images.

UNIT I:
Introduction: Introduction to Medical Imaging Technology, Systems, and Modalities. Brief History, Importance, Applications, Trends, Challenges. Medical Image Formation Principles: X-Ray physics, X-Ray generation, Attenuation, Scattering, Dose Basic Principles of CT, Reconstruction Methods, Artifacts, CT hardware.

UNIT II:
Storage and Processing: Medical Image Storage, Archiving and Communication Systems and Formats Picture archiving and communication system (PACS); Formats: DICOM Radiology Information Systems (RIS) and Hospital Information Systems (HIS). Medical Image Processing, Enhancement, Filtering Basic image processing algorithms Thresholding, contrast enhancement, SNR characteristics; filtering; histogram modeling.

UNIT III:
Visualization: Medical Image Visualization Fundamentals of Visualization, Surface and Volume Rendering/Visualization, Animation, Interaction. Magnetic Resonance Imaging (MRI) Mathematics of MR, Spin Physics, NMR Spectroscopy, Imaging Principles and Hardware, Image Artifacts.

UNIT IV:
Segmentation And Classification: Medical Image Segmentation, Histogram-Based Methods, Region Growing and Watersheds, Markov Random Field Models, Active Contours, Model-Based Segmentation. Multi-Scale Segmentation, Semi-Automated Methods, Clustering-Based Methods, Classification-Based Methods, Atlas-Guided Approaches, Multi-Model Segmentation. Medical Image Registration Intensity-Based Methods, Cost Functions, Optimization Techniques.

UNIT V:
Nuclear Imaging: PET and SPECT Ultrasound Imaging Methods, Mathematical Principles, Resolution, Noise Effect, 3D Imaging, Positron Emission Tomography, Single Photon Emission Tomography, Ultrasound Imaging, Applications. Medical Image Search and Retrieval Current Technology in Medical Image Search, Content-Based Image Retrieval, New Trends: Ontologies, Applications, Other Applications Of Medical Imaging Validation, Image Guided Surgery, Image Guided Therapy, Computer Aided Diagnosis/Diagnostic Support Systems.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:
1. Paul Suetens, "Fundamentals of Medical Imaging", Second Edition, Cambridge University Press, 2009.
2. J. Michael Fitzpatrick and Milan Sonka, "Handbook of Medical Imaging, Volume 2. Medical Image Processing and Analysis", SPIE Publications, 2009.

Reference Books:
1. Kayvan Najarian and Robert Splinter, "Biomedical Signal and Image Processing", Second Edition, CRC Press, 2005.
2. Geoff Dougherty, "Digital Image Processing for Medical Applications", First Edition, Cambridge University Press, 2009.
3. Jerry L. Prince and Jonathan Links, "Medical Imaging Signals and Systems", First Edition 1, Prentice Hall, 2005.
4. John L. Semmlow, "Biosignal and Medical Image Processing", Second Edition, CRC Press, 2008.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE AND SYLLABUS

For

B. Tech COMPUTER SCIENCE &ENGINEERING

(Applicable for batches admitted from 2019-2020)

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KAKINADA - 533 003, Andhra Pradesh, India

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE - R19

I Year – I SEMESTER

S. No	Course Code	Subjects	L	T	P	Credits
1	HS1101	English	3	0	0	3
2	BS1101	Mathematics - I	3	0	0	3
3	BS1106	Applied Chemistry	3	0	0	3
4	ES1112	Fundamentals of Computer Science	3	0	0	3
5	ES1103	Engineering Drawing	1	0	3	2.5
6	HS1102	English Lab	0	0	3	1.5
7	BS1107	Applied Chemistry Lab	0	0	3	1.5
8	ES1105	IT Workshop	0	0	3	1.5
9	MC1101	Environmental Science	3	0	0	0
Total Credits			**16**	**0**	**12**	**19**

I Year – II SEMESTER

S. No	Course Code	Subjects	L	T	P	Credits
1	BS1202	Mathematics – II	3	0	0	3
2	BS1203	Mathematics – III	3	0	0	3
3	BS1204	Applied Physics	3	0	0	3
4	ES1201	Programming for Problem Solving using C	3	0	0	3
5	ES1213	Digital Logic Design	3	0	0	3
6	BS1205	Applied Physics Lab	0	0	3	1.5
7	HS1203	Communication Skills Lab	0	1	2	2
8	ES1202	Programming for Problem Solving using C Lab	0	0	3	1.5
9	PR1201	Engineering Exploration Project	0	0	2	1
10	MC1204	Constitution of India	3	0	0	0
Total Credits			**18**	**1**	**10**	**21**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	CS2101	Mathematical Foundations of Computer Science	3	1	0	4
2	CS2102	Software Engineering	3	0	0	3
3	ES2101	Python Programming	3	0	0	3
4	CS2103	Data Structures	3	0	0	3
5	CS2104	Object Oriented Programming through C++	3	0	0	3
6	CS2105	Computer Organization	3	0	0	3
7	ES2102	Python Programming Lab	0	0	3	1.5
8	CS2106	Data Structures through C++ Lab	0	0	3	1.5
9	MC2101	Essence of Indian Traditional Knowledge	2	0	0	0
10	MC2102	Employability Skills- I*	2	0	0	0
		Total	23	1	6	22
***Internal Evaluation through Seminar / Test for 50 marks**						

II Year – II SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	BS2201	Probability and Statistics	3	0	0	3
2	CS2201	Java Programming	2	1	0	3
3	CS2202	Operating Systems	3	0	0	3
4	CS2203	Database Management Systems	3	1	0	4
5	CS2204	Formal Languages and Automata Theory	3	0	0	3
6	CS2205	Java Programming Lab	0	0	3	1.5
7	CS2206	UNIX Operating System Lab	0	0	2	1
8	CS2207	Database Management Systems Lab	0	0	3	1.5
9	MC2201	Professional Ethics & Human Values	3	0	0	0
10	PR2201	Socially Relevant Project*	0	0	2	1
		Total	17	2	10	21
***Internal Evaluation through Seminar for 50 marks**						

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	CS3101	Data Warehousing and Data Mining	3	0	0	3
2	CS3102	Computer Networks	3	0	0	3
3	CS3103	Compiler Design	3	0	0	3
4	CS3104	Artificial Intelligence	3	0	0	3
5	PE3101	**Professional Elective- I** 1. Computer Graphics 2. Principles of Programming Languages 3. Advanced Data Structures 4. Software Testing Methodologies 5. Advanced Computer Architecture	3	0	0	3
6	CS3105	Computer Networks Lab	0	0	2	1
7	CS3106	AI Tools & Techniques Lab	0	0	3	1.5
8	CS3107	Data Mining Lab	0	0	3	1.5
9	MC3101	Employability Skills -II*	2	0	0	0
		Total	17	0	8	19
*Internal Evaluation through Seminar / Test for 50 marks						

III Year – II SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	CS3201	Web Technologies	3	0	0	3
2	CS3202	Distributed Systems	3	0	0	3
3	CS3203	Design and Analysis of Algorithms	3	0	0	3
4	PE3201	**Professional Elective -II** (NPTEL/SWAYAM) **Duration: 12 Weeks Minimum** ***Course/subject title can't be repeated**	3	0	0	3
5	OE3201	**Open Elective- I** (Inter Disciplinary)	3	0	0	3
6	HS3201	Managerial Economics and Financial Accountancy	3	0	0	3
7	CS3204	Web Technologies Lab	0	0	4	2
9	PR3201	Industrial Training / Skill Development Programmes / Research Project in higher learning institutes	0	0	0	1
		Total	18	0	4	21

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	CS4101	Cryptography and Network Security	3	0	0	3
2	CS4102	UML & Design Patterns	3	0	0	3
3	CS4103	Machine Learning	3	0	0	3
4	OE4101	**Open Elective -II** (Inter Disciplinary)	3	0	0	3
5	PE4101	**Professional Elective- III** 1. Mobile Computing 2. Data Science 3. NoSQL Databases 4. Internet of Things 5. Software Project Management	3	0	0	3
6	PE4102	**Professional Elective- IV** 1. Web Services 2. Cloud Computing 3. Mean Stack Technologies 4. Ad-hoc and Sensor Networks 5. Cyber Security & Forensics	3	0	0	3
7	CS4104	UML Lab #	0	0	2	1
8	PR4101	Project- I	0	0	0	2
9	MC4101	IPR & Patents	3	0	0	0
		Total	21	0	2	21

Relevant theory to be taught in the lab

IV Year – II SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	HS4201	Management and Organizational Behavior	3	0	0	3
2	OE4201	**Open Elective- III** (Inter Disciplinary)	3	0	0	3
3	PE4201	**Professional Elective-V** 1. Deep Learning 2. Quantum Computing 3. DevOps 4. Blockchain Technologies 5. Big Data Analytics	3	0	0	3
4	PR4201	Project- II	0	0	0	7
		Total	9	0	0	16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Open Electives to be offered by CSE for Other Branches:

Open Elective I:	Open Elective II:
1. Data Structures 2. Java Programming 3. Data Base Management Systems 4. C++ Programming 5. Operating Systems 6. Internet of Things	1. Problem Solving using Python 2. Web Technologies 3. Machine Learning 4. Distributed Computing 5. AI Tools & Techniques 6. Data Science
Open Elective III: 1. Big Data 2. Image Processing 3. Mobile Application Development 4. Cyber Security 5. Deep Learning 6. Blockchain Technologies	

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
	ENGLISH (HS1101)				

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes

At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

UNIT I

Lesson-1: A Drawer full of happiness from "Infotech English", Maruthi Publications
Lesson-2: Deliverance by Premchand from "The Individual Society", Pearson Publications.
          (Non-detailed)
Listening: Listening to short audio texts and identifying the topic. Listening to short audio texts

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

and identifying the context and specific pieces of information to answer a series of questions both in speaking and writing.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.

Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.

Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.

Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.

Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.

Pronunciation: Vowels, Consonants, Plural markers and their realizations

UNIT II

Lesson-1: Nehru's letter to his daughter Indira on her birthday from "Infotech English", Maruthi Publications

Lesson-2: Bosom Friend by Hira Bansode from "The Individual Society", Pearson Publications. (Non-detailed)

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)

Grammar: Use of articles and zero article; prepositions.

Pronunciation: Past tense markers, word stress-di-syllabic words

UNIT III

Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "Infotech English", Maruthi Publications

Lesson-2: Shakespeare's Sister by Virginia Woolf from "The Individual Society", Pearson Publications. (Non-detailed)

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing.

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing. E-mail etiquette, Writing CV's.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

(20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Pronunciation: word stress-poly-syllabic words

UNIT IV

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "Infotech English", Maruthi Publications

Lesson-2: Telephone Conversation-Wole Soyinka from "The Individual Society", Pearson Publications. (Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.

Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Pronunciation: Contrastive Stress

UNIT V

Lesson-1: Stay Hungry-Stay foolish from "Infotech English", Maruthi Publications

Lesson-2: Still I Rise by Maya Angelou from "The Individual Society", Pearson Publications. (Non-detailed)

Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Functional English: Suggesting/Opinion giving.

Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques.

Reading for Writing: Writing academic proposals- writing research articles: format and style.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Pronunciation: Stress in compound words

Text books:
1) "Infotech English", Maruthi Publications. (Detailed)
2) "The Individual Society", Pearson Publications. (Non-detailed)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference books:

1) Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2) Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3) Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4) Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
	MATHEMATICS-I (BS1101) **(Common to all Branch's for I Year B. Tech)**				

Course Objectives:

- This course will illuminate the students in the concepts of calculus.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes:
At the end of the course, the student will be able to
- Utilize mean value theorems to real life problems (L3)
- Solve the differential equations related to various engineering fields (L3)
- Familiarize with functions of several variables which is useful in optimization (L3)
- Apply double integration techniques in evaluating areas bounded by region (L3)
- Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems (L5)

UNIT I: Sequences, Series and Mean value theorems: (10 hrs)
Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series – Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

UNIT II: Differential equations of first order and first degree: (10 hrs)
Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.

UNIT III: Linear differential equations of higher order: (10 hrs)
Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, e^{ax} V(x) and x^nV(x) – Method of Variation of parameters.
Applications: LCR circuit, Simple Harmonic motion.

UNIT IV: Partial differentiation: (10 hrs)
Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.
Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V: Multiple integrals: (8 hrs)
Double and Triple integrals – Change of order of integration – Change of variables.
Applications: Finding Areas and Volumes.

Text Books:
1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:
1) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2) Joel Hass, Christopher Heil and Maurice D. Weir, Thomas calculus, 14th Edition, Pearson.
3) Lawrence Turyn, Advanced Engineering Mathematics, CRC Press, 2013.
4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
	APPLIED CHEMISTRY (BS1106)				

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Course Objectives:

- *Importance* of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- *Outline* the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- *Express* the increase in demand as wide variety of advanced materials are introduced; which have excellent engineering properties.
- *Explain* the crystal structures, and the preparation of semiconductors. Magnetic properties are also studied.
- *Recall* the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.

UNIT I: Polymer Technology

Polymerisation:- Introduction-methods of polymerization (emulsion and suspension)-physical and mechanical properties.

Plastics: Compounding-fabrication (compression, injection, blown film, extrusion) - preparation, properties and applications of PVC, polycarbonates and Bakelite-mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.

Elastomers:- Natural rubber-drawbacks-vulcanization-preparation, properties and applications of synthetic rubbers (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics-conducting polymers-biodegradable polymers-biopolymers-biomedical polymers.

Learning Outcomes: *At the end of this unit, the students will be able to*

- *Outline* the properties of polymers and various additives added and different methods of forming plastic materials.
- *Explain* the preparation, properties and applications of some plastic materials.
- *Interpret* the mechanism of conduction in conducting polymers .
- *Discuss* natural and synthetic rubbers and their applications.

UNIT II: Electrochemical Cells and Corrosion

Single electrode potential-Electrochemical series and uses of series-standard hydrogen electrode, calomel electrode-concentration cell-construction of glass electrode-Batteries: Dry cell, Ni-Cd cells, Ni-Metal hydride cells, Li ion battery, zinc air cells–Fuel cells: H_2-O_2, CH_3OH-O_2, phosphoric acid, molten carbonate.

*Corrosion:-*Definition-theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, waterline corrosion-passivity of metals-galvanic series-factors influencing rate of corrosion-corrosion control (proper designing, cathodic protection)-Protective coatings: Surface preparation, cathodic and anodic coatings, electroplating,

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

electroless plating (nickel). Paints (constituents, functions, special paints).
Learning Outcomes: *At the end of this unit, the students will be able to*

- *Explain* the theory of construction of battery and fuel cells.
- *Categorize* the reasons for corrosion and study some methods of corrosion control.

UNIT III: Material Chemistry
Part I*:*
Non-elemental semiconducting materials:- Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).
Insulators & magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.
Part II:
Nano materials:- Introduction-sol-gel method- characterization by BET, SEM and TEM methods- applications of graphene-carbon nanotubes and fullerenes: Types, preparation and applications

Liquid crystals:- Introduction-types-applications.
*Super conductors:-*Type –I, Type II-characteristics and applications

Learning Outcomes: *At the end of this unit, the students will be able to*

- *Understand* the importance of materials like nanomaterials and fullerenes and their uses.
- *Understand* liquid crystals and superconductors.
- *Understand* the preparation of semiconductors.

UNIT IV: Advanced Concepts/Topics in Chemistry
Computational chemistry: Introduction, Ab Initio studies

Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor

Learning Outcomes: *At the end of this unit, the students will be able to*

- *Obtain* the knowledge of computational chemistry
- *Understand* importance molecular machines

UNIT V: Spectroscopic Techniques & Non Conventional Energy Sources
Part A: SPECTROSCOPIC TECHNIQUES
Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR (instrumentation and IR of some organic compounds, applications)-magnetic resonance imaging and CT scan (procedure & applications).

Part B*:* NON CONVENTIONAL ENERGY SOURCES
Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

Learning Outcomes: *At the end of this unit, the students will be able to*

- understand the principles of different analytical instruments.
- explain the different applications of analytical instruments.
- design sources of energy by different natural sources.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:
1) Engineering Chemistry by Jain and Jain; Dhanpat Rai Publicating Co.

Reference Books:
1) Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2019 edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
FUNDAMENTALS OF COMPUTER SCIENCE (ES1112)					

Course Objectives:
This course is designed to:

- Explain the concepts of computers and classify based on type and generation.
- Demonstrate the techniques of writing algorithms pseudo codes & schematic flow of logic in software development process.
- Teach about the purpose of networks and types of networks and media to connect the computers
- Teach about Operating Systems and its concepts.
- Illustrate about database architecture and its components
- Illustrate about distributed computing, peer to peer, grid, cloud on demand and utility computing.

Course Outcomes:
On completion of the course the student will be able to

- Illustrate the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming.
- Recognize the Computer networks, types of networks and topologies.
- Summarize the concepts of Operating Systems and Databases.
- Recite the Advanced Computer Technologies like Distributed Computing & Wireless Networks.

UNIT I
A Simple Computer System: Central processing unit, the further need of secondary storage, Types of memory, Hardware, Software and people.
Peripheral Devices: Input, Output and storage, Data Preparation, Factors affecting input, Input devices, Output devices, Secondary devices, Communication between the CPU and Input/ Output devices. (Text Book 1)

UNIT II
Problem Solving and Programming: Algorithm development, Flowcharts, Looping, some programming features, Pseudo code, the one-zero game, some structured programming concepts, documents.
Programming Languages: Machine Language and assembly language, high -level and low level languages, Assemblers, Compilers, and Interpreters (Text Book 1)

UNIT III
Computer Networks: Introduction to computer Networks, Network topologies-Bus topology, star topology, Ring topology, Mesh topology, Hybrid topology, Types of Networks: Local area Network, Wide Area Networks, Metropolitan Networks, Campus/ Corporate Area Network, Personal Area Network, Network Devices- Hub, Repeater, Switch, Bridge, Router, Gateway, Network interface Card, Open System Inter connection Model (Text Book 2)
Operating systems: Introduction, Evolution of operating systems, Process Management- Process control block, Process operations, Process scheduling, Command Interpreter, Popular operating

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

systems- Microsoft DOS, Microsoft Windows, UNIX and Linux. (Text Book 2)

UNIT IV

Database Systems: File-Oriented Approach, Database-oriented Approach-Components of Database system, Advantages & Disadvantages of Database approach, Applications of Database systems, Database views, Three-schema architecture, Database models-Hierarchical model, Network Model, relational Model, Object-oriented Data Model, Components of database management systems, Retrieving Data through Queries (Text Book 2)

Computer Systems and Development: Investigation, Analysis, Design, system processing and general program design, Presentation to management and users, Implementation, Documents. (Text Book 1)

UNIT V

Emerging Computer Technologies: Distributed Networking, Peer-to-peer Computing, Categorization of Peer-to-peer system Applications of Peer-to-peer networks, Grid Computing-components of Grid computing, Applications of Grid computing,, Cloud Computing-characteristics of cloud computing systems, cloud computing services, cloud computing architecture, cloud computing applications, Cloud computing concerns

Wireless Networks: Wireless network operations, Types of wireless networks, security in wireless Networks, Limitations of wireless Networks, Bluetooth – Bluetooth Piconets, Avoiding Interference in Bluetooth Devices, Bluetooth Security, Differences between Bluetooth and Wireless Networks. (Text Book 2)

Text Books:
1. An Introduction to Computer studies –Noel Kalicharan-Cambridge
2. Fundamentals of Computers –Reema Thareja-Oxford higher education

References Books:
1. Introduction to Information Technology – ITL education Solution Limited, Pearson
2. Computer Science and overview-J. Glenn Brookshear, Dennis Brylow-Pearson

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		1	0	3	2.5
	ENGINEERING DRAWING (ES1103)				

Course Objectives:

- Engineering drawing being the principal method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Course Outcomes:

- The student will learn how to visualize 2D & 3D objects.

UNIT I

Objective: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.

Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents & normals for the curves.

Scales: Plain scales, diagonal scales and vernier scales

UNIT II

Objective: To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

UNIT III

Objective: The objective is to make the students draw the projections of the plane inclined to both the planes.

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT IV

Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

UNIT V

Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects using Auto CAD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Note: In the End Examination there will be no question from CAD.

Text Books:
1) Engineering Drawing by N.D. Butt, Chariot Publications
2) Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

Reference Books:
1) Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
2) Engineering Graphics for Degree by K.C. John, PHI Publishers
3) Engineering Graphics by PI Varghese, McGrawHill Publishers
4) Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
	ENGLISH LAB (HS1102)				

UNIT I
Vowels, Consonants, Pronunciation, Phonetic Transcription

UNIT II
Past tense markers, word stress-di-syllabic words, Poly-Syllabic words

UNIT III
Rhythm & Intonation

UNIT IV
Contrastive Stress (Homographs)

UNIT V
Word Stress: Weak and Strong forms
Stress in compound words

References books:
1) Infotech English, Maruthi Publications (with Compact Disc).
2) Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
3) English Pronunciation in use- Mark Hancock, Cambridge University Press.
4) English Phonetics and Phonology-Peter Roach, Cambridge University Press.
5) English Pronunciation in use- Mark Hewings, Cambridge University Press.
6) English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
7) English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
	APPLIED CHEMISTRY LAB (BS1107)				

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1) Determination of HCl using standard Na_2CO_3 solution.

2) Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.

3) Determination of Mn (II) using standard oxalic acid solution.

4) Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.

5) Determination of copper (II) using standard hypo solution.

6) Determination of temporary and permanent hardness of water using standard EDTA solution.

7) Determination of iron (III) by a colorimetric method.

8) Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).

9) Determination of the concentration of strong acid vs strong base (by conductometric method).

10) Determination of strong acid vs strong base (by potentiometric method).

11) Determination of Mg^{+2} present in an antacid.

12) Determination of $CaCO_3$ present in an egg shell.

13) Estimation of Vitamin C.

14) Determination of phosphoric content in soft drinks.

15) Adsorption of acetic acid by charcoal.

16) Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.
Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books:
1) A Textbook of Quantitative Analysis, Arthur J. Vogel.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
	IT WORKSHOP (ES1105)				

Course Objectives:

The objective of IT Workshop is to

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
- Demonstrate basic command line interface commands on Linux
- Teach the usage of Internet for productivity and self paced lifelong learning
- Describe about Compression, Multimedia and Antivirus tools
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools

Course Outcomes:

Students should be able to:

- Assemble and disassemble components of a PC
- Construct a fully functional virtual machine, Summarize various Linux operating system commands,
- Secure a computer from cyber threats, Learn and practice programming skill in Github, Hackerrank, Codechef, HackerEarth etc.
- Recognize characters & extract text from scanned images, Create audio files and podcasts
- Create video tutorials and publishing, Use office tools for documentation, Build interactive presentations, Build websites, Create quizzes & analyze responses.

Computer Hardware:

Experiment 1: Identification of peripherals of a PC, Laptop, Server and Smart Phones: Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Operating Systems:

Experiment 2: Virtual Machine setup:
- o Setting up and configuring a new Virtual Machine
- o Setting up and configuring an existing Virtual Machine
- o Exporting and packaging an existing Virtual Machine into a portable format

Experiment 2: Operating System installation:
- o Installing an Operating System such as Linux on Computer hardware.

Experiment 3: Linux Operating System commands:
- o General command syntax
- o Basic *help* commands
- o Basic File system commands
- o Date and Time
- o Basic Filters and Text processing
- o Basic File compression commands
- o Miscellaneous: apt-get, vi editor

Networking and Internet:

Experiment 4: Networking Commands:
- o ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget,route

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Experiment 5: Internet Services:
- o Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/ plugins
- o Antivirus installation, configuring a firewall, blocking pop-ups
- o Email creation and usage, Creating a Digital Profile on LinkedIn
- o Source control on Github, Hackerrank, Codechef, HackerEarth, etc
- o Google hangout/ Skype/ gotomeeting video conferencing
- o archive.org for accessing archived resources on the web

Productivity Tools:

Experiment 6: Demonstration and Practice on archival and compression tools
- o scanning and image editing tools
- o OCR and text extraction
- o audio players, recording using Mic, editing, podcast preparation
- o video players, recording using webcam/camcorder, editing
- o podcast, screencast, vodcast, webcasting

Office Tools:

Experiment 7: Demonstration and Practice on Text Editors like Notepad++, Sublime Text, Atom, Brackets, Visual code, etc

Experiment 8: Demonstration and practice on Microsoft Word, Power Point

Experiment 9: Demonstration and practice on Microsoft Excel.

Experiment 10: Demonstration and practice on LaTeX and produce professional pdf documents.

Experiment 12: Cloud based productivity enhancement and collaboration tools:
- o Store, sync, and share files with ease in the cloud using Google Drive
- o Document creation and editing text documents in your web browser using Google docs
- o Handle task lists, create project plans, analyze data with charts and filters using Google Sheets
- o Create pitch decks, project presentations, training modules using Google Slides
- o Manage event registrations, create quizzes, analyze responses using Google Forms
- o Build public sites, internal project hubs using Google Sites
- o Online collaboration through cross-platform support using Jamboard
- o Keep track of important events, sharing one's schedule, and create multiple calendars using Google Calendar

Text Books:
1) Computer Fundamentals, Anita Goel, Pearson Education, 2017
2) PC Hardware Trouble Shooting Made Easy, TMH

References Books:
1) Essential Computer and IT Fundamentals for Engineering and Science Students, Dr.N.B.Vekateswarlu, S.Chand

e-Resources:
1) https://explorersposts.grc.nasa.gov/post631/2006-2007/computer_basics/ComputerPorts.doc
2) https://explorersposts.grc.nasa.gov/post631/2006-2007/bitsnbyte/Digital_Storage_Basics.doc
3) https://www.thegeekstuff.com/2009/07/linux-ls-command-examples

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

4) https://www.pcsuggest.com/basic-linux-commands/
5) https://www.vmware.com/pdf/VMwarePlayerManual10.pdf
6) https://geek-university.com/vmware-player/manually-install-a-guest-operating-system/
7) https://gsuite.google.com/learning-center/products/#!/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	0
	ENVIRONMENTAL SCIENCE (MC1101)				

Course Objectives:
The objectives of the course are to impart:
- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

UNIT I
Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.
Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT II
Natural Resources: Natural resources and associated problems.
Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.
Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.
Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT III
Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT IV
Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1) Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2) Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3) Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference Books:

1) Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2) A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3) Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4) Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
	MATHEMATICS - II (BS1202)				

Course Objectives:
- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes:
At the end of the course, the student will be able to
- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
- evaluate approximating the roots of polynomial and transcendental equations by different algorithms (L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations (L3)

UNIT I: Solving systems of linear equations, Eigen values and Eigen vectors: (10 hrs)
Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous equations linear equations – Gauss Elimination for solving system of equations – Eigen values and Eigen vectors and their properties.

UNIT-II: Cayley-Hamilton theorem and Quadratic forms: (10 hrs)

Cayley - Hamilton theorem (without proof) – Finding inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation. Singular values of a matrix, singular value decomposition (Ref. Book – 1).

UNIT III: Iterative methods: (8 hrs)
Introduction – Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations.

UNIT IV: Interpolation: (10 hrs)
Introduction – Errors in polynomial interpolation – Finite differences – Forward differences – Backward differences – Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula – Newton's divide difference formula.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V: Numerical integration and solution of ordinary differential equations: (10 hrs)
Trapezoidal rule – Simpson's $1/3^{rd}$ and $3/8^{th}$ rule – Solution of ordinary differential equations by Taylor's series – Picard's method of successive approximations – Euler's method – Runge-Kutta method (second and fourth order).

Text Books:

1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1) David Poole, Linear Algebra- A modern introduction, 4th Edition, Cengage.
2) Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education.
3) M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
4) Lawrence Turyn, Advanced Engineering Mathematics, CRC Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - III (BS1203)					

Course Objectives:

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Course Outcomes:

At the end of the course, the student will be able to

- Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- Estimate the work done against a field, circulation and flux using vector calculus (L5)
- Apply the Laplace transform for solving differential equations (L3)
- Find or compute the Fourier series of periodic signals (L3)
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
- Identify solution methods for partial differential equations that model physical processes (L3)

UNIT I: Vector calculus: (10 hrs)
Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential.
Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

UNIT II: Laplace Transforms: (10 hrs)
Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (without proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT III: Fourier series and Fourier Transforms: (10 hrs)
Fourier Series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.
Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – inverse transforms – Finite Fourier transforms.

UNIT IV: PDE of first order: (8 hrs)
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT V: Second order PDE and Applications: (10 hrs)
Second order PDE: Solutions of linear partial differential equations with constant coefficients – RHS term of the type $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$.

Applications of PDE: Method of separation of Variables – Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:

1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2) Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
3) Peter O' Neil, Advanced Engineering Mathematics, Cengage.
4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
	APPLIED PHYSICS (BS1204)				

Course Objectives:

Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by Jawaharlal Nehru Technological University Kakinada that serves as a transit to understand the branch specific advanced topics. The course is designed to:

- Impart Knowledge of Physical Optics phenomena like Interference and Diffraction required to design instruments with higher resolution.
- Understand the physics of Semiconductors and their working mechanism for their utility in sensors.
- To impart the knowledge of materials with characteristic utility in appliances.

UNIT I   (10hrs)

WAVE OPTICS: Principle of Superposition - Interference of light - Conditions for sustained   Interference - Interference in thin films (reflected geometry) - Newton's Rings (reflected geometry).

Diffraction - Fraunhofer Diffraction - Diffraction due to Single slit (quantitative), Double slit, N -slits and circular aperture (qualitative) – Intensity distribution curves - Diffraction Grating – Grating spectrum – missing order – resolving power – Rayleigh's criterion – Resolving powers of Microscope, Telescope and grating (qualitative).

Unit Outcomes: *The students will be able to*

- ➢ explain the need of coherent sources and the conditions for sustained interference.
- ➢ analyze the differences between interference and diffraction with applications.
- ➢ illustrate the resolving power of various optical instruments.

UNIT II   (9hrs)

QUANTUM MECHANICS: Introduction – Matter waves – de Broglie's hypothesis – Davisson-Germer experiment – G. P. Thomson experiment – Heisenberg's Uncertainity Principle – interpretation of wave function – Schröedinger Time Independent and Time Dependent wave equations – Particle in a potential box.

Unit Outcomes: *The students will be able to*

- ➢ explain the fundamental concepts of quantum mechanics.
- ➢ analyze the physical significance of wave function.
- ➢ apply Schrödinger's wave equation for energy values of a free particle .

UNIT III   (10hrs)

FREE ELECTRON THEORY & BAND THEORY OF SOLIDS : Introduction – Classical free electron theory (merits and demerits only) - Quantum Free electron theory – electrical conductivity based on quantum free electron theory – Fermi Dirac distribution function – Temperature dependence of Fermi-Dirac distribution function - expression for Fermi energy -

Density of states.

Bloch's theorem (qualitative) – Kronig-Penney model(qualitative) – energy bands in crystalline solids – E Vs K diagram – classification of crystalline solids – effective mass of electron – m^* Vs K diagram - concept of hole.

Unit Outcomes: *The students will be able to*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

- ➢ explain the various electron theories.
- ➢ calculate the Fermi energy.
- ➢ analyze the physical significance of wave function .
- ➢ interpret the effects of temperature on Fermi Dirac distribution function.
- ➢ summarise various types of solids based on band theory.

UNIT IV   (9hrs)

SEMICONDUCTOR PHYSICS: Introduction – Intrinsic semi conductors - density of charge carriers - Electrical conductivity – Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature – Hall effect- Hall coefficient - Applications of Hall effect - Drift and Diffusion currents – Einstein's equation.

Learning Outcomes: *The students will be able to*
- ➢ classify the energy bands of semiconductors.
- ➢ outline the properties of n-type and p-type semiconductors.
- ➢ identify the type of semiconductor using Hall effect.

UNIT V   (10 hrs)

MAGNETISM & DIELECTRICS: Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para & Ferro – Domain concept of Ferromagnetism - Hysteresis – soft and hard magnetic materials – applications of Ferromagnetic material.

Introduction - Dielectic polarization **–** Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation - Frequency dependence of polarization – Applications of dielectrics.

Unit Outcomes: *The students will be able to*
- ➢ explain the concept of polarization in dielectric materials.
- ➢ summarize various types of polarization of dielectrics .
- ➢ interpret Lorentz field and Claussius- Mosotti relation in dielectrics.
- ➢ classify the magnetic materials based on susceptibility and their temperature dependence.
- ➢ explain the applications of dielectric and magnetic materials .
- ➢ Apply the concept of magnetism to magnetic devices.

Text Books:
1) "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G.Kshirsagar - S.Chand Publications, 2017.
2) "Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).
3) "Engineering Physics" by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers, 2012.

Reference Books:
1) "Engineering Physics" by M. R. Srinivasan, New Age international publishers (2009).
2) "Optics" by Ajoy Ghatak, 6th Edition McGraw Hill Education, 2017.
3) "Solid State Physics" by A. J. Dekker, Mc Millan Publishers (2011).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FOR PROBLEM SOLVING USING C (ES1201)					

Course Objectives:
The objectives of Programming for Problem Solving Using C are
- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C
- To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage.
- To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
- To assimilate about File I/O and significance of functions

Course Outcomes:
Upon the completion of the course the student will learn
- To write algorithms and to draw flowcharts for solving problems
- To convert flowcharts/algorithms to C Programs, compile and debug programs
- To use different operators, data types and write programs that use two-way/ multi-way selection
- To select the best loop construct for a given problem
- To design and implement programs to analyze the different pointer applications
- To decompose a problem into functions and to develop modular reusable code
- To apply File I/O operations

UNIT I
Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II
Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.

Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions.

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.

UNIT III
Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code

Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT IV
Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value
Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application.
Processor Commands: Processor Commands.

UNIT V
Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion
Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions
Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

Text Books:
1) Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE.
2) The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson.

Reference Books:
1) Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill.
2) Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson.
3) Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
	DIGITAL LOGIC DESIGN (ES1213)				

Course objectives:
- To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, theory of Boolean algebra and map method for minimization of switching functions.
- To introduce the basic tools for design of combinational and sequential digital logic.
- To learn simple digital circuits in preparation for computer engineering.

Course outcomes:
A student who successfully fulfills the course requirements will have demonstrated:
- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different switching algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays.
- Students will be able to design various sequential circuits starting from flip-flop to registers and counters.

UNIT I: Digital Systems and Binary Numbers
Digital Systems, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit codes: BCD, EXCESS 3, alphanumeric codes, 9's complement, 2421, etc..

UNIT II: Concept of Boolean algebra
Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms.
Gate level Minimization
Map Method, Three-Variable K-Map, Four Variable K-Maps. Products of Sum Simplification, Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation, ExclusiveOR Function.

UNIT III: Combinational Logic
Introduction, Analysis Procedure, Binary Adder–Subtractor, Binary Multiplier, Decoders, Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, Magnitude Comparator, HDL Models of Combinational Circuits.
Realization of Switching Functions Using PROM, PAL and PLA.

UNIT IV: Synchronous Sequential Logic
Introduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops, Truth and Excitation Tables, Conversion of Flip Flops.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V: Registers and Counters

Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter.

Text Books:

1) Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA.
2) Fundamentals of Logic Design, 5/e, Roth, Cengage.

Reference Books:

1) Digital Logic and Computer Design, M.Morris Mano, PEA.
2) Digital Logic Design, Leach, Malvino, Saha, TMH.
3) Modern Digital Electronics, R.P. Jain, TMH.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		0	0	3	1.5
	APPLIED PHYSIC LAB (ES1205)				

(Any 10 of the following listed 15 experiments)

LIST OF EXPERIMENTS:

1) Determination of wavelength of a source-Diffraction Grating-Normal incidence.
2) Newton's rings – Radius of Curvature of Plano - Convex Lens.
3) Determination of thickness of a spacer using wedge film and parallel interference fringes.
4) Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
5) Energy Band gap of a Semiconductor p - n junction.
6) Characteristics of Thermistor   – Temperature Coefficients
7) Determination of dielectric constant by charging and discharging method
8) Determination of resistivity of semiconductor by Four probe method.
9) Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
10) Measurement of magnetic susceptibility by Gouy's method.
11) Dispersive power of diffraction grating.
12) Resolving Power of telescope
13) Resolving power of grating
14) Determination of Hall voltage and Hall coefficients of a given semiconductor using Hall effect.
15) Variation of dielectric constant with temperature.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		0	1	2	2
COMMUNICATION SKILLS LAB (HS1203)					

UNIT I
Oral Activity: JAM, Hypothetical Situations, Self/Peer Profile
Common Errors in Pronunciation, Neutralising Accent

UNIT II
Oral Activity: Telephonic Etiquette, Role Plays
Poster Presentations

UNIT III
Oral Activity: Oral Presentation skills, Public speaking
Data Interpretation

UNIT IV
Oral Activity: Group Discussions: Do's and Don'ts- Types, Modalities

UNIT V
Oral Activity: Interview Skills: Preparatory Techniques, Frequently asked questions, Mock Interviews.
Pronunciation: Connected speech (Pausing, Tempo, Tone, Fluency etc.,)

References:
1) Infotech English, Maruthi Publications (with Compact Disc).
2) Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
3) English Pronunciation in use- Mark Hancock, Cambridge University Press.
4) English Phonetics and Phonology-Peter Roach, Cambridge University Press.
5) English Pronunciation in use- Mark Hewings, Cambridge University Press.
6) English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
7) English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.
8) Technical Communication- Meenakshi Raman, Sangeeta Sharma, Oxford University Press.
9) Technical Communication- Gajendrea Singh Chauhan, Smita Kashiramka, Cengage Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING USING C LAB (ES1202)					

Course Objectives:
- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers & functions.
- To review the file operations, preprocessor commands.

Course Outcomes:
By the end of the Lab, the student
- Gains Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:
1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

Exercise 2:
1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:
1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:
1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum. $1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n$ terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:
1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:
1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:
1. Write a program in C to search an element in a row wise and column wise sorted matrix.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:
1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:
1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:
1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:
1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:
1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:
1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

Exercise 14:
1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:
1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:
1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		0	0	2	1
ENGINEERING EXPLORATION PROJECT (PR1201)					

Course Objectives:
- Build mindsets & foundations essential for designers
- Learn about the Human-Centered Design methodology and understand their real-world applications
- Use Design Thinking for problem solving methodology for investigating illdefined problems.
- Undergo several design challenges and work towards the final design challenge

Apply Design Thinking on the following Streams to
- Project Stream 1: Electronics, Robotics, IOT and Sensors
- Project Stream 2: Computer Science and IT Applications
- Project Stream 3: Mechanical and Electrical tools
- Project Stream4: Eco-friendly solutions for waste management, infrastructure, safety, alternative energy sources, Agriculture, Environmental science and other fields of engineering.

HOW TO PURSUE THE PROJECT WORK?
- The first part will be learning-based-masking students to embrace the methodology by exploring all the phases of design thinking through the wallet/ bag challenge and podcasts.
- The second part will be more discussion-based and will focus on building some necessary skills as designers and learning about complementary material for human- centered design.
- The class will then divide into teams and they will be working with one another for about 2 – 3 weeks. These teams and design challenges will be the basis for the final project and final presentation to be presented.
- The teams start with **Design Challenge** and go through all the phases more in depth from coming up with the right question to empathizing to ideating to prototyping and to testing.
- Outside of class, students will also be gathering the requirements, identifying the challenges, usability, importance etc
- At the end, Students are required to submit the final reports, and will be evaluated by the faculty.

TASKS TO BE DONE:

Task 1: Everyone is a Designer
- Understand class objectives & harness the designer mindset

Task 2: The Wallet/Bag Challenge and Podcast
- Gain a quick introduction to the design thinking methodology
- Go through all stages of the methodology through a simple design challenge
- Podcast: Observe, Listen and Engage with the surrounding environment and identify a design challenge.

Task 3: Teams & Problems
- Start Design Challenge and learn about teams & problems through this

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

- Foster team collaboration, find inspiration from the environment and learn how to identify problems

Task 4: Empathizing

- Continue Design Challenge and learn empathy
- Learn techniques on how to empathize with users
- Go to the field and interview people in their environments
- Submit Activity Card

Task 5: Ideating

- Continue Design Challenge and learn how to brainstorm effectively
- Encourage exploration and foster spaces for brainstorming
- Submit Activity Card

Task 6: Prototyping

- Continue Design Challenge and learn how to create effective prototypes
- Build tangible models and use them as communication tools
- Start giving constructive feedback to classmates and teammates
- Submit Activity Card

Task 7: Testing

- Finish Design Challenge and iterate prototypes and ideas through user feedback
- Evolve ideas and prototypes through user feedback and constructive criticism
- Get peer feedback on individual and group performance
- Submit Activity Card

Task 8:

- Final Report Submission and Presentation

Note: The colleges may arrange for Guest Speakers from Various Design Fields: Graphic Design, Industrial Design, Architecture, Product Design, Organizational Design, etc to enrich the students with Design Thinking Concept.

References:

1) Tom Kelly, *The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm* (Profile Books, 2002)
2) Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation (HarperBusiness, 2009)
3) Jeanne Liedtka, Randy Salzman, and Daisy Azer, Design Thinking for the Greater Good: Innovation in the Social Sector (Columbia Business School Publishing, 2017)

Other Useful Design Thinking Frameworks and Methodologies:

- Human-Centered Design Toolkit (IDEO); https://www.ideo.com/post/design-kit
- Design Thinking Boot Camp Bootleg (Stanford D-School); https://dschool.stanford.edu/resources/the-bootcamp-bootleg
- Collective Action Toolkit (frogdesign); https://www.frogdesign.com/wpcontent/ uploads/2016/03/CAT_2.0_English.pdf
- Design Thinking for Educators (IDEO); https://designthinkingforeducators.com/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	0
	CONSTITUTION OF INDIA (MC1204)				

Course Objectives:
- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcomes:
At the end of the course, the student will be able to have a clear knowledge on the following:
- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
    1. Know the sources, features and principles of Indian Constitution.
    2. Learn about Union Government, State government and its administration.
    3. Get acquainted with Local administration and Pachayati Raj.
    4. Be aware of basic concepts and developments of Human Rights.
    5. Gain knowledge on roles and functioning of Election Commission

UNIT I
Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.
Learning outcomes:After completion of this unit student will
- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT II
Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;
Learning outcomes:After completion of this unit student will
- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

Learning outcomes: After completion of this unit student will
- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariat

UNIT IV

A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning outcomes:-After completion of this unit student will
- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zillapanchayat block level organisation

UNIT V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes: After completion of this unit student will
- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

References:

1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
2) SubashKashyap, Indian Constitution, National Book Trust
3) J.A. Siwach, Dynamics of Indian Government & Politics
4) D.C. Gupta, Indian Government and Politics
5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6) J.C. Johari, Indian Government andPolitics Hans
7) J. Raj IndianGovernment and Politics
8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

e-Resources:

1) nptel.ac.in/courses/109104074/8
2) nptel.ac.in/courses/109104045/
3) nptel.ac.in/courses/101104065/
4) www.hss.iitb.ac.in/en/lecture-details
5) www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	1	0	4
	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE				

Course Objectives:

This course is designed to:

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science

Course Outcomes:

At the end of the course student will be able to

- Demonstrate skills in solving mathematical problems
- Comprehend mathematical principles and logic
- Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
- Manipulate and analyze data numerically and/or graphically using appropriate Software
- Communicate effectively mathematical ideas/results verbally or in writing

UNIT I

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT II

Set Theory: Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties, Algebraic Structures: Algebraic Systems, Properties, Semi Groups and Monoids, Group, Subgroup and Abelian Group, Homomorphism, Isomorphism.

UNIT III

Combinatorics: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems, Number Theory: Properties of Integers, Division Theorem, Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic, Fermat's and Euler's Theorems

UNIT IV

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V
Graph Theory: Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

Text Books:
1) Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2) Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.

Reference Books:
1) Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
2) Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
3) Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

e-Resources:
1) https://nptel.ac.in/courses/106/106/106106094/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	3
	SOFTWARE ENGINEERING				

Course Objectives:

This course is designed to:

- Give exposure to phases of Software Development, common process models including Waterfall, and the Unified Process, and hands-on experience with elements of the agile process
- Give exposure to a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, traceability, and version control
- Give exposure to Software Design techniques

Course Outcomes:

Students taking this subject will gain software engineering skills in the following areas:

- Ability to transform an Object-Oriented Design into high quality, executable code
- Skills to design, implement, and execute test cases at the Unit and Integration level
- Compare conventional and agile software methods

UNIT I

The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

UNIT II

Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge, Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

UNIT III

Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modelling, Requirements Modeling for WebApps.

UNIT IV

Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, Components, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V

The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation, Elements of Software Qualtiy Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing.

Text Books:

1) Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
2) Software Engineering, Ian Sommerville, Ninth Edition, Pearson.

Reference Books:

1) Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
2) Software Engineering, Ugrasen Suman, Cengage.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105182/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	3
	PYTHON PROGRAMMING				

Course Objectives:

The Objectives of Python Programming are

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes:

- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language
- Solve coding tasks related conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming

UNIT I

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.

Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

UNIT II

Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop

Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

UNIT III

List and Dictionaries: Lists, Defining Simple Functions, Dictionaries

Design with Function**:** Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.

Modules: Modules, Standard Modules, Packages.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT IV

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming**:** Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support

Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism

UNIT V

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.

Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.

Programming**:** Introduction to Programming Concepts with Scratch.

Text Books

1) Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
2) Python Programming: A Modern Approach, Vamsi Kurama, Pearson.

Reference Books:

1) Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
2) Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

e-Resources:

1) https://www.tutorialspoint.com/python3/python_tutorial.pdf

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	3
	DATA STRUCTURES				

Course Objectives:

The objective of the course is to

- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

Course Outcomes:

After completing this course a student will be able to:

- Summarize the properties, interfaces, and behaviors of basic abstract data types
- Discuss the computational efficiency of the principal algorithms for sorting & searching
- Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
- Demonstrate different methods for traversing trees

UNIT I

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.

Searching - Linear search, Binary search, Fibonacci search.

Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation ,Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues-Circular Queues, Deques, Priority Queues, Multiple Queues.

Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.

UNIT IV

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees-AVL Trees, Insertion, Deletion and Rotations.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

Text Books:

1) Data Structures Using C. 2nd Edition.Reema Thareja, Oxford.
2) Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:

1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2) Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
3) Data Structures with C, Seymour Lipschutz TMH

e-Resources:

1) http://algs4.cs.princeton.edu/home/
2) https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	3
OBJECT ORIENTED PROGRAMMING THROUGH C++					

Course Objectives:

- Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
- Understand dynamic memory management techniques using pointers, constructors, destructors
- Describe the concept of function overloading, operator overloading, virtual functions and polymorphism
- Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
- Demonstrate the use of various OOPs concepts with the help of programs

Course Outcomes:

By the end of the course, the student

- Classify object oriented programming and procedural programming
- Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
- Build C++ classes using appropriate encapsulation and design principles
- Apply object oriented or non-object oriented techniques to solve bigger computing problems

UNIT I

Introduction to C++: Difference between C and C++, Evolution of C++, The Object Oriented Technology, Disadvantage of Conventional Programming, Key Concepts of Object Oriented Programming, Advantage of OOP, Object Oriented Language.

UNIT II

Classes and Objects &Constructors and Destructor: Classes in C++, Declaring Objects, Access Specifiers and their Scope, Defining Member Function, Overloading Member Function, Nested class, Constructors and Destructors, Introduction, Constructors and Destructor, Characteristics of Constructor and Destructor, Application with Constructor, Constructor with Arguments parameterized Constructor, Destructors, Anonymous Objects.

UNIT III

Operator Overloading and Type Conversion & Inheritance: The Keyword Operator, Overloading Unary Operator, Operator Return Type, Overloading Assignment Operator (=), Rules for Overloading Operators, Inheritance, Reusability, Types of Inheritance, Virtual Base Classes-Object as a Class Member, Abstract Classes, Advantages of Inheritance, Disadvantages of Inheritance.

UNIT IV

Pointers & Binding Polymorphisms and Virtual Functions: Pointer, Features of Pointers, Pointer Declaration, Pointer to Class, Pointer Object, The this Pointer, Pointer to Derived Classes and Base Class, Binding Polymorphisms and Virtual Functions, Introduction, Binding in C++, Virtual Functions, Rules for Virtual Function, Virtual Destructor.

UNIT V

Generic Programming with Templates & Exception Handling: Definition of class Templates,

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Normal Function Templates, Over Loading of Template Function, Bubble Sort Using Function Templates, Difference between Templates and Macros, Linked Lists with Templates, Exception Handling, Principles of Exception Handling, The Keywords try throw and catch, Multiple Catch Statements, Specifying Exceptions.

Overview of Standard Template Library, STL Programming Model, Containers, Sequence Containers, Associative Containers, Algorithms, Iterators, Vectors, Lists, Maps.

Text Books:
1) A First Book of C++, Gary Bronson, Cengage Learning.
2) The Complete Reference C++, Herbert Schildt, TMH.

Reference Books:
1) Object Oriented Programming C++, Joyce Farrell, Cengage.
2) C++ Programming: from problem analysis to program design, DS Malik, Cengage Learning
3) Programming in C++, Ashok N Kamthane, Pearson 2nd Edition

e- Resources:
1) https://nptel.ac.in/courses/106/105/106105151/
2) https://github.com/topics/object-oriented-programming

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	3
	COMPUTER ORGANIZATION				

Course Objectives:

The course objectives of Computer Organization are to discuss and make student familiar with the

- Principles and the Implementation of Computer Arithmetic
- Operation of CPUs including RTL, ALU, Instruction Cycle and Busses
- Fundamentals of different Instruction Set Architectures and their relationship to the CPU Design
- Memory System and I/O Organization
- Principles of Operation of Multiprocessor Systems and Pipelining

Course Outcomes:

By the end of the course, the student will

- Develop a detailed understanding of computer systems
- Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
- Develop a detailed understanding of architecture and functionality of central processing unit
- Exemplify in a better way the I/O and memory organization
- Illustrate concepts of parallel processing, pipelining and inter processor communication

UNIT I

Basic Structure of Computers: Basic Organization of Computers, Historical Perspective, Bus Structures, Data Representation: Data types, Complements, Fixed Point Representation. Floating, Point Representation. Other Binary Codes, Error Detection Codes.

Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

UNIT II

Register Transfer Language and Microoperations: Register Transfer language. Register Transfer Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Register, Computer Instructions, Instruction Cycle, Memory – Reference Instructions. Input –Output and Interrupt, Complete Computer Description.

UNIT III

Central Processing Unit: General Register Organization, STACK Organization. Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

Microprogrammed Control: Control Memory, Address Sequencing, Micro Program example, Design of Control Unit.

UNIT IV

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V

Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures, Inter Processor Arbitration.

Pipeline: Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor.

Text Books:

1) Computer System Architecture, M. Morris Mano, Third Edition, Pearson, 2008.
2) Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 5/e, McGraw Hill, 2002.

Reference Books:

1) Computer Organization and Architecture, William Stallings, 6/e, Pearson, 2006.
2) Structured Computer Organization, Andrew S. Tanenbaum, 4/e, Pearson, 2005.
3) Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer, 2006.

e- Resources:

1) https://nptel.ac.in/courses/106/105/106105163/
2) http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		0	0	3	1.5
	PYTHON PROGRAMMING LAB				

Course Objectives:
The aim of Python Programming Lab is
- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

Course Outcomes:
By the end of this lab, the student is able to
- Write, Test and Debug Python Programs
- Use Conditionals and Loops for Python Programs
- Use functions and represent Compound data using Lists, Tuples and Dictionaries
- Use various applications using python

1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.

2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.

3) Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.

4) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.

5) Use a *for* loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.
```
*
**
***
****
```

6) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.

7) Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and Not close otherwise.

8) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.

9) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters *abcde* and *ABCDE* the program should print out *AaBbCcDdEe*.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

10) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.

11) In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4y or 3(x+5). Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.

12) Write a program that generates a list of 20 random numbers between 1 and 100.
   (a) Print the list.
   (b) Print the average of the elements in the list.
   (c) Print the largest and smallest values in the list.
   (d) Print the second largest and second smallest entries in the list
   (e) Print how many even numbers are in the list.

13) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.

14) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is 4.

15) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].

16) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements,it is much shorter with lists and it is also easier to add new conversions if you use lists.

17) Write a function called *sum_digits* that is given an integer num and returns the sum of the digits of num.

18) Write a function called *first_diff* that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.

19) Write a function called *number_of_factors* that takes an integer and returns how many factors the number has.

20) Write a function called *is_sorted* that is given a list and returns True if the list is sorted and False otherwise.

21) Write a function called root that is given a number x and an integer n and returns $x^{1/n}$. In the function definition, set the default value of n to 2.

22) Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be 100.

23) Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
   (a) Do this using the sort method. (b) Do this without using the sort method.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

24) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.

25) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.

26) Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.

27) Write a class called Product. The class should have fields called name, amount, and price, holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get_price* that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make_purchase* that receives the number of items to be bought and decreases amount by that much.

28) Write a class called Time whose only field is a time in seconds. It should have a method called *convert_to_minutes* that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert_to_hours* that returns a string of hours, minutes, and seconds formatted analogously to the previous method.

29) Write a class called Converter. The user will pass a length and a unit when declaring an object from the class—for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call c.feet() and should get 0.75 as the result.

30) Write a Python class to implement pow(x, n).

31) Write a Python class to reverse a string word by word.

32) Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.

33) Write a program to demonstrate Try/except/else.

34) Write a program to demonstrate try/finally and with/as.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		0	0	3	1.5
	DATA STRUCTURES THROUGH C++ LAB				

Course Objectives:

The objective of this lab is to

- Demonstrate procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
- Understand dynamic memory management techniques using pointers, constructors, destructors, etc
- Demonstrate the concept of function overloading, operator overloading, virtual functions and polymorphism, inheritance.
- Demonstrate the different data structures implementation.

Course Outcomes:

By the end of this lab the student is able to

- Apply the various OOPs concepts with the help of programs.
- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

Exercise -1 (Classes Objects)

Create a Distance class with:

- feet and inches as data members
- member function to input distance
- member function to output distance
- member function to add two distance objects

1. Write a main function to create objects of DISTANCE class. Input two distances and output the sum.
2. Write a C++ Program to illustrate the use of Constructors and Destructors (use the above program.)
3. Write a program for illustrating function overloading in adding the distance between objects (use the above problem)

Exercise – 2 (Access)

Write a program for illustrating Access Specifiers public, private, protected

1. Write a program implementing Friend Function
2. Write a program to illustrate this pointer
3. Write a Program to illustrate pointer to a class

Exercise -3 (Operator Overloading)

1. Write a program to Overload Unary, and Binary Operators as Member Function, and Non Member Function.
    1. Unary operator as member function
    2. Binary operator as non member function
2. Write a c ++ program to implement the overloading assignment = operator

Exercise -4 (Inheritance)

1. Write C++ Programs and incorporating various forms of Inheritance
    i) Single Inheritance
    ii) Hierarchical Inheritance

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

      iii) Multiple Inheritances

      iv) Multi-level inheritance

      v) Hybrid inheritance

2. Also illustrate the order of execution of constructors and destructors in inheritance

Exercise -5(Templates, Exception Handling)

1. a)Write a C++ Program to illustrate template class
2. b)Write a Program to illustrate member function templates
3. c) Write a Program for Exception Handling Divide by zero
4. d)Write a Program to rethrow an Exception

Exercise -6 (Searching)

Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.

b) Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

Exercise -7 (Sorting-I)

a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order

b) Write C program that implement Quick sort, to sort a given list of integers in ascending order

c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order

Exercise -8(Sorting-II)

a) Write C program that implement radix sort, to sort a given list of integers in ascending order

b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -9(Singly Linked List)

a) Write a C program that uses functions to create a singly linked list

b) Write a C program that uses functions to perform insertion operation on a singly linked list

c) Write a C program that uses functions to perform deletion operation on a singly linked list

d) Write a C program to reverse elements of a single linked list.

Exercise -10(Queue)

a) Write C program that implement Queue (its operations) using arrays.

b) Write C program that implement Queue (its operations) using linked lists

Exercise -11(Stack)

a) Write C program that implement stack (its operations) using arrays

b) Write C program that implement stack (its operations) using Linked list

c) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -12(Binary Search Tree)

a) Write a C program to Create a BST

b) Write a C program to insert a node into a BST.

c) Write a C program to delete a node from a BST.

d) Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	0
	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE				

Course Objectives:

To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system

- The course aim of the importing basic principle of third process reasoning and inference sustainability is at the course of Indian traditional knowledge system
- To understand the legal framework and traditional knowledge and biological diversity act 2002 and geographical indication act 2003
- The courses focus on traditional knowledge and intellectual property mechanism of traditional knowledge and protection
- To know the student traditional knowledge in different sector

Course Outcomes:

After completion of the course, students will be able to:

- Understand the concept of Traditional knowledge and its importance
- Know the need and importance of protecting traditional knowledge
- Know the various enactments related to the protection of traditional knowledge
- Understand the concepts of Intellectual property to protect the traditional knowledge

UNITI

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

Learning Outcomes:

At the end of the unit, the student will able to:

- Understand the traditional knowledge.
- Contrast and compare characteristics importance kinds of traditional knowledge.
- Analyze physical and social contexts of traditional knowledge.
- Evaluate social change on traditional knowledge.

UNIT II

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

Learning Outcomes:

At the end of the unit, the student will able to:

- Know the need of protecting traditional knowledge.
- Apply significance of tk protection.
- Analyze the value of tk in global economy.
- Evaluate role of government

UNIT III

Legal framework and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act,

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

2001 (PPVFR Act);B:The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

Learning Outcomes:

At the end of the unit the student will able to:

- Understand legal framework of TK.
- Contrast and compare the ST and other traditional forest dwellers
- Analyze plant variant protections
- Evaluate farmers right act

UNIT IV

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

Learning Outcomes:

At the end of the unit, the student will able to:

- Understand TK and IPR
- Apply systems of TK protection.
- Analyze legal concepts for the protection of TK.
- Evaluate strategies to increase the protection of TK.

UNIT V

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

Learning Outcomes:

At the end of the unit, the student will able to:

- Know TK in different sectors.
- Apply TK in engineering.
- Analyze TK in various sectors.
- Evaluate food security and protection of TK in the country.

Reference Books:

1) Traditional Knowledge System in India, by Amit Jha, 2009.
2) Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, PratibhaPrakashan 2012.
3) Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
4) "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino

e-Resources:

1) https://www.youtube.com/watch?v=LZP1StpYEPM
2) http://nptel.ac.in/courses/121106003/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		2	0	0	0
	EMPLOYABILITY SKILLS -I				

Course Objectives:

The aim of this course is

- To explore and practice basic communication skills
- To learn skills for effective discussions & team work
- To assess and improve personal grooming

Course Outcomes:

By the end of this course, the student

- Establish effective communication with employers, supervisors, and co-workers
- Identify to explore their values and career choices through individual skill assessments
- Adapts positive attitude and appropriate body language
- Interpret the core competencies to succeed in professional and personal life

A list of vital employability skills from the standpoint of engineering students with discussion how to potentially develop such skills through campus life.

1) Soft Skills: An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development.
2) Self-Discovery: Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue.
3) Positivity and Motivation: Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels.
4) Interpersonal Communication: Interpersonal relations; communication models, process and barriers; team communication; developing interpersonal relationships through effective communication; listening skills; essential formal writing skills; corporate communication styles – assertion, persuasion, negotiation.
5) Public Speaking: Skills, Methods, Strategies and Essential tips for effective public speaking.
6) Group Discussion: Importance, Planning, Elements, Skills assessed; Effectively disagreeing, Initiating, Summarizing and Attaining the Objective.
7) Non-Verbal Communication: Importance and Elements; Body Language.
8) Teamwork and Leadership Skills: Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills.

References Books:

1) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
3) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
4) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
5) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
6) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	0	0	3
	PROBABILITY AND STATISTICS				

Course Objectives:
- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

Upon successful completion of this course, the student should be able to
- Classify the concepts of data science and its importance (L4) or (L2)
- Interpret the association of characteristics and through correlation and regression tools (L4)
- Make use of the concepts of probability and their applications (L3)
- Apply discrete and continuous probability distributions (L3)
- Design the components of a classical hypothesis test   (L6)
- Infer the statistical inferential methods based on small and large sampling tests (L4)

UNIT I

Descriptive statistics and methods for data science: Data science – Statistics Introduction – Population vs Sample – Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability (spread or variance) – Skewness Kurtosis.

UNIT II

Correlation and Curve fitting: Correlation – correlation coefficient – rank correlation – regression coefficients and properties – regression lines – Method of least squares – Straight line – parabola – Exponential – Power curves.

UNIT III

Probability and Distributions: Probability – Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT IV

Sampling Theory:Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t, χ^2 and F-distributions – Point and Interval estimations – Maximum error of estimate.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V

Tests of Hypothesis: Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

Text Books:
1) Miller and Freund's, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2) S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:
1) Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2) Jay l. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3) Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4) Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		2	1	0	3
	JAVA PROGRAMMING				

Course Objectives:
The learning objectives of this course are:
- To identify Java language components and how they work together in applications
- To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- To understand how to design applications with threads in Java
- To understand how to use Java APIs for program development

Course Outcomes:
 By the end of the course, the student will be
- Able to realize the concept of Object Oriented Programming & Java Programming Constructs
- Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
- Apply the concept of exception handling and Input/ Output operations
- Able to design the applications of Java & Java applet
- Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit

UNIT I
Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II
Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by

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KAKINADA – 533 003, Andhra Pradesh, India

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Reference, Keyword this.
Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III
Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.
Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV
Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.

UNIT V
String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class String Builder.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread- Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface, Creating JDBC Application, JDBC Batch Processing, JDBC Transaction Management

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KAKINADA – 533 003, Andhra Pradesh, India

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Text Books:
1) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2) The complete Reference Java, 8th edition, Herbert Schildt, TMH.

References Books:
1) Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
2) Murach's Java Programming, Joel Murach

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105191/
2) https://www.w3schools.com/java/java_data_types.asp

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	0	0	3
	OPERATING SYSTEMS				

Course Objectives:
The objectives of this course is to
- Introduce to the internal operation of modern operating systems
- Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems
- Understand File Systems in Operating System like UNIX/Linux and Windows
- Understand Input Output Management and use of Device Driver and Secondary Storage (Disk) Mechanism
- Analyze Security and Protection Mechanism in Operating System

Course Outcomes:
After learning, the course the students should be able to:
- Describe various generations of Operating System and functions of Operating System
- Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
- Solve Inter Process Communication problems using Mathematical Equations by various methods
- Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
- Outline File Systems in Operating System like UNIX/Linux and Windows

UNIT I
Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems.

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.

UNIT II
Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems.
Multithreaded Programming: Multithreading models, Thread libraries, Threading issues.
Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling.
Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

UNIT III
Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation.

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KAKINADA – 533 003, Andhra Pradesh, India

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Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation.

UNIT IV

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention.

File Systems: Files, Directories, File system implementation, management and optimization.

Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

UNIT V

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.

System Security: Introduction, Program threats, System and network threats, Cryptography for security, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer security classification.

Case Studies: Linux, Microsoft Windows.

Text Books:
1) Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
2) Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Interprocess Communication and File systems.)

Reference Books:
1) Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
2) Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
3) Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105214/

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	1	0	4
	DATABASE MANAGEMENT SYSTEMS				

Course Objectives:
- To introduce about database management systems
- To give a good formal foundation on the relational model of data and usage of Relational Algebra
- To introduce the concepts of basic SQL as a universal Database language
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes:
By the end of the course, the student will be able to
- Describe a relational database and object-oriented database
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design
- Examine issues in data storage and query processing and can formulate appropriate solutions
- Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

UNIT I
Introduction: Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

UNIT II
Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).

UNIT III
Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

UNIT IV
Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).

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UNIT V

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing: Tree base Indexing ,Comparison of File Organizations, Indexes and Performance Tuning

Text Books:
1) Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
2) Database System Concepts,5/e, Silberschatz, Korth, TMH

Reference Books:

1) Introduction to Database Systems, 8/e C J Date, PEA.
2) Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

e-Resources:
1) https://nptel.ac.in/courses/106/105/106105175/
2) https://www.geeksforgeeks.org/introduction-to-nosql/

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	0	0	3
FORMAL LANGUAGES AND AUTOMATA THEORY					

Course Objectives:
- To learn fundamentals of Regular and Context Free Grammars and Languages
- To understand the relation between Regular Language and Finite Automata and machines
- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators
- To understand the relation between Contexts free Languages, PDA and TM
- To learn how to design PDA as acceptor and TM as Calculators

Course Outcomes:

By the end of the course students can
- Classify machines by their power to recognize languages.
- Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy
- Employ finite state machines to solve problems in computing
- Illustrate deterministic and non-deterministic machines
- Quote the hierarchy of problems arising in the computer science

UNIT I

Finite Automata: Need of Automata theory, Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with Є-Transitions, Minimization of Finite Automata, Finite Automata with output-Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT II

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two RE, Manipulations of REs, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between FA and RE, Pumping Lemma of Regular Sets, Closure Properties of Regular Sets, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Right and Left Linear Regular Grammars, Equivalence between RG and FA, Inter Conversion.

UNIT III

Formal Languages, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, Є-Productions and Unit Productions, Normal Forms-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

UNIT IV

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description, Language Acceptance of Pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars, Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V

Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a TM, Design of TMs, Types of TMs, Church's Thesis, Universal and Restricted TM, Decidable and Un-decidable Problems, Halting Problem of TMs, Post's Correspondence Problem, Modified PCP, Classes of P and NP, NP-Hard and NP-Complete Problems.

Text Books:
1) Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008
2) Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007

Reference Books:
1) Elements of Theory of Computation, Lewis H.P. & Papadimition C.H., Pearson /PHI
2) Theory of Computation, V. Kulkarni, Oxford University Press, 2013
3) Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014

e-Resources:
1) https://nptel.ac.in/courses/106/104/106104028/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		0	0	3	1.5
	JAVA PROGRAMMING LAB				

Course Objectives:

The aim of this lab is to

- Practice programming in the Java
- Gain knowledge of object-oriented paradigm in the Java programming language
- Learn use of Java in a variety of technologies and on different platforms

Course Outcomes:

By the end of the course student will be able to write java program for

- Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings
- Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
- Construct Threads, Event Handling, implement packages, developing applets

Exercise - 1 (Basics)

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program to sort for an element in a given list of elements using merge sort.

d) Write a JAVA program using StringBuffer to delete, remove character.

Exercise - 3 (Class, Objects)

a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.

b) Write a JAVA program to implement constructor.

Exercise - 4 (Methods)

a) Write a JAVA program to implement constructor overloading.

b) Write a JAVA program implement method overloading.

Exercise - 5 (Inheritance)

a) Write a JAVA program to implement Single Inheritance

b) Write a JAVA program to implement multi level Inheritance

c) Write a java program for abstract class to find areas of different shapes

Exercise - 6 (Inheritance - Continued)

a) Write a JAVA program give example for "super" keyword.

b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Exercise - 7 (Exception)
a) Write a JAVA program that describes exception handling mechanism
b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)
a) Write a JAVA program that implements Runtime polymorphism
b) Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise – 9 (User defined Exception)
a) Write a JAVA program for creation of Illustrating throw
b) Write a JAVA program for creation of Illustrating finally
c) Write a JAVA program for creation of Java Built-in Exceptions
d) d)Write a JAVA program for creation of User Defined Exception

Exercise – 10 (Threads)
a) Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)
b) Write a program illustrating **isAlive** and **join ()**
c) Write a Program illustrating Daemon Threads.

Exercise - 11 (Threads continuity)
a) Write a JAVA program Producer Consumer Problem
b) Write a case study on thread Synchronization after solving the above producer consumer problem

Exercise – 12 (Packages)
a) Write a JAVA program illustrate class path
b) Write a case study on including in class path in your os environment of your package.
c) Write a JAVA program that import and use the defined your package in the previous Problem

Exercise - 13 (Applet)
a) Write a JAVA program to paint like paint brush in applet.
b) Write a JAVA program to display analog clock using Applet.
c) Write a JAVA program to create different shapes and fill colors using Applet.

Exercise - 14 (Event Handling)
a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.
b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		0	0	2	1
	UNIX OPERATING SYSTEM LAB				

Course Objectives:
- To understand the design aspects of operating system
- To study the process management concepts & Techniques
- To study the storage management concepts
- To familiarize students with the Linux environment
- To learn the fundamentals of shell scripting/programming

Course Outcomes:
- To use Unix utilities and perform basic shell control of the utilities
- To use the Unix file system and file access control
- To use of an operating system to develop software
- Students will be able to use Linux environment efficiently
- Solve problems using bash for shell scripting

1) a) Study of Unix/Linux general purpose utility command list: man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.

   b) Study of vi editor

   c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system

   d) Study of Unix/Linux file system (tree structure)

   e) Study of .bashrc, /etc/bashrc and Environment variables.

2) Write a C program that makes a copy of a file using standard I/O, and system calls

3) Write a C program to emulate the UNIX ls –l command.

4) Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls –l | sort

5) Simulate the following CPU scheduling algorithms: (a) Round Robin (b) SJF (c) FCFS (d) Priority

6) Multiprogramming-Memory management-Implementation of fork (), wait (), exec() and exit (), System calls

7) Simulate the following:

   a)   Multiprogramming with a fixed number of tasks (MFT)
   b)   Multiprogramming with a variable number of tasks (MVT)

8) Simulate Bankers Algorithm for Dead Lock Avoidance

9) Simulate Bankers Algorithm for Dead Lock Prevention.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

10) Simulate the following page replacement algorithms:
   a) FIFO b) LRU c) LFU
11) Simulate the following File allocation strategies
   (a) Sequenced (b) Indexed (c) Linked

12) Write a C program that illustrates two processes communicating using shared   memory

13) Write a C program to simulate producer and consumer problem usingsemaphores

14) Write C program to create a thread using pthreads library and let it run its function.

15) Write a C program to illustrate concurrent execution of threads using pthreads library.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		0	0	3	1.5

DATABASE MANAGEMENT SYSTEMS LAB

Course Objectives:

This Course will enable students to
- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

Course Outcomes:

At the end of the course the student will be able to:
- Utilize SQL to execute queries for creating database and performing data manipulation operations
- Examine integrity constraints to build efficient databases
- Apply Queries using Advanced Concepts of SQL
- Build PL/SQL programs including stored procedures, functions, cursors and triggers

List of Exercises:

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5.
   i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
   ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexing techniques.

Text Books/Suggested Reading:

1) Oracle: The Complete Reference by Oracle Press
2) Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3) Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	0	0	0
	PROFESSIONAL ETHICS & HUMAN VALUES				

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others
- To create awareness on assessment of safety and risk

Course outcomes:

Students will be able to:

- Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
- Identify the multiple ethical interests at stake in a real-world situation or practice
- Articulate what makes a particular course of action ethically defensible
- Assess their own ethical values and the social context of problems
- Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
- Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work
- Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.

UNIT I

Human Values: Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty -Courage-Cooperation– Commitment – Empathy –Self Confidence Character –Spirituality.

Learning outcomes:

1. Learn about morals, values & work ethics.
2. Learn to respect others and develop civic virtue.
3. Develop commitment
4. Learn how to live peacefully

UNIT II

Engineering Ethics: Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry – Moral dilemmas –Moral autonomy –Kohlberg's theory-Gilligan's theory-Consensus and controversy –Models of professional roles-Theories about right action-Self-interest -Customs and religion –Uses of Ethical theories –Valuing time –Cooperation –Commitment.

Learning outcomes:

1. Learn about the ethical responsibilities of the engineers.
2. Create awareness about the customs and religions.
3. Learn time management
4. Learn about the different professional roles.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT III

Engineering as Social Experimentation: Engineering As Social Experimentation –Framing the problem –Determining the facts –Codes of Ethics –Clarifying Concepts –Application issues – Common Ground -General Principles –Utilitarian thinking respect for persons.

Learning outcomes:
1. Demonstrate knowledge to become a social experimenter.
2. Provide depth knowledge on framing of the problem and determining the facts.
3. Provide depth knowledge on codes of ethics.
4. Develop utilitarian thinking

UNIT IV

Engineers Responsibility for Safety and Risk: Safety and risk –Assessment of safety and risk – Risk benefit analysis and reducing risk-Safety and the Engineer-Designing for the safety-Intellectual Property rights (IPR).

Learning outcomes:
1. Create awareness about safety, risk & risk benefit analysis.
2. Engineer's design practices for providing safety.
3. Provide knowledge on intellectual property rights.

UINIT V

Global Issues: Globalization –Cross-culture issues-Environmental Ethics –Computer Ethics – Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts – Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research.

Learning outcomes:
1. Develop knowledge about global issues.
2. Create awareness on computer and environmental ethics
3. Analyze ethical problems in research.
4. Give a picture on weapons development.

Text Books:
1) "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and, V.S.Senthil Kumar-PHI Learning Pvt. Ltd-2009
2) "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
3) "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger –Tata McGraw-Hill–2003.
4) "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications.
5) "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran-LaxmiPublications.
6) "Professional Ethics and Human Values" by Prof.D.R.Kiran-
7) "Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		0	0	2	1
	SOCIALLY RELEVANT PROJECT(15HRS)				

Course Objectives:

The aim of Socially Relevant Project is to encourage students

- To express their ideas, to solve real-world problems and to complete projects
- Using human experience to gather ideas from a wide range of problems in society by observation or pooling information
- Using scientific, social-scientific, humanistic, cultural reasoning to analyze global problems

Course Outcomes:

The student learns to

- Use scientific reasoning to gather, evaluate, and interpret ideas
- Analyze and design solutions to solve the ideas
- Use one or more creative tools to complete the projects

The student can choose any one of the given below / any other socially relevant problem and work on it to produce a project document.

1. Water Conservation Related Works
2. Swatch Bharath (Internal External)
3. Helping police
4. Traffic monitoring
5. Teaching Rural Kids (Sarva siksha Abhiyan)
6. Street light monitoring
7. Electricity Conservation
8. Solar panel utilization
9. E- policing & cyber solution
10. Pollution
11. Any social related

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
DATA WAREHOUSING AND DATA MINING					

Course Objectives:
- To understand data warehouse concepts, architecture, business analysis and tools
- To understand data pre-processing and data visualization techniques
- To study algorithms for finding hidden and interesting patterns in data
- To understand and apply various classification and clustering techniques using tools

Course Outcomes:
At the end of the course, the students will be able to:
- Design a Data warehouse system and perform business analysis with OLAP tools
- Apply suitable pre-processing and visualization techniques for data analysis
- Apply frequent pattern and association rule mining techniques for data analysis
- Apply appropriate classification techniques for data analysis
- Apply appropriate clustering techniques for data analysis

UNIT I
Data Warehousing, Business Analysis and On-Line Analytical Processing (OLAP): Basic Concepts, Data Warehousing Components, Building a Data Warehouse, Database Architectures for Parallel Processing, Parallel DBMS Vendors, Multidimensional Data Model, Data Warehouse Schemas for Decision Support, Concept Hierarchies, Characteristics of OLAP Systems, Typical OLAP Operations, OLAP and OLTP.

UNIT II
Data Mining – Introduction: Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Techniques, Issues, applications, Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT III
Data Mining - Frequent Pattern Analysis: Mining Frequent Patterns, Associations and Correlations, Mining Methods, Pattern Evaluation Method, Pattern Mining in Multilevel, Multi-Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns

UNIT IV
Classification: Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification by Back Propagation, Support Vector Machines, Lazy Learners, Model Evaluation and Selection, Techniques to improve Classification Accuracy

UNIT V
Clustering: Clustering Techniques, Cluster analysis, Partitioning Methods, Hierarchical methods, Density Based Methods, Grid Based Methods, Evaluation of clustering, Clustering high dimensional data, Clustering with constraints, Outlier analysis, outlier detection methods.

Text Books:
1) Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

2) Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Pearson,2016.

Reference Books:

1) Alex Berson and Stephen J.Smith, ―Data Warehousing, Data Mining & OLAP‖, Tata McGraw – Hill Edition, 35th Reprint 2016.
2) K.P. Soman, ShyamDiwakar and V. Ajay, ―Insight into Data Mining Theory and Practice‖, Eastern Economy Edition, Prentice Hall of India, 2006.
3) Ian H.Witten and Eibe Frank, ―Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.

e-Resources:

1) https://www.saedsayad.com/data_mining_map.htm
2) https://nptel.ac.in/courses/106/105/106105174/
3) (NPTEL course by Prof.Pabitra Mitra) http://onlinecourses.nptel.ac.in/noc17_mg24/preview
4) (NPTEL course by Dr. Nandan Sudarshanam & Dr. Balaraman Ravindran) http://www.saedsayad.com/data_mining_map.htm

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
	COMPUTER NETWORKS				

Course Objectives:

The main objectives are

- Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model
- Study data link layer concepts, design issues, and protocols
- Gain core knowledge of Network layer routing protocols and IP addressing
- Study Session layer design issues, Transport layer services, and protocols
- Acquire knowledge of Application layer and Presentation layer paradigms and protocols

Course Outcomes:

At the end of the course, the students will be able to:

- Illustrate the OSI and TCP/IP reference model
- Analyze MAC layer protocols and LAN technologies
- Design applications using internet protocols
- Implement routing and congestion control algorithms
- Develop application layer protocols

UNIT I

Introduction: History and development of computer networks, Basic Network Architectures: OSI reference model, TCP/IP reference model, and Networks topologies, types of networks (LAN, MAN, WAN, circuit switched, packet switched, message switched, extranet, intranet, Internet, wired, wireless).

UNIT II

Physical layer: Line encoding, block encoding, scrambling, modulation demodulation (both analog and digital), errors in transmission, multiplexing (FDM, TDM, WDM, OFDM, DSSS), Different types of transmission media. Data Link Layer services: framing, error control, flow control, medium access control. Error & Flow control mechanisms: stop and wait, Go back N and selective repeat. MAC protocols: Aloha, slotted aloha, CSMA, CSMA/CD, CSMA/CA, polling, token passing, scheduling.

UNIT III

Local Area Network Technology: Token Ring. Error detection (Parity, CRC), Ethernet, Fast Ethernet, Gigabit Ethernet, Personal Area Network: Bluetooth and Wireless Communications Standard: Wi-Fi (802.11) and Wi-MAX.

UNIT IV

Network layer: Internet Protocol, IPv6, ARP, DHCP, ICMP, Routing algorithms: Distance vector, Link state, Metrics, Inter-domain routing. Sub netting, Super netting, Classless addressing, Network Address Translation.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V

Transport layer: UDP, TCP. Connection establishment and termination, sliding window, flow and congestion control, timers, retransmission, TCP extensions, Queuing theory, Single and multiple server queuing models, Little's formula. Application Layer. Network Application services and protocols including e-mail, www, DNS, SMTP, IMAP, FTP, TFTP, Telnet, BOOTP, HTTP, IPSec, Firewalls.

Text Books:

1) Computer Networks , Andrew S. Tanenbaum, David J. Wetherall, Pearson Education India; 5 edition, 2013
2) Data Communication and Networking , Behrouz A. Forouzan, McGraw Hill, 5th Edition, 2012

Reference Books:

1) Computer Networks: A Systems Approach, LL Peterson, BS Davie, Morgan-Kauffman , 5th Edition, 2011.
2) Computer Networking: A Top-Down Approach JF Kurose, KW Ross, Addison-Wesley, 5th Edition, 2009
3) Data and Computer Communications , William Stallings , Pearson , 8th Edition, 2007

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105183/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
	COMPILER DESIGN				

Course Objectives:
- To study the various phases in the design of a compiler
- To understand the design of top-down and bottom-up parsers
- To understand syntax directed translation schemes
- To introduce LEX and YACC tools
- To learn to develop algorithms to generate code for a target machine

Course Outcomes:
At the end of the course, the students will be able to:
- Design, develop, and implement a compiler for any language
- Use LEX and YACC tools for developing a scanner and a parser
- Design and implement LL and LR parsers
- Design algorithms to perform code optimization in order to improve the performance of a program in terms of space and time complexity
- Apply algorithms to generate machine code

UNIT I
Language Processors, the structure of a compiler, the science of building a compiler, programming language basics.
Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers.

UNIT II
Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Recursive and Non recursive top down parsers, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars, Parser Generators.

UNIT III
Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, and Implementing L-Attributed SDD's. Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Back patching, Switch-Statements, Intermediate Code for Procedures.

UNIT IV
Run-Time Environments: Storage organization, Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection.
Machine-Independent Optimizations: The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.

UNIT V
Code Generation: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Generator.

Machine-dependent Optimizations: Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.

Text Books:
1) Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson.
2) Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning.

Reference Books:
1) Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
2) The Theory and Practice of Compiler writing, J. P. Tremblay and P. G. Sorenson, TMH
3) Writing compilers and interpreters, R. Mak, 3rd edition, Wiley student edition.

e-Resources:
1) https://nptel.ac.in/courses/106/104/106104123/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
	ARTIFICIAL INTELLIGENCE				

Course Objectives:
- To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language
- To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs
- To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning

Course Outcomes:
- Outline problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem
- Apply the language/framework of different AI methods for a given problem
- Implement basic AI algorithms- standard search algorithms or dynamic programming
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports

UNIT I
Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

UNIT II
Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction.
Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

UNIT III
Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

UNIT IV
Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.
Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web

UNIT V
Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems
Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory
Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

Text Books:
1) Artificial Intelligence- Saroj Kaushik, CENGAGE Learning
2) Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

Reference Books:
1) Artificial Intelligence- Deepak Khemani, TMH, 2013
2) Introduction to Artificial Intelligence, Patterson, PHI
3) Atificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA

e-Resources:
1) https://nptel.ac.in/courses/106/105/106105077/
2) http://aima.cs.berkeley.edu/

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
	COMPUTER GRAPHICS				

Course Objectives:
- To develop, design and implement two and three dimensional graphical structures
- To enable students to acquire knowledge Multimedia compression and animations
- To learn Creation, Management and Transmission of Multimedia objects

Course Outcomes:
After learning the course, the student will be able:
- Illustrate the basics of computer graphics, different graphics systems and applications of computer graphics with various algorithms for line, circle and ellipse drawing objects for 2D transformations
- Apply projections and visible surface detection techniques for display of 3D scene on 2D screen
- Illustrate able to create the general software architecture of programs that use 3D object sets with computer graphics

UNIT I
Introduction to Graphics: Application areas of Computer Graphics, overview of graphics systems, video-display devices, graphics monitors and work stations and input devices. 2D Primitives: Output primitives-Line, Circle and Ellipse drawing algorithms, Attributes of output primitives, Two dimensional Geometric transformations, Two dimensional viewing Line, Polygon, Curve and Text clipping algorithms.

UNIT II
3D Concepts: Parallel and Perspective projections, Three dimensional object representation-Polygons, Curved lines, Splines, Quadric Surfaces, Visualization of data sets, 3D transformations, Viewing, Visible surface identification.

UNIT III
Graphics Programming: Color Models- RGB, YIQ, CMY, HSV, Animations -General Computer Animation, Raster, Keyframe. Graphics programming using OPENGL-Basic graphics primitives, Drawing three dimensional objects, Drawing three dimensional scenes.

UNIT IV
Rendering: Introduction to shading models, Flat and Smooth shading, Adding texture to faces, Adding shadows of objects, Building a camera in a program, Creating shaded objects

UNIT V
Overview of Ray Tracing: Intersecting rays with other primitives, Adding Surface texture, Reflections and Transparency, Boolean operations on Objects.

Text Books:
1) Donald Hearn, Pauline Baker, Computer Graphics – C Version, second edition, Pearson Education,2004.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

2) Schaum's Outline of Computer Graphics Second Edition, Zhigang Xiang, Roy A. Plastock.

Reference Books:

1) James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007.
2) F.S. Hill, Computer Graphics using OPENGL, Second edition, Pearson Education, 2003.

e-Resources:

1) http://math.hws.edu/eck/cs424/downloads/graphicsbook-linked.pdf
2) https://nptel.ac.in/courses/106/106/106106090/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3

PRINCIPLES OF PROGRAMMING LANGUAGES

Course Objectives:
- To understand and describe syntax and semantics of programming languages
- To understand data, data types, and basic statements
- To understand call-return architecture and ways of implementing them
- To understand object-orientation, concurrency, and event handling in programming languages
- To develop programs in non-procedural programming paradigms

Course Outcomes:
- Describe the syntax and semantics of programming languages and gain practical knowledge in lexical analysis and parsing phases of a compiler
- Make use of different constructs in programming languages with merits and demerits
- Design and implement sub programs in various programming languages
- Developing the knowledge on different programming language features like object-orientation, concurrency, exception handling and event handling
- Analyzing functional paradigm and ability to write small programs using Scheme and ML and Develop programs logic paradigm and ability to write small programs using Prolog

UNIT I

Syntax and semantics: Evolution of programming languages, describing syntax, context, free grammars, attribute grammars, describing semantics, lexical analysis, parsing, recursive - decent bottom - up parsing.

UNIT II

Data, data types, and basic statements: Names, variables, binding, type checking, scope, scope rules, lifetime and garbage collection, primitive data types, strings, array types, associative arrays, record types, union types, pointers and references, Arithmetic expressions, overloaded operators, type conversions, relational and Boolean expressions, assignment statements, mixed mode assignments, control structures – selection, iterations, branching, guarded Statements.

UNIT III

Subprograms and implementations: Subprograms, design issues, local referencing, parameter passing, overloaded methods, generic methods, design issues for functions, semantics of call and return, implementing simple subprograms, stack and dynamic local variables, nested subprograms, blocks, dynamic scoping.

UNIT IV

Object- orientation, concurrency, and event handling: Object – orientation, design issues for OOP languages, implementation of object, oriented constructs, concurrency, semaphores, Monitors, message passing, threads, statement level concurrency, exception handling, event handling.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V
Functional programming languages: Introduction to lambda calculus, fundamentals of functional programming languages, Programming with Scheme, Programming with ML
Logic programming languages: Introduction to logic and logic programming, Programming with Prolog, multi - paradigm languages.

Text Books:
1) Robert W. Sebesta, "Concepts of Programming Languages", Tenth Edition, Addison Wesley, 2012.
2) Programming Languages, Principles & Paradigms, 2ed, Allen B Tucker, Robert E Noonan, TMH.

Reference Books:
1) R. Kent Dybvig, "The Scheme programming language", Fourth Edition, MIT Press, 2009.
2) Jeffrey D. Ullman, "Elements of ML programming", Second Edition, Prentice Hall, 1998.
3) Richard A. O'Keefe, "The craft of Prolog", MIT Press, 2009.
4) W. F. Clocksin and C. S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
	ADVANCED DATA STRUCTURES				

Course Objectives:

- Describe and implement a variety of advanced data structures (hash tables, priority queues, balanced search trees, graphs)
- Analyze the space and time complexity of the algorithms studied in the course
- Identify different solutions for a given problem; analyze advantages and disadvantages to different solutions
- Demonstrate an understanding of Amortization
- Demonstrate an understanding of various search trees

Course Outcomes:

Upon completion of the course, graduates will be able to

- Illustrate several sub-quadratic sorting algorithms.
- Demonstrate recursive methods
- Apply advanced data structures such as balanced search trees, hash tables, priority queues and the disjoint set union/find data structure

UNIT I

Sorting: Medians and order statistics, External Sorting, Introduction, K-way Merging, Buffer Handling for parallel Operation, Run Generation, Optimal Merging of Runs.

Hashing: Introduction, Static Hashing, Hash Table, Hash Functions, Secure Hash Function, Overflow Handling, Theoretical Evaluation of Overflow Techniques, Dynamic Hashing-Motivation for Dynamic Hashing, Dynamic Hashing Using Directories, Directory less Dynamic Hashing, Alternate hash functions (mid-square, folding, digit analysis), Double Hashing

UNIT II

Priority Queues and Advance Heaps: Double Ended Priority queues, Leftist Trees: Height Biased, Weight Biased. Binomial Heaps: Cost Amortization, Definition of Binomial Heaps, Insertion, Melding two Binomial Heaps, deletion of min element. Fibonacci Heaps: Definition, Deletion from an F-heap, Decrease key, Cascading Cut.

UNIT III

Advanced and Efficient Binary Search Trees: Optimal Binary Search Trees, AVL Trees-rotations, insertion, deletion operations, Red-Black Trees, Definition, Representation of a Red-Black Tree, Searching a Red-Black Tree, Inserting into a Red Black Tree, Deletion from a Red-Black Tree, Joining Red-Black Trees, Splitting a Red-Black tree.

UNIT IV

Multi-way Search Trees: M-Way Search Trees, Definition and Properties, Searching an M-Way Search Tree, B-Trees, Definition and Properties, Number of Elements in a B-tree, Insertion into B-Tree, Deletion from a B-Tree, B+-Tree Definition, Searching a B+-Tree, Insertion into B+-tree, Deletion from a B+-Tree.

UNIT V

Digital Search Structures: Digital Search Trees: Definition, Search, Insert and Delete. Binary Tries, Compressed Binary Tries. Multi-way Tries: Definition, searching a Trie, sampling

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

strategies, Insertion, Deletion, Height of a Trie. Prefix Search and applications. Suffix Trees.

Text Books:
1) Fundamentals of DATA STRUCTURES in C: 2nd ed, , Horowitz , Sahani, Anderson-freed, Universities Press
2) Data Structures, a Pseudo code Approach, Richard F Gilberg, Behrouz A Forouzan, Cengage.

Reference Books:
1) Data structures and Algorithm Analysis in C, 2nd edition, Mark Allen Weiss, Pearson
2) "Introduction to Algorithms", T. Cormen, R.Rivest, C. Stein, C. Leiserson, PHI publication, Second Edition, 2004, ISBN 81-203-2141-3.

e-Resources:
1) Web : http://lcm.csa.iisc.ernet.in/dsa/dsa.html
2) http://utubersity.com/?page_id=878
3) http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures
4) http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
	SOFTWARE TESTING METHODOLOGIES				

Course Objectives:
- To study fundamental concepts in software testing and discuss various software testing issues and solutions in software unit, integration, regression and system testing
- To learn how to plan a test project, design test cases and data, conduct testing, manage software problems and defects, generate a test report
- To expose the advanced software testing concepts such as object-oriented software testing methods, web-based and component-based software testing
- To understand software test automation problems and solutions
- To learn how to write software test documents and communicate with engineers in various forms

Course Outcomes:
By the end of the course, the student should have the ability to:
- Identify and understand various software testing problems, apply software testing knowledge and engineering methods and solve these problems by designing and selecting software test models, criteria, strategies, and methods
- Design and conduct a software test process for a software project
- Analyze the needs of software test automation
- Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects
- Basic understanding and knowledge of contemporary issues in software testing, such as component-based, web based and object oriented software testing problems
- Write test cases for given software to test it before delivery to the customer and write test scripts for both desktop and web based applications

UNIT I
Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs Exhaustive Software Testing.
Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology.
Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, verifying code, Validation.

UNIT II
Dynamic Testing-Black Box testing techniques**:** Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing.
White-Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing.

UNIT III
Static Testing: Inspections, Structured Walkthroughs, Technical Reviews.
Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing.
Regression testing: Progressives Vs regressive testing, Regression test ability, Objectives of regression testing, Regression testing types, Regression testing techniques.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT IV
Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite Software Quality Management: Software Quality metrics, SQA models.
Debugging: process, techniques, correcting bugs.

UNIT V
Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit . Test Automation using Selenium tool.
Testing Object Oriented Software: basics, Object oriented testing Testing Web based Systems: Challenges in testing for web based software, quality aspects, web engineering, testing of web based systems, Testing mobile systems.

Text Books:
1) Software Testing, Principles and Practices, Naresh Chauhan, Oxford
2) Software Testing, Yogesh Singh, CAMBRIDGE

Reference Books:
1) Foundations of Software testing, Aditya P Mathur, 2ed, Pearson
2) Software testing techniques – Baris Beizer, Dreamtech, second edition.
3) Software Testing, Principles, techniques and Tools, M G Limaye, TMH
4) Effective Methods for Software testing, Willian E Perry, 3ed, Wiley

e-Resources:
1) https://www.tutorialspoint.com/software_testing_dictionary/test_tools.htm

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
	ADVANCED COMPUTER ARCHITECTURE				

Course Objectives:

- Understand the Concept of Parallel Processing and its applications
- Implement the Hardware for Arithmetic Operations
- Analyze the performance of different scalar Computers
- Develop the Pipelining Concept for a given set of Instructions
- Distinguish the performance of pipelining and non pipelining environment in a processor

Course Outcomes:

After the completion of the course, student will be able to

- Illustrate the types of computers, and new trends and developments in computer architecture
- Outline pipelining, instruction set architectures, memory addressing
- Apply ILP using dynamic scheduling, multiple issue, and speculation
- Illustrate the various techniques to enhance a processors ability to exploit Instruction-level parallelism (ILP), and its challenges
- Apply multithreading by using ILP and supporting thread-level parallelism (TLP)

UNIT I

Computer Abstractions and Technology: Introduction, Eight Great Ideas in Computer Architecture, Below Your Program, Under the Covers, Technologies for Building Processors and Memory, Performance, The Power Wall, The Sea Change: The Switch from Uni-processors to Multiprocessors, Benchmarking the Intel Core i7, Fallacies and Pitfalls.

UNIT II

Instructions: Language of the Computer: Operations of the Computer Hardware, Operands of the Computer Hardware, Signed and Unsigned Numbers, Representing Instructions in the Computer, Logical Operations, Instructions for Making Decisions, Supporting Procedures in Computer Hardware, Communicating with People, MIPS Addressing for 32-Bit Immediates and Addresses, Parallelism and Instructions: Synchronization, Translating and Starting a Program, A C Sort Example to Put It All Together, Arrays versus Pointers, ARMv7 (32-bit) Instructions, x86 Instructions, ARMv8 (64-bit) Instructions.

UNIT III

Arithmetic for Computers: Introduction, Addition and Subtraction, Multiplication, Division, Floating Point, Parallelism and Computer Arithmetic: Subword Parallelism, Streaming SIMD Extensions and Advanced Vector Extensions in x86, Subword Parallelism and Matrix Multiply.

UNIT IV

The Processor: Introduction, Logic Design Conventions, Building a Datapath, A Simple Implementation Scheme, An Overview of Pipelining, Pipelined Datapath and Control, Data Hazards: Forwarding versus Stalling, Control Hazards, Exceptions, Parallelism via Instructions, The ARM Cortex-A8 and Intel Core i7 Pipelines.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V
Large and Fast: Exploiting Memory Hierarchy: Introduction, Memory Technologies, The Basics of Caches, Measuring and Improving Cache Performance, Dependable Memory Hierarchy, Virtual Machines, Virtual Memory, A Common Framework for Memory Hierarchy, Using a Finite-State Machine to Control a Simple Cache, Parallelism and Memory Hierarchies: Cache Coherence, Parallelism and Memory Hierarchy: Redundant Arrays of Inexpensive Disks, Advanced Material: Implementing Cache Controllers, The ARM Cortex-A8 and Intel Core i7 Memory Hierarchies.

Text Books:
1) Computer Organization and Design: The hardware and Software Interface, David A Patterson, John L Hennessy, 5th edition, MK.
2) Computer Architecture and Parallel Processing – Kai Hwang, Faye A.Brigs, Mc Graw Hill.

Reference Books:
1) Modern Processor Design: Fundamentals of Super Scalar Processors, John P. Shen and Miikko H. Lipasti, Mc Graw Hill.
2) Advanced Computer Architecture – A Design Space Approach – Dezso Sima, Terence Fountain, Peter Kacsuk , Pearson.

e-Resources:
1) https://nptel.ac.in/courses/106/105/106105163/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		0	0	2	1
	COMPUTER NETWORKS LAB				

Course Objectives:
- Understand and apply different network commands
- Analyze different networking functions and features for implementing optimal solutions
  Apply different networking concepts for implementing network solution
- Implement different network protocols

Course Outcomes:
- Apply the basics of Physical layer in real time applications
- Apply data link layer concepts, design issues, and protocols
- Apply Network layer routing protocols and IP addressing
- Implement the functions of Application layer and Presentation layer paradigms and Protocols

Experiments:

1) Implement the data link layer framing methods such as character stuffing and bit stuffing.
2) Write a C program to develop a DNS client server to resolve the given hostname.
3) Implement on a data set of characters the three CRC polynomials – CRC-12, CRC-16 and CRC-CCIP.
4) Implement Dijkstra's algorithm to compute the Shortest path in a graph.
5) Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm
6) Take an example subnet of hosts. Obtain broadcast tree for it.
7) Write a client-server application for chat using UDP
8) Implement programs using raw sockets (like packet capturing and filtering)
9) Write a C program to perform sliding window protocol.
10) Get the MAC or Physical address of the system using Address Resolution Protocol.
11) Simulate the Implementing Routing Protocols using border gateway protocol(BGP)
12) Simulate the OPEN SHORTEST PATH FIRST routing protocol based on the cost assigned to the path.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		0	0	3	1.5
AI TOOLS & TECHNIQUES LAB					

Course Objectives:
- Study the concepts of Artificial Intelligence
- Learn the methods of solving problems using Artificial Intelligence
- Introduce the concepts of machine learning

Course Outcomes:
At the end of the course, the students will be able to:
- Identify problems that are amenable to solution by AI methods
- Identify appropriate AI methods to solve a given problem
- Use language/framework of different AI methods for solving problems
- Implement basic AI algorithms
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports

Experiments:

1) Study of Prolog.
2) Write simple fact for the statements using PROLOG.
3) Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing
4) Write a program to solve the Monkey Banana problem.
5) Write a program in turbo prolog for medical diagnosis and show the advantage and disadvantage of green and red cuts
6) Write a program to implement factorial, Fibonacci of a given number
7) Write a program to solve 4-Queen and 8-puzzle problem.
8) Write a program to solve traveling salesman problem.
9) Write a program to solve water jug problem using LISP
10) Implementation of A* Algorithm using LISP /PROLOG
11) Implementation of Hill Climbing Algorithm using LISP /PROLOG
12) Implementation of DFS and BFS for water jug problem using LISP /PROLOG
13) Implementation of Towers of Hanoi Problem using LISP /PROLOG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		0	0	3	1.5
	DATA MINING LAB				

Course Objectives:
- To understand the mathematical basics quickly and covers each and every condition of data mining in order to prepare for real-world problems
- The various classes of algorithms will be covered to give a foundation to further apply knowledge to dive deeper into the different flavors of algorithms
- Students should aware of packages and libraries of R and also familiar with functions used in R for visualization
- To enable students to use R to conduct analytics on large real life datasets
- To familiarize students with how various statistics like mean median etc and data can be collected for data exploration in R

Course Outcomes: At the end of the course, student will be able to
- Extend the functionality of R by using add-on packages
- Examine data from files and other sources and perform various data manipulation tasks on them
- Code statistical functions in R
- Use R Graphics and Tables to visualize results of various statistical operations on data
- Apply the knowledge of R gained to data Analytics for real life applications

List of Experiments:

1) Implement all basic R commands.
2) Interact data through .csv files (Import from and export to .csv files).
3) Get and Clean data using swirl exercises. (Use 'swirl' package, library and install that topic from swirl).
4) Visualize all Statistical measures (Mean, Mode, Median, Range, Inter Quartile Range etc., using Histograms, Boxplots and Scatter Plots).
5) Create a data frame with the following structure.

EMP ID	EMP NAME	SALARY	START DATE
1	Satish	5000	01-11-2013
2	Vani	7500	05-06-2011
3	Ramesh	10000	21-09-1999
4	Praveen	9500	13-09-2005
5	Pallavi	4500	23-10-2000

   a. Extract two column names using column name.
   b. Extract the first two rows and then all columns.
   c. Extract 3rd and 5th row with 2nd and 4th column.
6) Write R Program using 'apply' group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them into
   i. 0 to 1 range with min-max normalization.
   ii. a value around 0 with z-score normalization.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

7) Create a data frame with 10 observations and 3 variables and add new rows and columns to it using 'rbind' and 'cbind' function.
8) Write R program to implement linear and multiple regression on 'mtcars' dataset to estimate the value of 'mpg' variable, with best R^2 and plot the original values in 'green' and predicted values in 'red'.
9) Implement k-means clustering using R.
10) Implement k-medoids clustering using R.
11) implement density based clustering on iris dataset.
12) implement decision trees using 'readingSkills' dataset.
13) Implement decision trees using 'iris' dataset using package party and 'rpart'.
14) Use a Corpus() function to create a data corpus then Build a term Matrix and Reveal word frequencies.

Text Books:

1) R and Data Mining: Examples and Case Studies, 1st ed, Yanchang Zhao, Sprnger, 2012.
2) R for Everyone, Advanced Analytics and Graphics, 2nd ed, Jared Lander, Pearson, 2018.

e-Resources:

1) www.r-tutor.com

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		2	0	0	0
	EMPLOYABILITY SKILLS -II				

Course Objectives:
The main of this course is
- To learn how to make effective presentations and impressive interviews
- To learn skills for discussing and resolving problems on the work site
- To assess and improve personal grooming
- To promote safety awareness including rules and procedures on the work site
- To develop and practice self management skills for the work site

Course Outcomes:
By the end of this course, the student
- Recite the corporate etiquette.
- Make presentations effectively with appropriate body language
- Be composed with positive attitude
- Apply their core competencies to succeed in professional and personal life

A list of vital employability skills from the standpoint of engineering students with discussion how to potentially develop such skills through campus life.

1) Interview Skills: Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success.
2) Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness.
3) Etiquette and Manners – Social and Business.
4) Time Management – Concept, Essentials, Tips.
5) Personality Development – Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills.
6) Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills.
7) Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods of Conflict Resoultion.
8) Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Managemet of Stress
9) Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behaviour; Assertivness Skills.
10) Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence.

Reference Books:
1) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
3) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
4) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

5) Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012.

6) English and Soft Skills – S.P.Dhanavel, Orient Blackswan India, 2010.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		3	0	0	3
	WEB TECHNOLOGIES				

Course Objectives:

From the course the student will learn

- Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client
- Write backend code in PHP language and Writing optimized front end code HTML and JavaScript
- Understand, create and debug database related queries and Create test code to validate the applications against client requirement
- Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution

Course Outcomes:

- Illustrate the basic concepts of HTML and CSS & apply those concepts to design static web pages
- Identify and understand various concepts related to dynamic web pages and validate them using JavaScript
- Outline the concepts of Extensible markup language & AJAX
- Develop web Applications using Scripting Languages & Frameworks
- Create and deploy secure, usable database driven web applications using PHP and RUBY

UNIT I

HTML: Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Html styles, Elements, Attributes, Heading, Layouts, Html media, Iframes Images, Hypertext Links, Lists, Tables, Forms, GET and POST method, HTML 5, Dynamic HTML.

CSS: Cascading style sheets, Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model, Conflict Resolution, CSS3.

UNIT II

Javascript - Introduction to Javascript, Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions, Fundamentals of Angular JS and NODE JS Angular Java Script- Introduction to Angular JS Expressions: ARRAY, Objects, Strings, Angular JS Form Validation & Form Submission.

Node.js- Introduction, Advantages, Node.js Process Model, Node JS Modules, Node JS File system, Node JS URL module, Node JS Events.

UNIT III

Working with XML: Document type Definition (DTD), XML schemas, XSLT, Document object model, Parsers - DOM and SAX.

AJAX A New Approach: Introduction to AJAX, Basics of AJAX, XML Http Request Object, AJAX UI tags, Integrating PHP and AJAX.

UNIT IV

PHP Programming: Introduction to PHP, Creating PHP script, Running PHP script. Working with variables and constants: Using variables, Using constants, Data types, Operators. Controlling program flow: Conditional statements, Control statements, Arrays, functions.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V

Web Servers- IIS (XAMPP, LAMP) and Tomcat Servers. Java Web Technologies-Introduction to Servlet, Life cycle of Servlet, Servlet methods, Java Server Pages.

Database connectivity – Servlets, JSP, PHP, Practice of SQL Queries.

Introduction to Mongo DB and JQuery.

Web development frameworks – Introduction to Ruby, Ruby Scripting, Ruby on rails –Design, Implementation and Maintenance aspects.

Text Books:

1) Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
2) Web Technologies, 1st Edition 7th impression, Uttam K Roy, Oxford, 2012.
3) Pro Mean Stack Development, 1st Edition, ELad Elrom, Apress O'Reilly, 2016
4) Java Script & jQuery the missing manual, 2nd Edition, David sawyer mcfarland, O'Reilly, 2011.
5) Web Hosting for Dummies, 1st Edition, Peter Pollock, John Wiley & Sons, 2013.
6) RESTful web services, 1st Edition, Leonard Richardson, Ruby, O'Reilly, 2007.

Reference Books:

1) Ruby on Rails Up and Running, Lightning fast Web development, 1st Edition, Bruce Tate, Curt Hibbs, Oreilly, 2006.
2) Programming Perl, 4th Edition, Tom Christiansen, Jonathan Orwant, O'Reilly, 2012.
3) Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech, 2009.
4) An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning, 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		3	0	0	3
	DISTRIBUTED SYSTEMS				

Course Objectives:
- To understand the foundations of distributed systems.
- To learn issues related to clock Synchronization and the need for global state in distributed systems
- To learn distributed mutual exclusion and deadlock detection algorithms
- To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems
- To learn the characteristics of peer-to-peer and distributed shared memory systems

Course Outcomes:
At the end of the course, the students will be able to:
- Elucidate the foundations and issues of distributed systems
- Illustrate the various synchronization issues and global state for distributed systems
- Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems
- Describe the agreement protocols and fault tolerance mechanisms in distributed systems
- Describe the features of peer-to-peer and distributed shared memory systems

UNIT I
Distributed Systems: Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues and challenges.
A model of distributed computations: A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of process communications.
Logical Time: A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP.

UNIT II
Message Ordering & Snapshots: Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order. Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels.

UNIT III
Distributed Mutex & Deadlock: Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport's algorithm – Ricart-Agrawala algorithm – Maekawa's algorithm – Suzuki–Kasami's broadcast algorithm. Deadlock detection in distributed systems: Introduction – System model – Preliminaries – Models of deadlocks – Knapp's classification – Algorithms for the single resource model, the AND model and the OR model.

UNIT IV
Recovery & Consensus: Check pointing and rollback recovery: Introduction – Background and definitions – Issues in failure recovery – Checkpoint-based recovery – Log-based rollback

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

recovery – Coordinated check pointing algorithm – Algorithm for asynchronous check pointing and recovery. Consensus and agreement algorithms: Problem definition – Overview of results – Agreement in a failure – free system – Agreement in synchronous systems with failures.

UNIT V
Peer-to-peer computing and overlay graphs: Introduction – Data indexing and overlays – Chord – Content addressable networks **–** Tapestry.
Distributed shared memory: Abstraction and advantages – Memory consistency models –Shared memory Mutual Exclusion.

Text Books:
1) Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and Tim Kindberg, Fifth Edition, Pearson Education, 2012.
2) Distributed computing: Principles, algorithms, and systems, Ajay D Kshemkalyani and Mukesh Singhal, Cambridge University Press, 2011.

Reference Books:
1) Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall of India, 2007.
2) Advanced concepts in operating systems. Mukesh Singhal and Niranjan G. Shivaratri, McGraw-Hill, 1994.
3) Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M.,Pearson Education, 2007.

e-Resources:
1) https://nptel.ac.in/courses/106/106/106106168/

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		3	0	0	3
DESIGN AND ANALYSIS OF ALGORITHMS					

Course Objectives:
- To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms
- To introduce the different algorithmic approaches for problem solving through numerous example problems
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

Course Outcomes:
- Describe asymptotic notation used for denoting performance of algorithms
- Analyze the performance of a given algorithm and denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
- List and describe various algorithmic approaches
- Solve problems using divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches
- Apply graph search algorithms to real world problems
- Demonstrate an understanding of NP- Completeness theory and lower bound theory

UNIT I
Introduction: Algorithm Definition, Algorithm Specification, performance Analysis, Performance measurement, Asymptotic notation, Randomized Algorithms.
Sets & Disjoint set union: introduction, union and find operations.
Basic Traversal & Search Techniques: Techniques for Graphs, connected components and Spanning Trees, Bi-connected components and DFS.

UNIT II
Divide and Conquer: General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort.
The Greedy Method: The general Method, container loading, knapsack problem, Job sequencing with deadlines, minimum-cost spanning Trees.

UNIT III
Dynamic Programming: The general method, multistage graphs, All pairs-shortest paths, single-source shortest paths: general weights, optimal Binary search trees, 0/1 knapsack, reliability Design, The traveling salesperson problem, matrix chain multiplication.

UNIT IV
Backtracking: The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, knapsack problem.
Branch and Bound: FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack problem, Traveling salesperson problem.

UNIT V
NP-Hard and NP-Complete problems: Basic concepts, Cook's Theorem.
String Matching: Introduction, String Matching-Meaning and Application, NaÏve String Matching Algorithm, Rabin-Karp Algorithm, Knuth-Morris-Pratt Automata, Tries, Suffix Tree.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:
1) Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, " Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
2) Harsh Bhasin, " Algorithms Design & Analysis", Oxford University Press.

Reference Books:
1) Horowitz E. Sahani S: "Fundamentals of Computer Algorithms", 2nd Edition, Galgotia Piblications, 2008.
2) S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

e-Resources:
1) http://nptel.ac.in/courses/106101060/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		3	0	0	3
	PROFESSIONAL ELECTIVE -II				

(NPTEL/SWAYAM) Course
Duration: 12 Weeks Minimum
*Course/subject title can't be repeated

12 Weeks NPTEL Courses by NPTEL/SWAYAM courses

1) Introduction to Industry 4.0 and Industrial Internet of Things
2) AI: Knowledge Representation and Reasoning
3) Synthesis of Digital Systems
4) Privacy and Security in Online Social Media
5) Block chain architecture design and use cases
6) Machine Learning for Engineering and Science Applications
7) Randomized Algorithms
8) Parallel Algorithms
9) Hardware Security

Note: The courses listed here are just few examples. The student can take courses offered in CSE discipline which are 12 weeks minimum duration.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

		L	T	P	C
III Year – II Semester		3	0	0	3
	OPEN ELECTIVE -I				

Note: The student has to take any one **open elective course** offered in the other departments (or) SWAYAM/NPTEL courses offered by other than parent department. (12 week minimum).
Given below are some of the courses offered by NPTEL/SWAYAM

Electronics & Communication Engineering	**Mathematics**
1) Information Coding Theory 2) VLSI Design 3) Signals & Systems 4) Digital Signal Processing	1) Optimization Techniques 2) Computational Number Theory and Cryptography
Electrical and Electronics Engineering	**Civil Engineering**
1) Networking Analysis 2) Fuzzy Sets, Logic and Systems & Applications 3) Energy Management Systems and SCADA 4) Industrial Safety Engineering	1) Intelligent transportation engineering 2) Remote Sensing and GIS 3) Engineering Mechanics 4) City and Metropolitan Planning 5) Sustainable Materials and Green Buildings
Mechanical Engineering	
1) Industrial Automation and Control 2) Robotics 3) CAD 4) Mechatronics And Manufacturing Automation 5) Non Conventional Energy Resources	

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		3	0	0	3

MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting.
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation.
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

Unit-I
Introduction to Managerial Economics and demand Analysis:
Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

Unit – II:
Theories of Production and Cost Analyses:
Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

Unit – III:
Introduction to Markets, Theories of the Firm & Pricing Policies:
Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

Unit – IV:
Introduction to Accounting & Financing Analysis:
Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

Unit – V:
Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Course Outcomes:
- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product.
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

TEXT BOOKS:
A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

REFERENCES:
1. Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd,
2. JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3. N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd,
4. MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
5. I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6. V. Maheswari, Managerial Economics, S. Chand & Company Ltd,

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		0	0	4	2
	WEB TECHNOLOGIES LAB				

Course Objectives:

From the course the student will

- Learn the core concepts of both the frontend and backend programming course
- Get familiar with the latest web development technologies
- Learn all about PHP and SQL databases
- Learn complete web development process

Course Outcomes:

By the end of the course the student will be able to

- Analyze and apply the role of languages like HTML, CSS, XML
- Review JavaScript, PHP and protocols in the workings of the web and web applications
- Apply Web Application Terminologies, Internet Tools, E – Commerce and other web services
- Develop and Analyze dynamic Web Applications using PHP & MySql
- Install & Use Frameworks

List of Experiments:

1) Design the following static web pages required for an online book store web site:

(a) **HOME PAGE:**

The static home page must contain three **frames**.

Top frame: Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).

Left frame: At least four links for navigation, which will display the catalogue of respective links.

For e.g.: When you click the link **"MCA"** the catalogue for MCA Books should be displayed in the Right frame.

Right frame: The *pages to the links in the left frame must be loaded here*. Initially this page contains description of the web site.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
mca mba BCA	Description of the Web Site			

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
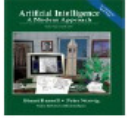
(b) **LOGIN PAGE:**

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
MCA MBA BCA		Login : 11a51f0003 Password: ******* Submit Reset		

(c) **CATOLOGUE PAGE:**

The catalogue page should contain the details of all the books available in the web site in a table: The details should contain the following:
1. Snap shot of Cover Page.
2. Author Name.
3. Publisher.
4. Price.
5. Add to cart button.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
MCA MBA BCA	[XML Bible cover] [AI cover] [Java2 cover] [HTML4 cover]	Book : XML Bible Author : Winston Publication : Wiely — $ 40.5 Book : AI Author : S.Russel Publication : Princeton hall — $ 63 Book : Java 2 Author : Watson Publication : BPB publications — $ 35.5 Book : HTML in 24 hours Author : Sam Peter Publication : Sam — $ 50		Add to cart Add to cart Add to cart Add to cart

(d). **REGISTRATION PAGE:**

Create a "*registration form* "with the following fields
1) Name (Text field)   2) Password (password field)
3) E-mail id (text field)   4) Phone number (text field)
5) Sex (radio button)   6) Date of birth (3 select boxes)
7) Languages known (check boxes – English, Telugu, Hindi, Tamil)
8) Address (text area)

2) Design a web page using **CSS (C**ascading **S**tyle **S**heets**)** which includes the following: Use different font, styles:
In the style definition you define how each selector should work (font, color etc.).

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Then, in the body of your pages, you refer to these selectors to activate the styles

3) Design a dynamic web page with validation using JavaScript.
4) Design a HTML having a text box and four buttons viz Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate javascript function should be called to display
   a. Factorial of that number
   b. Fibonacci series up to that number
   c. Prime numbers up to that number
   d. Is it palindrome or not
5) Write JavaScript programs on Event Handling
   a. Validation of registration form
   b. Open a Window from the current window
   c. Change color of background at each click of button or refresh of a page
   d. Display calendar for the month and year selected from combo box
   e. On Mouse over event

6) Write an XML file which will display the Book information which includes the following:
   1) Title of the book   2) Author Name   3) ISBN number
   4) Publisher name   5) Edition   6) Price
   a) Write a Document Type Definition (DTD) to validate the above XML file.
   b) Write a XML Schema Definition (XSD) to validate the above XML file.

7) Create Web pages using AJAX.

8) User Authentication:
   Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a PHP for doing the following.
   1. Create a Cookie and add these four user id's and passwords to this Cookie.
   2. Read the user id and passwords entered in the Login form (week1)   and authenticate with the values (user id and passwords) available in the cookies.
   If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display "You are not an authenticated user ''.
   Use init-parameters to do this.

9) Example PHP program for registering users of a website and login.

10) Install a database (Mysql or Oracle).
   Create a table which should contain at least the following fields: name, password, email-id, phone number (these should hold the data from the registration form).
   Write a PHP program   to connect to that database and extract data from the tables and display them. Experiment with various SQL queries.
   Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page (week2).
11) Write a PHP which does the following job:
   Insert the details of the 3 or 4 users who register with the web site (week9) by using

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

registration form. Authenticate the user when he submits the login form using the user name and password from the database (similar to week8 instead of cookies).

12) Implement a Servlet program on request response processing.
13) Implement a Servlet program for Registration Page.
14) Connect to a database using JSP and practice SQL Queries (MySql or Oracle).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		0	0	0	1
Industrial Training / Skill Development Programmes / Research Project in higher learning institutes					

Note: The Industrial Training / Skill Development Programmes / Research Project in higher learning institutes should be taken during the semester gap between II B.Tech-II Semester and III B.Tech-I Semester for a period of 4 weeks.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		3	0	0	3
	CRYPTOGRAPHY AND NETWORK SECURITY				

Course Objectives:

This course aims at training students to master the:

- The concepts of classical encryption techniques and concepts of finite fields and number theory
- Working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
- Design issues and working principles of various authentication protocols, PKI standards
- Various secure communication standards including Kerberos, IPsec, and SSL/TLS and email
- Concepts of cryptographic utilities and authentication mechanisms to design secure applications

Course Outcomes:

By the end of the course the student

- Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory
- Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
- Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
- Apply different digital signature algorithms to achieve authentication and create secure applications
- Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP
- Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

UNIT I

Classical Encryption Techniques: Security Attacks, Services & Mechanisms, Symmetric Cipher Model. Cyber Threats, Phishing Attack, Web Based Attacks, SQL Injection Attacks, Buffer Overflow& Format String Vulnerabilities, TCP session hijacking, UDP Session Hijacking.
Block Ciphers: Traditional Block Cipher Structure, Block Cipher Design Principles.

UNIT II

Symmetric Key Cryptography: Data Encryption Standard (DES), Advanced Encryption Standard (AES), Blowfish, IDEA, Block Cipher Modes of Operations.
Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem, Discrete Logarithms.

UNIT III

Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.
Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security, HMAC & CMAC.
Digital Signatures: NIST Digital Signature Algorithm, Key Management and Distribution

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT IV

User Authentication: Remote User Authentication Principles, Kerberos.
Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME.
IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

UNIT V

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Shell (SSH)
Firewalls: Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration, Trusted Systems.

Text Books:
1) Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition.
2) Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition.

Reference Books:
1) Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyaya, Mc-GrawHill, 3rd Edition, 2015.
2) Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

e-Resources:
1) https://nptel.ac.in/courses/106/105/106105031/ lecture by Dr. Debdeep MukhopadhyayIIT Kharagpur [Video Lecture]
2) https://nptel.ac.in/courses/106/105/106105162/ lecture by Dr. Sourav Mukhopadhyay IIT Kharagpur [Video Lecture]
3) https://www.mitel.com/articles/web-communication-cryptography-and-network-security web articles by Mitel Power Connections

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		3	0	0	3
	UML & DESIGN PATTERNS				

Course Objectives:
- To understand the fundamentals of object modeling
- To understand and differentiate Unified Process from other approaches
- To design with static UML diagrams
- To design with the UML dynamic and implementation diagrams
- To improve the software design with design patterns
- To test the software against its requirements specification

Course Outcomes:
At the end of the course, the students will be able to:
- Illustrate software design with UML diagrams
- Design software applications using OO concepts
- Identify various scenarios based on software requirements
- Apply UML based software design into pattern based design using design patterns
- Illustrate the various testing methodologies for OO software

UNIT I
Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle. Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Advanced classes, advanced relationships, Object diagrams: common modeling techniques.

UNIT II
Behavioral Modeling: Interactions, Interaction diagrams. Use cases, Use case Diagrams, Activity Diagrams, Events and signals, state machines, state chart diagrams.

UNIT III
Advanced Behavioral Modeling: Architectural Modeling: Components, Deployment, Component diagrams and Deployment diagrams, Common modeling techniques for component and deployment diagrams
Design Pattern: Introduction, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, Using a Design Pattern.

UNIT IV
Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton
Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy.

UNIT V
Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, Strategy, Template Method, What to Expect from Design Patterns

Text Books:
1) The unified Modeling language user guide by Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson.
2) Design Patterns, Erich Gamma, Pearson.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:

1) Object Oriented Analysis and Design, Satzinger, CENGAGE

e-Resources:

1) https://www.tutorialspoint.com/design_pattern/design_pattern_quick_guide.html

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		3	0	0	3
	MACHINE LEARNING				

Course Objectives:

The course is introduced for students to

- Gain knowledge about basic concepts of Machine Learning
- Study about different learning algorithms
- Learn about of evaluation of learning algorithms
- Learn about Dimensionality reduction

Course Outcomes:

- Identify machine learning techniques suitable for a given problem
- Solve the problems using various machine learning techniques
- Apply Dimensionality reduction techniques
- Design application using machine learning techniques

UNIT I

Introduction: Definition of learning systems, Goals and applications of machine learning, Aspects of developing a learning system: training data, concept representation, function approximation.

Inductive Classification: The concept learning task, Concept learning as search through a hypothesis space, General-to-specific ordering of hypotheses, Finding maximally specific hypotheses, Version spaces and the candidate elimination algorithm, Learning conjunctive concepts, The importance of inductive bias.

UNIT II

Decision Tree Learning: Representing concepts as decision trees, Recursive induction of decision trees, Picking the best splitting attribute: entropy and information gain, Searching for simple trees and computational complexity, Occam's razor, Overfitting, noisy data, and pruning.

Experimental Evaluation of Learning Algorithms: Measuring the accuracy of learned hypotheses. Comparing learning algorithms: cross-validation, learning curves, and statistical hypothesis testing.

UNIT III

Computational Learning Theory: Models of learnability: learning in the limit; probably approximately correct (PAC) learning. Sample complexity for infinite hypothesis spaces, Vapnik-Chervonenkis dimension.

Rule Learning: Propositional and First-Order, Translating decision trees into rules, Heuristic rule induction using separate and conquer and information gain, First-order Horn-clause induction (Inductive Logic Programming) and Foil, Learning recursive rules, Inverse resolution, Golem, and Progol.

UNIT IV

Artificial Neural Networks: Neurons and biological motivation, Linear threshold units. Perceptrons: representational limitation and gradient descent training, Multilayer networks and backpropagation, Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks.

Support Vector Machines: Maximum margin linear separators. Quadractic programming solution to finding maximum margin separators. Kernels for learning non-linear functions.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V

Bayesian Learning: Probability theory and Bayes rule. Naive Bayes learning algorithm. Parameter smoothing. Generative vs. discriminative training. Logisitic regression. Bayes nets and Markov nets for representing dependencies.

Instance-Based Learning: Constructing explicit generalizations versus comparing to past specific examples. k-Nearest-neighbor algorithm. Case-based learning.

Text Books:
1) T.M. Mitchell, "Machine Learning", McGraw-Hill, 1997.
2) Machine Learning, Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.

Reference Books:
1) Ethern Alpaydin, "Introduction to Machine Learning", MIT Press, 2004.
2) Stephen Marsland, "Machine Learning -An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
3) Andreas C. Müller and Sarah Guido "Introduction to Machine Learning with Python: A Guide for Data Scientists", Oreilly.

e-Resources:
1) Andrew Ng, "Machine Learning Yearning" https://www.deeplearning.ai/machine-learning-yearning/
2) Shai Shalev-Shwartz , Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms" , Cambridge University Press https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I SEMESTER		L	T	P	C
		3	0	0	3
	Open Elective –II				

Note: The student has to take any one **open elective course** offered in the other departments (or) SWAYAM/NPTEL courses offered by other than parent department. (12 week minimum).
Given below are some of the courses offered by NPTEL/SWAYAM

Electronics & Communication Engineering	**Mathematics**
1) Information Coding Theory 2) VLSI Design 3) Signals & Systems 4) Digital Signal Processing	1) Optimization Techniques 2) Computational Number Theory and Cryptography
Electrical and Electronics Engineering	**Civil Engineering**
1) Networking Analysis 2) Fuzzy Sets, Logic and Systems & Applications 3) Energy Management Systems and SCADA 4) Industrial Safety Engineering	1) Intelligent transportation engineering 2) Remote Sensing and GIS 3) Engineering Mechanics 4) City and Metropolitan Planning 5) Sustainable Materials and Green Buildings
Mechanical Engineering	
1) Industrial Automation and Control 2) Robotics 3) CAD 4) Mechatronics And Manufacturing Automation 5) Non Conventional Energy Resources	

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		3	0	0	3
	MOBILE COMPUTING				

Course Objectives:
- To study the emerging technologies in the context of wireless networks
- To understand the mobile computing environment
- To learn about pervasive computing environment

Course Outcomes:
At the end of the course, student will be able to
- Interpret Wireless local area networks (WLAN): MAC design principles, 802.11 WIFI
- Discuss fundamental challenges in mobile communications and potential Techniques in GSM
- Demonstrate Mobile IP in Network layer
- Elaborate TCP/IP Protocols and database issues
- Illustrate different data delivery methods and synchronization protocols
- Develop applications that are mobile-device specific and demonstrate current Practice in mobile computing contexts

UNIT I

Mobile Communications: An Overview- Mobile Communication-guided transmission, unguided transmission- signal propagation frequencies, antennae, modulation, modulation methods and standards for voice-oriented data communication standards, modulation methods and standards for data and voice communication, mobile computing- novel applications and limitations, mobile computing architecture, mobile system networks. Mobile devices and systems: Cellular networks and frequency reuse, Mobile smart phones, Smart mobiles and systems, handheld pocket computers, Handheld devices, Smart systems, Limitations of mobile devices.

UNIT II

GSM and other 2G Architectures: GSM-services and system architecture, Radio interfaces of GSM, Protocols of GSM, Localization, Call handling, GPRS system architecture. Wireless medium access control, CDMA, 3G, 4G and 5G Communication: Modulation, Multiplexing, Controlling the medium access, Spread spectrum, Coding methods, IMT-20003G wireless communication standards, WCDMA 3G communication standards, CDMA 3G communication standards, Broadband wireless access, 4G networks, 5G Networks.

UNIT III

Mobile IP Network layer: IP and Mobile IP network layers: OSI layer functions, TCP/IP and Internet protocol, Mobile internet protocol; Packet delivery and Handover Management; Location Management: Agent Discovery; Mobile TCP Introduction to Mobile Adhoc network: fixed infrastructure architecture, MANET infrastructure architecture; MANET: properties, spectrum, applications; Security in Ad-hoc network; Wireless sensor networks; sensor network applications.

UNIT IV

Synchronization: Synchronization in mobile computing systems, Usage models for Synchronization in mobile application, Domain-dependant specific rules for data synchronization, Personal information manager, synchronization and conflict resolution strategies, synchronizer; Mobile agent: mobile agent design, aglets; Application Server.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V
Mobile Wireless Short Range Networks and Mobile Internet: Wireless networking and wireless LAN, Wireless LAN (WLAN) architecture, IEEE 802.11protocol layers, Wireless application protocol (WAP)-WAP1.1 architecture, wireless datagram protocol (WDP), Wireless Transport Layer Security (WTLS), wireless transaction and session layers, wireless application environment.

Text Books:
1) Mobile Computing, 2nd edition, Raj kamal, Oxford,2011
2) Mobile Computing, Technology Applications and Service Creation, 2nd Edition, Asoke K Talukder, Hasanahmed, Roopa R Yavagal, McGraw Hill,2017

Reference Books:
1) "Principles of Mobile Computing," 2nd Edition, UWE Hansmann, Lother Merk, Martin S. Nocklous, Thomas Stober, Springer.2003

e-Resources:
1) https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		3	0	0	3
	DATA SCIENCE				

Course Objectives:
From the course the student will learn
- Provide you with the knowledge and expertise to become a proficient data scientist
- Demonstrate an understanding of statistics and machine learning concepts that are vital for data science
- Learn to statistically analyze a dataset
- Explain the significance of exploratory data analysis (EDA) in data science
- Critically evaluate data visualizations based on their design and use for communicating stories from data

Course Outcomes:
At the end of the course, student will be able to
- Describe what Data Science is and the skill sets needed to be a data scientist
- Illustrate in basic terms what Statistical Inference means. Identify probability distributions
  commonly used as foundations for statistical modelling, Fit a model to data
- Use R to carry out basic statistical modeling and analysis
- Apply basic tools (plots, graphs, summary statistics) to carry out EDA
- Describe the Data Science Process and how its components interact
- Use APIs and other tools to scrap the Web and collect data
- Apply EDA and the Data Science process in a case study

UNIT I
Introduction, The Ascendance of Data, Motivating Hypothetical: Data Sciencester, Finding Key Connectors, The Zen of Python, Getting Python, Virtual Environments, Whitespace Formatting, Modules, Functions, Strings, Exceptions, Lists, Tuples, Dictionaries defaultdict, Counters, Sets, Control Flow, Truthiness, Sorting, List Comprehensions, Automated Testing and assert, Object-Oriented Programming, Iterables and Generators, Randomness, Regular Expressions, Functional Programming, zip and Argument Unpacking, args and kwargs, Type Annotations, How to Write Type Annotations.

UNIT II
Visualizing Data: matplotlib, Bar Charts, Line Charts, Scatterplots. Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Some Other Correlational Caveats, Correlation and Causation.
Gradient Descent: The Idea Behind Gradient Descent, Estimating the Gradient, Using the Gradient, Choosing the Right Step Size, Using Gradient Descent to Fit Models, Minibatch and Stochastic Gradient Descent.

UNIT III
Getting Data: stdin and stdout, Reading Files, Scraping the Web, Using APIs,
Working with Data: Exploring Your DataUsing NamedTuples, Dataclasses, Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.
Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT IV
Machine Learning: Modeling, Overfitting and Underfitting, Correctness, The Bias-Variance Tradeoff, Feature Extraction and Selection, k-Nearest Neighbors, Naive Bayes, Simple Linear Regression, Multiple Regression, Digression, Logistic Regression

UNIT V
Clustering: The Idea, The Model, Choosing k, Bottom-Up Hierarchical Clustering.
Recommender Systems: Manual Curation, Recommending What's Popular, User-Based Collaborative Filtering, Item-Based Collaborative Filtering, Matrix Factorization
Data Ethics, Building Bad Data Products, Trading Off Accuracy and Fairness, Collaboration, Interpretability, Recommendations, Biased Data, Data Protection
IPython, Mathematics, NumPy, pandas, scikit-learn, Visualization, R

Textbooks:
1) Joel Grus, "Data Science From Scratch", OReilly.
2) Allen B.Downey, "Think Stats", OReilly.

Reference Books:
1) Doing Data Science: Straight Talk From The Frontline, 1st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013
2) Mining of Massive Datasets, 2nd Edition, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, v2.1, Cambridge University Press, 2014
3) "The Art of Data Science", 1st Edition, Roger D. Peng and Elizabeth matsui, Lean Publications, 2015
4) "Algorithms for Data Science", 1st Edition, Steele, Brian, Chandler, John, Reddy, Swarna, springers Publications, 2016

e-Resources:
1) https://github.com/joelgrus/data-science-from-scratch
2) https://github.com/donnemartin/data-science-ipython-notebooks
3) https://github.com/academic/awesome-datascience

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		3	0	0	3
NoSQL DATABASES					

Course Objectives:

From the course the student will

- To understand the basic concepts and the applications of database systems. To master the basics of SQL and construct queries using SQL
- To understand the relational database design principles
- To become familiar with the basic issues of transaction processing and concurrency control
- To become familiar with database storage structures and access techniques

Course Outcomes:

After the completion of the course, student will be able to do the following

- Identify what type of NoSQL database to implement based on business requirements (key-value, document, full text, graph, etc.)
- Apply NoSQL data modeling from application specific queries
- Use Atomic Aggregates and denormalization as data modelling techniques to optimize query processing

UNIT I

Introduction to NoSQL: Definition And Introduction, Sorted Ordered Column-Oriented Stores, Key/Value Stores, Document Databases, Graph Databases, Examining Two Simple Examples, Location Preferences Store, Car Make And Model Database, Working With Language Bindings.

UNIT II

Interacting with NoSQL: If NoSql Then What, Language Bindings For NoSQL Data Stores, Performing Crud Operations, Creating Records, Accessing Data, Updating And Deleting Data.

UNIT III

NoSQL Storage Architecture: Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value Stores In Memcached And Redis, Eventually Consistent Non-Relational Databases.

UNIT IV

NoSQL Stores: Similarities Between Sql And Mongodb Query Features, Accessing Data From Column-Oriented Databases Like Hbase, Querying Redis Data Stores, Changing Document Databases, Schema Evolution In Column-Oriented Databases, Hbase Data Import And Export, Data Evolution In Key/Value Stores.

UNIT V

Indexing and Ordering Data Sets : Essential Concepts Behind A Database Index, Indexing And Ordering In Mongodb, Creating and Using Indexes In Mongodb, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.

Text Books:

1) Pramod Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional, 2012.
2) Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications, 2013.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:

1) Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN: 978-0-470-94224-6
2) Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013.

e-Resources:

1) https://www.trustradius.com/nosql-databases

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		3	0	0	3
	INTERNET OF THINGS				

Course Objectives:
- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem
- Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc)
- Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming)
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports

Course Outcomes:
- Describe the usage of the term 'the internet of things' in different contexts
- Discover the various network protocols used in IoTand familiar with the key wireless technologies used in IoT systems, such as Wi-Fi, 6LoWPAN, Bluetooth and ZigBee
- Define the role of big data, cloud computing and data analytics in a typical IoT system Design a simple IoT system made up of sensors, wireless network connection, data analytics and display/actuators, and write the necessary control software
- Build and test a complete working IoT system

UNIT I
The Internet of Things: An Overview of Internet of Things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices.

UNIT II
Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High-level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability.

UNIT III
Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT IV
Data link layer of IoT, Wireless Communication Technologies, Wired Communication Technologies, Manet Networks: Network Layer of IoT, 6lowPAN adaptation layer for devices with limited resources, Dynamic routing protocols for wireless adhoc networks Communication protocols for IoT, Service oriented protocol(COAP), Communication protocols based on the exchange of messages(MQTT), Service discovery protocols.

UNIT V
Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/ Services/ Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:

1) Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education.
2) Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015.

Reference Books:

1) An Introduction to Internet of Things, Connecting devices, Edge Gateway and Cloud with Applications, Rahul Dubey, Cengage, 2019.
2) IoT Fundamentals, Networking Technologies, Protocols and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetette, rob Barton, Jerome Henry, CISCO, Pearson, 2018.
3) Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		3	0	0	3
	SOFTWARE PROJECT MANAGEMENT				

Course Objectives:

At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course Outcomes:

Upon the completion of the course students will be able to:-

- Apply the process to be followed in the software development life-cycle models.
- Apply the concepts of project management & planning.
- Implement the project plans through managing people, communications and change
- Conduct activities necessary to successfully complete and close the Software projects
- Implement communication, modeling, and construction & deployment practices in software development.

UNIT I

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT III

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows.

Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT IV

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT V

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach (Text book 2)

Text Books:
1) Software Project Management, Walker Royce, Pearson Education, 2005.
2) Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

Reference Books:
1) Software Project Management, Joel Henry, Pearson Education.
2) Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
3) Effective Software Project Management, Robert K.Wysocki, Wiley,2006.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		3	0	0	3
WEB SERVICES					

Course Objective:

- To understand the concept of XML and to implement Web services using XML based standards

Course Outcomes:

After the completion of the course, student will be able to

- Recite the advantages of using XML technology family
- Analyze the problems associated with tightly coupled distributed software architecture
- Learn the Web services building block
- Implement e-business solutions using XML based web services

UNIT I

XML technology family : XML, benefits, Advantages of XML over HTML, EDI, Databases, XML based standards, Structuring with schemas, DTD, XML Schemas, XML processing, DOM, SAX, presentation technologies, XSL, XFORMS, XHTML, Transformation, XSLT, XLINK, XPATH, XQuery.

UNIT II

Architecting Web Services: Business motivations for web services, B2B, B2C, Technical motivations, limitations of CORBA and DCOM, Service-oriented Architecture (SOA), Architecting web services, Implementation view, web services technology stack, logical view, composition of web services, deployment view, from application server to peer to peer, process view, life in the runtime.

UNIT III

Web Services Building Blocks: Transport protocols for web services, messaging with web services, protocols, SOAP, describing web services, WSDL, Anatomy of WSDL, manipulating WSDL, web service policy, Discovering web services, UDDI, Anatomy of UDDI, Web service inspection, Ad-Hoc Discovery, Securing web services.

UNIT IV

Implementing XML in E-Business: B2B – B2C Applications, Different types of B2B interaction, Components of e-business XML systems, ebXML, RosettaNet, Applied XML in vertical industry, web services for mobile devices.

UNIT V

XML Content Management and Security: Semantic Web, Role of Meta data in web content, Resource Description Framework, RDF schema, Architecture of semantic web, content management workflow, XLANG, WSFL, Securing web services.

Text Books:

1) Ron Schmelzer et al. " XML and Web Services", Pearson Education, 2002.

Reference Books:

1) Keith Ballinger, ". NET Web Services Architecture and Implementation", Pearson Education, 2003.
2) David Chappell, "Understanding .NET A Tutorial and Analysis", Addison Wesley, 2002.
3) Kennard Scibner and Mark C.Stiver, " Understanding SOAP", SAMS publishing.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

4) Alexander Nakhimovsky and Tom Myers, "XML Programming: Web Applications and Web Services with JSP and ASP", Apress, 2002.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		3	0	0	3

CLOUD COMPUTING

Course Objectives:
- To implement Virtualization
- To implement Task Scheduling algorithms
- Apply Map-Reduce concept to applications
- To build Private Cloud
- Broadly educate to know the impact of engineering on legal and societal issues involved

Course Outcomes:
At the end of the course, student will be able to
- Interpret the key dimensions of the challenge of Cloud Computing
- Examine the economics, financial, and technological implications for selecting cloud computing for own organization
- Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications
- Evaluate own organizations' needs for capacity building and training in cloud computing-related IT areas
- Illustrate Virtualization for Data-Center Automation

UNIT I
Introduction: Network centric computing, Network centric content, peer-to –peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing. Parallel and Distributed Systems: introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, and model concurrency with Petri Nets.

UNIT II
Cloud Infrastructure: At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing, Cloud Computing : Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, HPC on cloud.

UNIT III
Cloud Resource virtualization: Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades, Cloud Resource Management and Scheduling: Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feedback control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling.

UNIT IV
Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Apache Hadoop, Big Table, Megastore (text book 1), Amazon Simple Storage Service(S3) (Text book 2), Cloud

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Security: Cloud security risks, security – a top concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks.

UNIT V
Cloud Application Development: Amazon Web Services : EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming (Text Book 1), Google: Google App Engine, Google Web Toolkit (Text Book 2), Microsoft: Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book 2)

Text Books:
1) Cloud Computing, Theory and Practice,1st Edition, Dan C Marinescu, MK Elsevier publisher ,2013
2) Cloud Computing, A Practical Approach, 1st Edition, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH,2017

Reference Books:
1) Mastering Cloud Computing, Foundations and Application Programming,1st Edition, Raj Kumar Buyya, Christen vecctiola, S Tammarai selvi, TMH,2013
2) Essential of Cloud Computing, 1st Edition, K Chandrasekharan, CRC Press, 2014.
3) Cloud Computing, A Hands on Approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2014.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		3	0	0	3

MEAN STACK TECHNOLOGIES

Course Objectives:

From the course the student will learn

- Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client
- Writing optimized front end code HTML and JavaScript
- Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution
- Design and implementation of Robust and Scalable Front End Applications

After the completion of the course, student will be able to

- Enumerate the Basic Concepts of Web & Markup Languages
- Develop web Applications using Scripting Languages & Frameworks
- Make use of Express JS and Node JS frameworks
- Illustrate the uses of web services concepts like restful, react js
- Apply Deployment Techniques & Working with cloud platform

UNIT I

Introduction to Web: Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. Html5 concepts, CSS3, Anatomy of a web page. XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.

UNIT II

JavaScript: The Basic of JavaScript: Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions. Angular Java Script Angular JS Expressions: ARRAY, Objects, $eval, Strings, Angular JS Form Validation & Form Submission, Single Page Application development using Angular JS.

UNIT III

Node.js: Introduction, Advantages, Node.js Process Model, Node JS Modules. Express.js: Introduction to Express Framework, Introduction to Nodejs , What is Nodejs, Getting Started with Express, Your first Express App, Express Routing, Implementing MVC in Express, Middleware, Using Template Engines, Error Handling , API Handling , Debugging, Developing Template Engines, Using Process Managers, Security & Deployment.

UNIT IV

RESTful Web Services: Using the Uniform Interface, Designing URIs,
Web Linking, Conditional Requests. React Js: Welcome to React, Obstacles and Roadblocks, React's Future, Keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories.

UNIT V

Mongo DB: Introduction, Architecture, Features, Examples, Database Creation & Collection in Mongo DB. Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:
1) Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2) Web Technologies, Uttam K Roy, Oxford
3) Pro Mean Stack Development, ELadElrom, Apress
4) Restful Web Services Cookbook, Subbu Allamraju, O'Reilly
5) JavaScript & jQuery the missing manual, David sawyer mcfarland, O'Reilly
6) Web Hosting for Dummies, Peter Pollock, John Wiley Brand

Reference Books:
1) Ruby on Rails up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006).
2) Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012).
3) Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
4) An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning.
5) Express.JS Guide,The Comprehensive Book on Express.js, Azat Mardan, Lean Publishing.

e-Resources:
1) http://www.upriss.org.uk/perl/PerlCourse.html

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		3	0	0	3
	AD-HOC AND SENSOR NETWORKS				

Course Objectives:
From the course the student will learn
- Architect sensor networks for various application setups
- Devise appropriate data dissemination protocols and model links cost
- Understanding of the fundamental concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers
- Evaluate the performance of sensor networks and identify bottlenecks

Course Outcomes:
- Evaluate the principles and characteristics of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks
- Determine the principles and characteristics of wireless sensor networks
- Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc sensor networks
- Illustrate the various sensor network Platforms, tools and applications
- Demonstrate the issues and challenges in security provisioning and also familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs

UNIT I
Introduction to Ad Hoc Wireless Networks- Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet, MAC protocols for Ad hoc Wireless Networks-Issues, Design Goals and Classifications of the MAC Protocols.

UNIT II
Routing Protocols for Ad Hoc Wireless Networks- Issues in Designing a Routing Protocol, Classifications of Routing Protocols, Topology-based versus Position-based Approaches, Issues and design goals of a Transport layer protocol, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Solutions for TCP over Ad Hoc Wireless Networks, Other Transport layer protocols.

UNIT III
Security protocols for Ad hoc Wireless Networks- Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks, Cooperation in MANETs, Intrusion Detection Systems.

UNIT IV
Basics of Wireless Sensors and Applications- The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

UNIT V
Security in WSNs- Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote, Sensor Network Operating Systems–TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language-nesC, Dataflow Style

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Language- TinyGALS, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.

Text Books:
1) Ad Hoc Wireless Networks – Architectures and Protocols, C. Siva Ram Murthy, B. S. Murthy, Pearson Education, 2004.
2) Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P.Aggarwal, World Scientific Publications / Cambridge University Press, March 2006.
3) Wireless Sensor Networks – Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010.

Reference Books:
1) Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp2009.
2) Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008.
3) Ad hoc Networking, Charles E.Perkins, Pearson Education, 2001.
4) Wireless Ad hoc Networking, Shih-Lin Wu, Yu-Chee Tseng, Auerbach Publications, Taylor & Francis Group, 2007.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		3	0	0	3
	CYBER SECURITY & FORENSICS				

Course Objectives:
- Able to identify security risks and take preventive steps
- To understand the forensics fundamentals
- To understand the evidence capturing process
- To understand the preservation of digital evidence

Course Outcomes:
At the end of the course, student will be able to
- Enumerate the computer forensics fundamentals
- Describe the types of computer forensics technology
- Analyze various computer forensics systems
- Illustrate the methods for data recovery, evidence collection and data seizure
- Identify the Role of CERT-In Security

UNIT I
Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.

UNIT II
Tools and Methods : Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares,Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration.

UNIT III
Cyber Crime Investigation: Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

UNIT IV
Computer Forensics and Investigations: Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics.

UNIT V
Cyber Crime Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario.

Text Books:
1) Sunit Belapure Nina Godbole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY, 2011.
2) Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.

Reference Books:
1) Michael T. Simpson, Kent Backman and James E. Corley, "Hands on Ethical Hacking and Network Defence", Cengage, 2019.
2) Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3) Alfred Basta, Nadine Basta,Mary Brown and Ravinder Kumar "Cyber Security and Cyber Laws" , Cengage,2018.

e-Resources:
1) CERT-In Guidelines- http://www.cert-in.org.in/
2) https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks [Online Course]
3) https://computersecurity.stanford.edu/free-online-videos [Free Online Videos]
4) Nickolai Zeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu. License: Creative Commons BY-NC-SA.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		0	0	2	1
UML LAB					

Course Objectives:

- To know the practical issues of the different object oriented analysis and design concepts
- Inculcate the art of object oriented software analysis and design
- Apply forward and reverse engineering of a software system
- Carry out the analysis and design of a system in an object oriented way

Course Outcomes:

At the end of the course, student will be able to

- Know the syntax of different UML diagrams
- Create use case documents that capture requirements for a software system
- Create class diagrams that model both the domain model and design model of a software system
- Create interaction diagrams that model the dynamic aspects of a software system
- Write code that builds a software system
- Develop simple applications

Note: For performing the experiments consider any case study (ATM/ Banking / Library /Hospital management systems)

Experiment 1:
Familiarization with Rational Rose or Umbrella environment

Experiment 2:
a) Identify and analyze events
b) Identify Use cases
c) Develop event table

Experiment 3:
a) Identify & analyze domain classes
b) Represent use cases and a domain class diagram using Rational Rose
c) Develop CRUD matrix to represent relationships between use cases and problem domain classes

Experiment 4:
a) Develop Use case diagrams
b) Develop elaborate Use case descriptions & scenarios
c) Develop prototypes (without functionality)

Experiment 5:
a) Develop system sequence diagrams and high-level sequence diagrams for each use case
b) Identify MVC classes / objects for each use case
c) Develop Detailed Sequence Diagrams / Communication diagrams for each use case showing interactions among all the three-layer objects

Experiment 6:
a) Develop detailed design class model (use GRASP patterns for responsibility assignment)
b) Develop three-layer package diagrams for each case study

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Experiment 7:

a) Develop Use case Packages

b) Develop component diagrams

c) Identify relationships between use cases and represent them

d) Refine domain class model by showing all the associations among classes

Experiment 8:

Develop sample diagrams for other UML diagrams - state chart diagrams, activity diagrams and deployment diagrams

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		0	0	0	2
PROJECT-I					

Note: The marks are awarded based on: Selection of Area, Defining the problem, Submission of the Abstract and Presentation of seminar.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		3	0	0	0
	IPR & PATENTS				

Course Objectives:

- To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines

- Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments

Course Outcomes:

- IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents
- Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements

UNIT I

Introduction to Intellectual Property Rights (IPR): Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

UNIT II

Copyrights and Neighboring Rights: Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

UNIT III

Patents: Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations

UNIT IV

Trademarks: Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities

Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

UNIT V

Trade Secrets & Cyber Law and Cyber Crime: Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Unfair Competition – Trade Secret Litigation – Applying State Law.

Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions –

E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

References Books:
1) Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2) Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
3) PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
4) Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
5) Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
6) Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
7) R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
8) M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –II Semester		L	T	P	C
		3	0	0	3
	MANAGEMENT AND ORGANIZATIONAL BEHAVIOR				

Course Objectives:
- To familiarize with the process of management, principles, leadership styles and basic concepts on Organization
- To provide conceptual knowledge on functional management that is on Human resource management and Marketing management
- To provide basic insight into select contemporary management practices and Strategic Management
- To learn theories of motivation and also deals with individual behavior, their personality and perception of individuals
- To understand about organizations groups that affect the climate of an entire organizations which helps employees in stress management

Course Outcomes:
- After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational structure
- Will familiarize with the concepts of functional management that is HRM and Marketing of new product developments
- The learner is able to think in strategically through contemporary management practices
- The learner can develop positive attitude through personality development and can equip with motivational theories
- The student can attain the group performance and grievance handling in managing the organizational culture

UNIT I
Introduction: Management and organizational concepts of management and organization-Nature and Importance of Management, Functions of Management, System approach to Management - Taylor's Scientific Management Theory, Fayol's Principles of Management, Leadership Styles, Social responsibilities of Management. Designing Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, MBO, Process and concepts.

UNIT II
Functional Management: Human Resource Management (HRM) Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Wage and Salary Administration Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating. Marketing Management: Concepts of Marketing, Marketing mix elements and marketing strategies.

UNIT III
Strategic Management: Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and implementation, Generic Strategy alternatives. Bench Marking and Balanced Score Card as Contemporary Business Strategies.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT IV

Individual Behavior: Perception-Perceptual process- Impression management- Personality development – Socialization – Attitude- Process- Formation- Positive attitude- Change – Learning – Learning organizations- Reinforcement Motivation – Process- Motives – Theories of Motivation: Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation.

UNIT V

Group Dynamics: Types of Groups, Stages of Group Development, Group Behaviour and Group Performance Factors, Organizational conflicts: Reasons for Conflicts, Consequences of Conflicts in Organization, Types of Conflicts, Strategies for Managing Conflicts, Organizational Climate and Culture, Stress, Causes and effects, coping strategies of stress.

Text Books:
1) Subba Rao P., Organizational Behaviour, Himalaya Publishing House. Mumbai
2) L.M. Prasad, Principles and Practice of Management.

Reference Books:
1) Fred Luthans Organizational Behaviour, TMH, New Delhi.
2) Robins, Stephen P., Fundamentals of Management, Pearson, India.
3) Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI, 2007
4) Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2007
5) Kanishka Bedi, Production and Operations Management, Oxford University Press, 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –II Semester		L	T	P	C
		3	0	0	3
	Open Elective –III				

Note: The student has to take any one **open elective course** offered in the other departments (or) SWAYAM/NPTEL courses offered by other than parent department. (12 week minimum).
Given below are some of the courses offered by NPTEL/SWAYAM

Electronics & Communication Engineering	Mathematics
1) Information Coding Theory 2) VLSI Design 3) Signals & Systems 4) Digital Signal Processing	1) Optimization Techniques 2) Computational Number Theory and Cryptography
Electrical and Electronics Engineering	**Civil Engineering**
1) Networking Analysis 2) Fuzzy Sets, Logic and Systems & Applications 3) Energy Management Systems and SCADA 4) Industrial Safety Engineering	1) Intelligent transportation engineering 2) Remote Sensing and GI 3) Engineering Mechanics 4) City and Metropolitan Planning 5) Sustainable Materials and Green Buildings
Mechanical Engineering	
1) Industrial Automation and Control 2) Robotics 3) CAD 4) Mechatronics And Manufacturing Automation 5) Non Conventional Energy Resources	

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –II Semester		L	T	P	C
		3	0	0	3
	DEEP LEARNING				

Course Objectives:
- Demonstrate the major technology trends driving Deep Learning
- Build, train and apply fully connected deep neural networks
- Implement efficient (vectorized) neural networks
- Analyze the key parameters and hyper parameters in a neural network's architecture

Course Outcomes:
- Demonstrate the mathematical foundation of neural network
- Describe the machine learning basics
- Differentiate architecture of deep neural network
- Build a convolutional neural network
- Build and train RNN and LSTMs

UNIT I
Linear Algebra: Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis. Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes' Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

UNIT II
Machine Learning: Basics and Underfitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and other Differentiation Algorithms.

UNIT III
Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. Optimization for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

UNIT IV
Convolutional Networks: The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolutional Networks.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT V

Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models.

Text Books:
1) Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press,2016.
2) Josh Patterson and Adam Gibson, "Deep learning: A practitioner's approach", O'Reilly Media, First Edition, 2017.

Reference Books:
1) Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O'Reilly, Shroff Publishers, 2019.
2) Deep learning Cook Book, Practical recipes to get started Quickly, Douwe Osinga, O'Reilly, Shroff Publishers, 2019.

e-Resources:
1) https://keras.io/datasets/
2) http://deeplearning.net/tutorial/deeplearning.pdf
3) https://arxiv.org/pdf/1404.7828v4.pdf

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –II Semester		L	T	P	C
		3	0	0	3
	QUANTUM COMPUTING				

Course Objectives:
- This course teaches the fundamentals of quantum information processing, including quantum computation, quantum cryptography, and quantum information theory.

Course Outcomes:
By the end of this course, the student is able to
- Analyze the behaviour of basic quantum algorithms
- Implement simple quantum algorithms and information channels in the quantum circuit model
- Simulate a simple quantum error-correcting code
- Prove basic facts about quantum information channels

UNIT I
Introduction: Quantum Measurements Density Matrices, Positive-Operator Valued Measure, Fragility of quantum information: Decoherence, Quantum Superposition and Entanglement, Quantum Gates and Circuits.

UNIT II
Quantum Basics and Principles: No cloning theorem & Quantum Teleportation, Bell's inequality and its implications, Quantum Algorithms & Circuits.

UNIT III
Algorithms: Deutsch and Deutsch–Jozsa algorithms, Grover's Search Algorithm, Quantum Fourier Transform, Shore's Factorization Algorithm.

UNIT IV
Performance, Security and Scalability: Quantum Error Correction: Fault tolerance; Quantum Cryptography, Implementing Quantum Computing: issues of fidelity; Scalability in quantum computing.

UNIT V
Quantum Computing Models: NMR Quantum Computing, Spintronics and QED MODEL, Linear Optical MODEL, Nonlinear Optical Approaches; Limits of all the discussed approaches, Future of Quantum computing.

Text Books:
1) Eric R. Johnston, Nic Harrigan, Mercedes and Gimeno-Segovia "Programming Quantum Computers: Essential Algorithms And Code Samples, SHROFF/ O'Reilly.
2) Dr. Christine Corbett Moran, Mastering Quantum Computing with IBM QX: Explore the world of quantum computing using the Quantum Composer and Qiskit, Kindle Edition Packt
3) V.K Sahni, Quantum Computing (with CD), TATA McGrawHill.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:
1) Chris Bernhardt, Quantum Computing for Everyone (The MIT Press).
2) Michael A. Nielsen and Issac L. Chuang, "Quantum Computation and Information", Cambridge (2002).
3) Riley Tipton Perry, "Quantum Computing from the Ground Up", World Scientific Publishing Ltd (2012).
4) Scott Aaronson, "Quantum Computing since Democritus", Cambridge (2013).
5) P. Kok, B. Lovett, "Introduction to Optical Quantum Information Processing", Cambridge.

e-Resources:
1) https://nptel.ac.in/courses/104104082/
2) https://swayam.gov.in/nd1_noc19_cy31/preview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –II Semester		L	T	P	C
		3	0	0	3
	DevOps				

Course Objectives:
- DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance

Course Outcomes:

At the end of the course, student will be able to
- Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility
- Describe DevOps & DevSecOps methodologies and their key concepts
- Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
- Set up complete private infrastructure using version control systems and CI/CD tools

UNIT I

Phases of Software Development life cycle. Values and principles of agile software development.

UNIT II

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.

UNIT III

DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

UNIT IV

CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment , Benefits of CI/CD, Metrics to track CICD practices

UNIT V

Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment

Text Books:
1) The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.
2) What is Devops? Infrastructure as code, 1st Edition, Mike Loukides ,O'Reilly publications, 2012.

Reference Books:
1) Building a DevOps Culture, 1st Edition, Mandi Walls, O'Reilly publications, 2013.
2) The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Microservices, 1st Edition, Viktor Farcic, CreateSpace Independent Publishing Platform publications, 2016
3) Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation, 1st Edition, Jez Humble and David Farley, 2010.
4) Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps, and

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

microservices, 1st Edition, Dave Harrison, Knox Lively, Apress publications, 2019

e-Resources:
1) https://www.javatpoint.com/devops
2) https://github.com/nkatre/Free-DevOps-Books-1/blob

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –II Semester		L	T	P	C
		3	0	0	3
	BLOCKCHAIN TECHNOLOGIES				

Course Objectives:

By the end of the course, students will be able to
- Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them,
- Design, build, and deploy smart contracts and distributed applications,
- Integrate ideas from block chain technology into their own projects.

Course Outcomes:

At the end of the course, student will be able to
- Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.
- Identify the risks involved in building Block chain applications.
- Review of legal implications using smart contracts.
- Choose the present landscape of Blockchain implementations and Understand Crypto currency markets
- Examine how to profit from trading crypto currencies.

UNIT I

Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain.

Evolution of Blockchain : Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

UNIT II

Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

UNIT III

Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications.

Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.

UNIT IV

Ethereum Blockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEtherWallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, OpenZeppelin Contracts

UNIT V

Hyperledger Blockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Advanced Concepts in Blockchain: Introduction, InterPlanetary File System (IPFS),
Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML
Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings,
Blockchain and its Future Potential.

Text Books:
1) Ambadas, Arshad Sarfarz Ariff, Sham "Blockchain for Enterprise Application Developers", Wiley
2) Andreas M. Antonpoulos, "Mastering Bitcoin: Programming the Open Blockchain", O'Reilly

Reference Books:
1) Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill.
2) Blockchain: Blueprint for a New Economy, Melanie Swan, O'Reilly

e-Resources:
1) https://github.com/blockchainedindia/resources

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –II Semester		L	T	P	C
		3	0	0	3
	BIG DATA ANALYTICS				

Course Objectives:
- To optimize business decisions and create competitive advantage with Big Data analytics
- To learn to analyze the big data using intelligent techniques
- To introduce programming tools PIG & HIVE in Hadoop echo system

Course Outcomes:
At the end of the course, the students will be able to
- Illustrate big data challenges in different domains including social media, transportation, finance and medicine
- Use various techniques for mining data stream
- Design and develop Hadoop
- Identify the characteristics of datasets and compare the trivial data and big data for various applications
- Explore the various search methods and visualization techniques

UNIT I
Introduction: Introduction to big data: Introduction to Big Data Platform, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting.

UNIT II
Stream Processing: Mining data streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) Applications, Case Studies - Real Time Sentiment Analysis - Stock Market Predictions.

UNIT III
Introduction to Hadoop: Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analysing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment.

UNIT IV
Frameworks and Applications: Frameworks: Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and ZooKeeper.

UNIT V
Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, Multiple linear regression, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:

1) Tom White, "Hadoop: The Definitive Guide", Third Edition, O'reilly Media, Fourth Edition, 2015.
2) Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.
3) Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP, 2012

Reference Books:

1) Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley& sons, 2012.
2) Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, "Harness the Power of Big Data:The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.
3) Arshdeep Bahga and Vijay Madisetti, "Big Data Science & Analytics: A Hands On Approach ", VPT, 2016.
4) Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons, 2014.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Open Electives to be offered by CSE for Other Branches:

Open Elective I: For syllabus Refer to

Data Structures	**CS2103**
Java Programming	**CS2201**
Database Management Systems	**CS2203**
C++ Programming	**CS2104**
Operating Systems	**CS2202**
Internet of Things	**PE4101**

Open Elective II:

Problem Solving using Python	**ES1201**
Web Technologies	**CS3201**
Machine Learning	**CS4103**
Distributed Computing	**CS3202**
AI Tools & Techniques	**CS3104**
Data Science	**PE4101**

Open Elective III:

Big Data	**PE4201**
Image Processing	
Mobile Application Development	
Cyber Security	
Deep Learning	**PE4201**
Blockchain Technologies	**PE4201**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Open Elective III (Offered by CSE to other departments)
IMAGE PROCESSING

Course Objectives:

- To become familiar with digital image fundamentals
- To get exposed to simple image enhancement techniques in Spatial and Frequency domain
- To learn concepts of degradation function and restoration techniques
- To study the image segmentation and representation techniques
- To become familiar with image compression and recognition methods

Course Outcomes:

At the end of the course, the students will be able to:

- Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms
- Operate on images using the techniques of smoothing, sharpening and enhancement.
- Use the restoration concepts and filtering techniques
- Illustrate the basics of segmentation

UNIT I

Digital Image Fundamentals: Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

UNIT II

Image Enhancement: Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

UNIT III

Image Restoration: Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering.

UNIT IV

Image Segmentation: Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT V

Image Compression and Recognition: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

Text Books:

1) Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson, Third Edition, 2010.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

2) Anil K. Jain, Fundamentals of Digital Image Processing, Pearson, 2002.

Reference Books:

1) Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.
2) D,E. Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing, Prentice Hall Professional Technical Reference, 1990.
3) William K. Pratt, Digital Image Processing, John Wiley, New York, 2002.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Open Elective III (Offered by CSE to other departments)
MOBILE APPLICATION DEVELOPMENT

Course Objectives:
- To demonstrate the introduction and characteristics of mobile applications
- Application models of mobile application frameworks. Managing application data and User-interface design for mobile applications
- Integrating networking, the OS and hardware into mobile-applications
- Addressing enterprise requirements in mobile applications – performance, scalability, modifiability, availability and security
- Testing methodologies for mobile applications– Publishing, deployment, maintenance and management. To demonstrate their skills of using Android software development tools
- To demonstrate their ability to deploy software to mobile devices

Course Outcomes:
Upon completion of the course students should be able to:
- Install and configure Android application development tools.
- Design and develop user Interfaces for the Android platform.
- Use state information across important operating system events.
- Apply Java programming concepts to Android application development.

UNIT I
Introduction to mobile devices: Introduction to Mobile Computing, Introduction to Android Development Environment, Mobile devices vs. desktop devices, ARM and Intel architectures, Screen resolution, Touch interfaces, Application deployment, App Store, Google Play, Windows Store.
Development environments: XCode, Eclipse, VS2012, PhoneGAP, etc.; Native vs. web applications.
Factors in Developing Mobile Applications: Mobile Software Engineering, Frameworks and Tools, Generic UI Development, Android User.

UNIT II
Android User Interface: Measurements – Device and pixel density independent measuring units
User Interface (UI) Components – Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities.

UNIT III
Back Ground Running Process, Networking And Telephony Services: Services: Introduction to services – local service, remote service and binding the service, the communication between service and activity, Intent Service.
MultiThreading: Handlers, AsyncTask.
Android network programming: Http Url Connection, Connecting to REST-based and SOAP based Web services.
Broad cast receivers: Local Broadcast Manager, Dynamic broadcast receiver, System Broadcast. Pending Intent, Notifications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

UNIT IV

Android: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT V

Advanced Topics: Power Management: Wake locks and assertions, Low-level OS support, Writing power-smart applications.

Augmented Reality via GPS and other sensors: GPS, Accelerometer, Camera.

Mobile device security in depth: Mobile malware, Device protections, iOS "Jailbreaking", Android "rooting" and Windows' "defenestration"; Security and Hacking: Active Transactions, More on Security, Hacking Android.

Text Books:

1) Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, Android Programming: The Big Nerd
2) Ranch Guide, Big Nerd Ranch LLC, 2nd edition, 2015.
3) Valentino Lee, Heather Schneider, and Robbie Schell, Mobile Applications: Architecture, Design and Development, Prentice Hall, 2004.
4) Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
5) Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013
6) Dawn Griffiths, David Griffiths,*"Head First: Android Development"* *,OReilly2015,ISBN*: 9781449362188
7) http://developer.android.com/develop/index.html
8) Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012

Reference Books:

1) Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013
2) Tomasz Nurkiewicz and Ben Christensen, Reactive Programming with RxJava, O'Reilly Media, 2016.
3) Brian Fling, Mobile Design and Development, O'Reilly Media, Inc., 2009.
4) Maximiliano Firtman, Programming the Mobile Web, O'Reilly Media, Inc., 2nd ed., 2013.
5) Cristian Crumlish and Erin Malone, Designing Social Interfaces, 2nd ed., O'Reilly Media, Inc., 2014.
6) Suzanne Ginsburg, Designing the iPhone User Experience: A User-Centered Approach to Sketching and Prototyping iPhone Apps, Addison-Wesley Professional, 2010.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Open Elective III (Offered by CSE to other departments)
CYBER SECURITY

Course Objectives:

- In this course, the student will learn about the essential building blocks and basic concepts around cyber security such as Confidentiality, Integrity, Availability, Authentication, Authorization, Vulnerability, Threat & Risk and so on.

Course Outcomes:

At the end of the course, the students will be able to:

- Illustrate the broad set of technical, social & political aspects of Cyber Security and security management methods to maintain security protection
- Appreciate the vulnerabilities and threats posed by criminals, terrorist and nation states to national infrastructure
- Illustrate the nature of secure software development and operating systems
- Demonstrate the role security management plays in cyber security defense and legal and social issues at play in developing solutions.

UNIT I

Introduction: Introduction to Computer Security, Threats, Harm, Vulnerabilities, Controls, Authentication, Access Control, and Cryptography, Authentication, Access Control, Cryptography.

Programs and Programming: Unintentional (Non-malicious) Programming Oversights, Malicious Code—Malware, Countermeasures.

UNIT II

Web Security: User Side, Browser Attacks, Web Attacks Targeting Users, Obtaining User or Website Data, Email Attacks.

Operating Systems Security: Security in Operating Systems, Security in the Design of Operating Systems, Rootkit.

UNIT III

Network Security: Network Concepts, Threats to Network Communications, Wireless Network Security, Denial of Service, Distributed Denial-of-Service Strategic Defenses: Security Countermeasures, Cryptography in Network Security, Firewalls, Intrusion Detection and Prevention Systems, Network Management .

Cloud Computing and Security: Cloud Computing Concepts, Moving to the Cloud, Cloud Security Tools and Techniques, Cloud Identity Management, Securing IaaS.

UNIT IV

Privacy: Privacy Concepts, Privacy Principles and Policies, Authentication and Privacy, Data Mining, Privacy on the Web, Email Security, Privacy Impacts of Emerging Technologies, Where the Field Is Headed.

Management and Incidents: Security Planning, Business Continuity Planning, Handling Incidents, Risk Analysis, Dealing with Disaster.

UNIT V

Legal Issues and Ethics: Protecting Programs and Data, Information and the Law, Rights of Employees and Employers, Redress for Software Failures, Computer Crime, Ethical Issues in Computer Security, Incident Analysis with Ethics Emerging Topics: The Internet of Things, Economics, Computerized Elections, Cyber Warfare.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:

1) Pfleeger, C.P., Security in Computing, Prentice Hall, 2010, 5th edition.
2) Schneier, Bruce. Applied Cryptography, Second Edition, John Wiley & Sons, 1996

Reference Books:

1) Rhodes-Ousley, Mark. Information Security: The Complete Reference, Second Edition, Information Security Management: Concepts and Practice, McGraw-Hill, 2013.
2) Whitman, Michael E. and Herbert J. Mattord. Roadmap to Information Security for IT and Infosec Managers. Boston, MA: Course Technology, 2011.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE AND SYLLABUS

For

B. TECH ELECTRONICS AND COMMUNICATION ENGINEERING

(Applicable for batches admitted from 2019-2020)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA - 533 003, Andhra Pradesh, India

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year – I SEMESTER

Sl. No	Course Code	Subjects	L	T	P	Credits
1	HS1101	English	3	0	0	3
2	BS1101	Mathematics - I	3	0	0	3
3	BS1106	Applied Chemistry	3	0	0	3
4	ES1101	Programming for Problem Solving Using C	3	0	0	3
5	ES1103	Engineering Drawing	1	0	3	2.5
6	HS1102	English Lab	0	0	3	1.5
7	BS1107	Applied Chemistry Lab	0	0	3	1.5
8	ES1102	Programming for Problem Solving Using C Lab	0	0	3	1.5
9	MC1101	Environmental Science	3	0	0	0
		Total Credits	**16**	**0**	**12**	**19**

I Year – IISEMESTER

Sl. No	Course Code	Subjects	L	T	P	Credits
1	BS1202	Mathematics – II	3	0	0	3
2	BS1203	Mathematics – III	3	0	0	3
3	BS1204	Applied Physics	3	0	0	3
4	ES1209	Network Analysis	3	0	0	3
5	ES1211	Basic Electrical Engineering	3	0	0	3
6	ES1215	Electronic workshop	0	0	2	1
7	ES1208	Basic Electrical Engineering Lab	0	0	3	1.5
8	BS1205	Applied Physics Lab	0	0	3	1.5
9	HS1203	Communication Skills Lab	0	0	2	1
10	PR1201	Engineering Exploration Project	0	0	2	1
			15	**0**	**12**	**21**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year – ISemester

S. No.	Course	Category	L	T	P	Credits
1	Electronic Devices and Circuits	PC	3	0	0	3
2	Switching Theory and Logic Design	PC	3	0	0	3
3	Signals and Systems	PC	3	0	0	3
4	Random Variables and Stochastic Processes	PC	3	0	0	3
5	Object Oriented Programming through Java	ES	3	0	0	3
6	Managerial Economics & Financial Analysis	HS	3	0	0	3
7	Electronic Devices and Circuits - Lab	LC	0	0	3	1.5
8	Switching Theory and Logic Design - Lab	LC	0	0	3	1.5
9	Constitution of India	MC	3	0	0	0
			Sub-Total			**21**

II Year – IISemester

S. No.	Course	Category	L	T	P	Credits
1	Electronic Circuit Analysis	PC	3	0	0	3
2	Linear Control Systems	PC	3	0	0	3
3	Electromagnetic Waves and Transmission Lines	PC	3	0	0	3
4	Analog Communications	PC	3	0	0	3
5	Computer Architecture and Organization	ES	3	0	0	3
6	Management and Organizational Behavior	HS	3	0	0	3
7	Electronic Circuit Analysis - Lab	LC	0	0	3	1.5
8	Analog Communications - Lab	LC	0	0	3	1.5
			Sub-Total			**21**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year – I Semester

S. No.	Course	Category	L	T	P	Credits
1	Linear Integrated Circuits and Applications	PC	3	0	0	3
2	Microprocessor and Microcontrollers	PC	3	0	0	3
3	Digital Communications	PC	3	0	0	3
4	Electronic Measurements & Instrumentation	PC	3	0	0	3
5	Professional Elective (PE 1)	PE	3	0	0	3
6	Linear Integrated Circuits and Applications - Lab	LC	0	0	3	1.5
7	Digital Communications Lab	LC	0	0	3	1.5
8	Microprocessor and Microcontrollers - Lab	LC	0	0	3	1.5
9	Mini Project with Hardware Development	PR	0	0	3	1.5
10	Essence of Indian Traditional Knowledge	MC	3	0	0	0
				Sub-Total		**21**

III Year – IISemester

S. No.	Course	Category	L	T	P	Credits
1	Wired and Wireless Transmission Devices	PC	3	0	0	3
2	VLSI Design	PC	3	0	0	3
3	Digital Signal Processing	PC	3	0	0	3
4	Professional Elective (PE2)	PE	3	0	0	3
5	Open Elective (OE1)	OE	3	0	0	3
6	Internet of Things	PC	3	0	0	3
7	VLSI Lab	LC	0	0	3	1.5
8	Digital Signal Processing Lab	LC	0	0	3	1.5
9	Intellectual Property Rights (IPR) & Patents	MC	3	0	0	0
				Sub-Total		**21**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year – ISemester

S. No.	Course	Category	L	T	P	Credits
1	Microwave and Optical Communication Engineering	PC	3	0	0	3
2	Data Communications & Computer networks	PC	3	0	0	3
3	Digital Image and Video Processing	PC	3	0	0	3
4	Professional Elective (PE3)	PE	3	0	0	3
5	Professional Elective (PE4)	PE	3	0	0	3
6	Internet of Things Lab	LC	0	0	3	1.5
7	Microwave and Optical Communication Engineering LAB	LC	0	0	3	1.5
8	Project - Part I	PR	0	0	6	3
				Sub-Total		**21**

IV Year – II Semester

S. No.	Course	Category	L	T	P	Credits
1	Professional Elective (PE5)	PE	3	0	0	3
2	Open Elective (OE2)	OE	3	0	0	3
3	Project - Part II	PR	0	0	18	9
				Sub-Total		**15**
				Total		**160**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

PROFESSIONAL ELECTIVES 1:
1. Information Theory &Coding
2. Digital System Design usingHDL
3. Data structures andAlgorithms
4. Soft computing techniques and Pythonprogramming
5. Simulation& MathematicalModeling

PROFESSIONAL ELECTIVES 2:
1. Cellular & Mobile Communication
2. Digital ICDesign
3. Business Intelligence &Analytics
4. PatternRecognition
5. Robotics andAutomation

PROFESSIONAL ELECTIVES 3:
1. Communication Standards andProtocols
2. Analog ICDesign
3. SmartSensors
4. Advanced Digital SignalProcessing
5. AugmentedReality

PROFESSIONAL ELECTIVES 4:
1. SoftwareRadio
2. Low power VLSIDesign
3. EmbeddedSystems
4. DSP processors andArchitectures
5. Multi MediaCommunication

PROFESSIONAL ELECTIVES 5:
1. WirelessCommunication
2. VLSI Testing &Testability
3. Machine Learning & ArtificialIntelligence
4. SpeechProcessing
5. Industrial Internet ofThings

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

OPEN ELECTIVES FOR ECE:

Open Elective 1:

1. DataMining
2. PowerElectronics
3. MEMS and itsapplications
4. Artificial NeuralNetworks

Open Elective 2:

1. 3D Printing
2. Block chainTechnology
3. Cyber Security &Cryptography

OPEN ELECTIVES OFFERED BY ECE:

OE 1   Principles of communication
OE 2   Embedded Systems

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
	ENGLISH				

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratorysessions.

CourseObjectives
  ➢ Facilitate effective listening skills for better comprehension of academic lectures and English spoken by nativespeakers
  ➢ Focus on appropriate reading strategies for comprehension of various academic texts and authenticmaterials
  ➢ Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oralpresentations
  ➢ Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report usefulinformation
  ➢ Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Learning Outcomes
At the end of the module, the learners will be able to
  ➢ understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specificinformation
  ➢ ask and answer general questions on familiar topics and introduceoneself/others
  ➢ employ suitable strategies for skimming and scanning to get the general idea of a text and locate specificinformation
  ➢ recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
  ➢ form sentences using proper grammatical structures and correct wordforms

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Unit 1:

Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications

Lesson-2: Deliverance by Premchand from "**The Individual Society",** PearsonPublications. (Non-detailed)

Listening: Listening to short audio texts and identifying the topic. Listening to short audio texts and identifying the context and specific pieces of information to answer a series of questions both in speaking and writing.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests.Self introductions and introducing others.

Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.

Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capitalletters.

Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary(20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing ofwords.

Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.
Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit 2:

Lesson-1: Nehru's letter to his daughter Indira on her birthday from "**Infotech English**", Maruthi Publications

Lesson-2: Bosom Friend by Hira Bansode from "**The Individual Society",** Pearson Publications. (Non-detailed)

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)

Grammar: Use of articles and zero article; prepositions.

Pronunciation: Past tense markers, word stress-di-syllabic words

Unit 3:

Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications

Lesson-2: Shakespeare's Sister by Virginia Woolf from "**The Individual Society",** Pearson Publications. (Non-detailed)

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing.

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing. E-mail etiquette, Writing CV's.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academicpurposes.

Pronunciation: word stress-poly-syllabic words

Unit 4:

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "**Infotech English**", Maruthi Publications

Lesson-2: Telephone Conversation-Wole Soyinka from "**The Individual Society",** Pearson Publications**.** (Non-detailed)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.

Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Pronunciation: Contrastive Stress

Unit 5:

Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications

Lesson-2: Still I Rise by Maya Angelou from "**The Individual Society",** Pearson Publications. (Non-detailed)

Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Functional English: Suggesting/Opinion giving.

Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques.

Reading for Writing: Writing academic proposals- writing research articles: format and style.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verbagreement)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Pronunciation: Stress in compound words

Prescribed text books for theory for Semester-I:
1. "**Infotech English**", Maruthi Publications.(Detailed)
2. "**The Individual Society",** Pearson Publications.(Non-detailed)

Reference books:
1. Bailey, Stephen. Academic writing: A handbook for international students.Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking.Heinley ELT;
   2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) MacmillanEducational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP,2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
	MATHEMATICS-I **(Common to all Branch's for I Year B.Tech)**				

Course Objectives:

- This course will illuminate the students in the concepts ofcalculus.

- To enlighten the learners in the concept of differential equations andmultivariable calculus.

- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and theirapplications.

Course Outcomes: At the end of the course, the student will be able to

- utilize mean value theorems to real life problems (L3)

- solve the differential equations related to various engineering fields(L3)

- familiarize with functions of several variables which is useful in optimization(L3)

- Apply double integration techniques in evaluating areas bounded by region(L3)

- students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems (L5)

UNIT I: Sequences, Series and Meanvaluetheorems: **(10hrs)**

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series – Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

UNIT II: Differential equations of first order andfirstdegree: **(10 hrs)**

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exactform.
Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT III: Linear differential equations ofhigherorder: **(10 hrs)**

Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters.
Applications: LCR circuit, Simple Harmonic motion.

UNIT IV:Partialdifferentiation: **(10 hrs)**

Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.
Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

UNIT V:Multipleintegrals: **(8hrs)**

Double and Triple integrals – Change of order of integration – Change of variables.
Applications: Finding Areas and Volumes.

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 43rd Edition, KhannaPublishers.
2. **B. V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:
1. **Erwin Kreyszig,**Advanced Engineering Mathematics, 10th Edition,Wiley-India.
2. **Joel Hass, Christopher Heil and Maurice D. Weir,** Thomas calculus, 14th Edition, Pearson.
3. **Lawrence Turyn,**Advanced Engineering Mathematics, CRC Press,2013.
4. **Srimantha Pal, S C Bhunia,** Engineering Mathematics, Oxford UniversityPress.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
	APPLIED CHEMISTRY				

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Learning Objectives:

- *Importance* of usage of plastics in household appliances and composites (FRP) in aerospace and automotiveindustries.
- *Outline* the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can beprevented.
- *Express* the increase in demand as wide variety of advanced materials are introduced; which have excellent engineeringproperties.
- *Explain* the crystal structures, and the preparation of semiconductors. Magnetic properties are alsostudied.
- *Recall* the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.

UNIT I POLYMER TECHNOLOGY

*Polymerisation:-*Introduction-methods of polymerization (emulsion and suspension)-physical and mechanical properties.

Plastics: Compounding-fabrication (compression, injection, blown film, extrusion) - preparation, properties and applications of PVC, polycarbonates and Bakelite-mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.

*Elastomers:-*Natural rubber-drawbacks-vulcanization-preparation, properties and applications of synthetic rubbers (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics-conducting polymers-biodegradable polymers-biopolymers-biomedical polymers.

Learning Outcomes: *At the end of this unit, the students will be able to*

- *Outline* the properties of polymers and various additives added and different methods of forming plasticmaterials.
- *Explain* the preparation, properties and applications of some plasticmaterials.
- *Interpret* the mechanism of conduction in conducting polymers.
- *Discuss* natural and synthetic rubbers and theirapplications.

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION

Single electrode potential-Electrochemical series and uses of series-standard hydrogen electrode, calomel electrode-concentration cell-construction of glass electrode-Batteries: Dry cell, Ni-Cd cells, Ni-Metal hydride cells, Li ion battery, zinc air cells–Fuel cells: H_2-O_2, CH_3OH-O_2, phosphoric acid, molten carbonate.

*Corrosion:-*Definition-theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, waterline corrosion-passivity of metals-galvanic series-factors influencing rate of corrosion-corrosion control (proper designing, cathodic

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

protection)-Protective coatings: Surface preparation, cathodic and anodic coatings, electroplating, electroless plating (nickel). Paints (constituents, functions, specialpaints).

Learning Outcomes: *At the end of this unit, the students will be able to*
- *Explain* the theory of construction of battery and fuelcells.
- *Categorize* the reasons for corrosion and study some methods of corrosioncontrol.

UNIT III: MATERIAL CHEMISTRY

Part I *: Non-elemental semiconducting materials:*- Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Insulators & magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.

Part II:

*Nano materials:-*Introduction-sol-gel method- characterization by BET, SEM and TEM methods-applications of graphene-carbon nanotubes and fullerenes: Types, preparation and applications

*Liquid crystals:-*Introduction-types-applications.

*Super conductors:-*Type –I, Type II-characteristics and applications

Learning Outcomes: *At the end of this unit, the students will be able to*

- *Understand* the importance of materials like nanomaterials and fullerenes and theiruses.
- *Understand* liquid crystals andsuperconductors.
- *Understand* the preparation ofsemiconductors.

UNIT IV: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY

Computational chemistry: Introduction, Ab Initio studies

*Molecular switches***:** characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor

Learning Outcomes: *At the end of this unit, the students will be able to*
- *Obtain* the knowledge of computationalchemistry
- *Understand* importance molecularmachines

UNIT V: SPECTROSCOPIC TECHNIQUES & NON CONVENTIONAL ENERGY SOURCES

Part A: **SPECTROSCOPIC TECHNIQUES**

Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR (instrumentation and IR of some organic compounds, applications)-magnetic resonance imaging and CT scan (procedure & applications).

Part B*:* **NON CONVENTIONAL ENERGY SOURCES**

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Learning Outcomes: *At the end of this unit, the students will be able to*
- understand the principles of different analyticalinstruments.
- explain the different applications of analyticalinstruments.
- design sources of energy by different naturalsources.

Standard Books:
1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publicating Co.

Reference Books:
1. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2019edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3

PROGRAMMING FOR PROBLEM SOLVING USING C

COURSE OBJECTIVES: <u>COURSE OBJECTIVES:</u>
The objectives of Programming for Problem Solving Using C are
1) To learn about the computer systems, computing environments, developing of acomputer program and Structure of a CProgram
2) To gain knowledge of the operators, selection, control statements and repetition inC
3) To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about theirusage.
4) To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
5) To assimilate about File I/O and significance offunctions

UNIT I
Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers
Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.
Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II
Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.
Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions
Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples

UNIT III
Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – CalculateAverages
Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code
Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application

UNIT IV
Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value
Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application
Processor Commands: Processor Commands

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT V
Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion
Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions
Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files,Converting File Type.

TEXT BOOKS:
1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE
2. The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e,Pearson

REFERENCES:
1. Computer Fundamentals and Programming, Sumithabha Das, Mc GrawHill
2. Programming in C, Ashok N. Kamthane, Amit Kamthane,Pearson
3. Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh,OXFORD

COURSE OUTCOMES:
Upon the completion of the course the student will learn
1) To write algorithms and to draw flowcharts for solvingproblems
2) To convert flowcharts/algorithms to C Programs, compile and debugprograms
3) To use different operators, data types and write programs that use two-way/ multi-way selection
4) To select the best loop construct for a givenproblem
5) To design and implement programs to analyze the different pointerapplications
6) To decompose a problem into functions and to develop modular reusablecode
7) To apply File I/Ooperations

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - I Semester		L	T	P	C
		1	0	3	2.5
	ENGINEERING DRAWING				

Course Objective: Engineering drawing being the principal method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scalingetc.

Unit I

Objective: To introduce the students to use drawing instruments and to draw polygons, Engg.Curves.
Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.
Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents & normals for thecurves.
Scales: Plain scales, diagonal scales and vernier scales

UnitII

Objective: To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.
Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to otherplane.
Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

Unit III

Objective: The objective is to make the students draw the projections of the plane inclined to both the planes.
Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

Unit IV

Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Unit V

Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and viceversa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects using Auto CAD

Note: In the End Examination there will be no question from CAD.

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, ChariotPublications
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw HillPublishers

REFERENCE BOOKS:

1. Engineering Drawing by K.L.Narayana & P. Kannaiah, ScitechPublishers
2. Engineering Graphics for Degree by K.C. John, PHIPublishers
3. Engineering Graphics by PI Varghese, McGrawHillPublishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, NewAge

Course Outcome: The student will learn how to visualize 2D & 3D objects.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
ENGLISH LAB					

UNIT I:

Vowels, Consonants, Pronunciation, Phonetic Transcription

UNIT II:

Past tense markers, word stress-di-syllabic words, Poly-Syllabic words

UNIT III:

Rhythm & Intonation

UNIT IV:

Contrastive Stress (Homographs)

UNIT V:

Word Stress: Weak and Strong forms
Stress in compound words

References books:

1. Infotech English, Maruthi Publications. (with CompactDisc)
2. Exercises in Spoken English Part 1,2,3,4, OUP andCIEFL.
3. English Pronunciation in use- Mark Hancock, Cambridge UniversityPress.
4. English Phonetics and Phonology-Peter Roach, Cambridge UniversityPress.
5. English Pronunciation in use- Mark Hewings, Cambridge UniversityPress.
6. English Pronunciation Dictionary- Daniel Jones, Cambridge UniversityPress.
7. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
APPLIED CHEMISTRY LAB					

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions,
volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn (II) using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of copper (II) using standard hyposolution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of iron (III) by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of the concentration of strong acid vs strong base (by conductometric method).
10. Determination of strong acid vs strong base (by potentiometric method).
11. Determination of Mg^{+2} present in an antacid.
12. Determination of $CaCO_3$ present in an eggshell.
13. Estimation of Vitamin C.
14. Determination of phosphoric content in softdrinks.
15. Adsorption of acetic acid by charcoal.
16. Preparation of nylon-6, 6 and Bakelite (demonstration only).
    Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books
1. A Textbook of Quantitative Analysis, Arthur J.Vogel.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING USING C LAB					

Course Objectives:

1) Apply the principles of C language in problemsolving.
2) To design flowcharts, algorithms and knowing how to debugprograms.
3) To design & develop of C programs using arrays, strings pointers &functions.
4) To review the file operations, preprocessorcommands.

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and fourcharacters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5inches.
3. Write a C program to display multiplevariables.

Exercise 2:

1. Write a C program to calculate the distance between the twopoints.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrongvalues".

Exercise 3:

1. Write a C program to convert a string to a longinteger.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometricalshape.
3. Write a C program to calculate the factorial of a givennumber.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and theirsum.
2. Write a program in C to display the n terms of harmonic series and their sum. $1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n$ terms.
3. Write a C program to check whether a given number is an Armstrong number ornot.

Exercise 5:

1. Write a program in C to print all unique elements in anarray.
2. Write a program in C to separate odd and even integers in separatearrays.
3. Write a program in C to sort elements of array in ascendingorder.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a givenmatrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverseorder.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Exercise 8:
1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to anotherstring.

Exercise 9:
1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in theprogram.

Exercise 10:
1. Write a program in C to demonstrate the use of & (address of) and *(value at address)operator.
2. rite a program in C to add two numbers usingpointers.

Exercise 11:
1. Write a program in C to add numbers using call byreference.
2. Write a program in C to find the largest element using Dynamic MemoryAllocation.

Exercise 12:
1. Write a program in C to swap elements using call byreference.
2. Write a program in C to count the number of vowels and consonants in a string using apointer.

Exercise 13:
1. Write a program in C to show how a function returningpointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( )function.

Exercise 14:
1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above twoprograms
2. Write a program in C to convert decimal number to binary number using thefunction.

Exercise 15:
1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using thefunction.

Exercise 16:
1. Write a program in C to append multiple lines at the end of a textfile.
2. Write a program in C to copy a file in anothername.
3. Write a program in C to remove a file from thedisk.

Course Outcomes:

By the end of the Lab, the student

1) Gains Knowledge on various concepts of a Clanguage.
2) Able to draw flowcharts and writealgorithms.
3) Able design and development of C problem solvingskills.
4) Able to design and develop modular programmingskills.
5) Able to trace and debug aprogram

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	0
	ENVIRONMENTAL SCIENCE				

Learning Objectives:

The objectives of the course are to impart:

- Overall understanding of the naturalresources.
- Basic understanding of the ecosystem and itsdiversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impact of developmentalactivities.
- Awareness on the social issues, environmental legislation and globaltreaties.

UNIT-I:

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects;.Role of information technology in environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT-II:

Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT-III:

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation ofbiodiversity.

UNIT – IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his wellbeing.
Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Publicawareness.

UNIT – VI

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.
The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers,Vijayawada
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford UniversityPress.
3. EnvironmentalStudies,P.   N.   Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education,Chennai

Reference:

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, NewDelhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, NewDelhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New AgeInternational Publishers,2014

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3

MATHEMATICS - II
(Common to all Branch for I Year B. Tech)

Course Objectives:

- To instruct the concept of Matrices in solving linear algebraicequations
- To elucidate the different numerical methods to solve nonlinear algebraicequations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and theirapplications.

Course Outcomes: At the end of the course, the student will be able to

- develop the use of matrix algebra techniques that is needed by engineers for practical applications(L6)

- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel(L3)

- evaluate approximating the roots of polynomial and transcendental equations by different algorithms(L5)

- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals(L3)

- apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations(L3)

Unit I: Solving systems of linear equations, Eigen values andEigenvectors: (10 hrs)

Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous equations linear equations – Gauss Elimination for solving system of equations – Eigen values and Eigen vectors and their properties.

Unit-II: Cayley-Hamilton theorem andQuadraticforms: (10hrs)

Cayley-Hamilton theorem (without proof) – Finding inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation.
Singular values of a matrix, singular value decomposition (Ref. Book – 1).

UNIT III:Iterativemethods: (8 hrs)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Introduction – Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system ofequations.

UNITIV:Interpolation: (10 hrs)

Introduction – Errors in polynomial interpolation – Finite differences – Forward differences – Backward differences – Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula – Newton's divide difference formula.

UNIT V: Numerical integration and solution of ordinarydifferentialequations: (10 hrs)

Trapezoidal rule – Simpson's $1/3^{rd}$ and $3/8^{th}$ rule – Solution of ordinary differential equations by Taylor's series – Picard's method of successive approximations – Euler's method – Runge-Kutta method (second and fourthorder).

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 43rd Edition, KhannaPublishers.
2. **B. V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. **David Poole,** Linear Algebra- A modern introduction, 4th Edition,Cengage.
2. **Steven C. Chapra,** Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw HillEducation.
3. **M. K. Jain, S. R. K. Iyengar and R. K. Jain,** Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
4. **Lawrence Turyn,**Advanced Engineering Mathematics, CRCPress.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3

<table>
<tr><td colspan="2" align="center">MATHEMATICS - III
(Common to all Branch for I Year B. Tech)</td></tr>
</table>

Course Objectives:

- To familiarize the techniques in partial differentialequations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real worldapplications.

Course Outcomes: At the end of the course, the student will be able to

- interpret the physical meaning of different operators such as gradient, curl anddivergence (L5)
- estimate the work done against a field, circulation and flux using vector calculus(L5)
- apply the Laplace transform for solving differential equations(L3)
- find or compute the Fourier series of periodic signals(L3)
- know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms(L3)
- identify solution methods for partial differential equations that model physical processes (L3)

Unit – I:Vectorcalculus: **(10 hrs)**

Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential.

Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

Unit –II:LaplaceTransforms: **(10 hrs)**

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (with out proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Unit –III: Fourier series andFourierTransforms: **(10 hrs)**

Fourier Series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.

Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – inverse transforms – Finite Fourier transforms.

Unit –IV: PDE offirstorder: **(8hrs)**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT V: Second order PDEand Applications: **(10hrs)**

SecondorderPDE:Solutionsoflinearpartialdifferentialequationswithconstantcoefficients–
RHS term of the type e^{ax+by},sin($ax +by$), cos($ax +by$), $x^m y^n$.

Applications of PDE: Method of separation of Variables – Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 43rd Edition, KhannaPublishers.
2. **B. V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. **Erwin Kreyszig,**Advanced Engineering Mathematics, 10th Edition,Wiley-India.
2. **Dean. G. Duffy,**Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
3. **Peter O' Neil,** Advanced Engineering Mathematics,Cengage.
4. **Srimantha Pal, S C Bhunia,** Engineering Mathematics, Oxford UniversityPress.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
	APPLIED PHYSICS				

Course Objectives:

Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by Jawaharlal Nehru Technological University Kakinada that serves as a transit to understand the branch specific advanced topics. The course is designed to:

➢ Impart Knowledge of Physical Optics phenomena like Interference and Diffraction required to design instruments with higherresolution.

➢ Understand the physics of Semiconductors and their working mechanism for their utility insensors.

➢ To impart the knowledge of materials with characteristic utility inappliances.

UNIT-I   (10hrs)

WAVE OPTICS: Principle of Superposition - Interference of light - Conditions for sustained Interference - Interference in thin films (reflected geometry) - Newton's Rings (reflected geometry).

Diffraction - Fraunhofer Diffraction - Diffraction due to Single slit (quantitative), Double slit, N -slits and circular aperture (qualitative) – Intensity distribution curves - Diffraction Grating – Grating spectrum – missing order – resolving power – Rayleigh's criterion – Resolving powers of Microscope, Telescope and grating(qualitative).

Unit Outcomes:

The students will be able to

➢ **explain**the need of coherent sources and the conditions for sustainedinterference.

➢ **analyze**the differences between interference and diffraction withapplications.

➢ **illustrate**the resolving power of various opticalinstruments.

UNIT-II   (9hrs)

QUANTUM MECHANICS: Introduction – Matter waves – de Broglie's hypothesis – Davisson-Germer experiment – G. P. Thomson experiment – Heisenberg's Uncertainity Principle –interpretation of wave function – Schröedinger Time Independent and Time Dependent wave equations – Particle in a potentialbox.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Unit Outcomes:

The students will be able to

- ➢ **explain**the fundamental concepts of quantummechanics.
- ➢ **analyze**the physical significance of wavefunction.
- ➢ **apply**Schrödinger's wave equation for energy values of a free particle.

UNIT-III (**10hrs**)

FREE ELECTRON THEORY & BAND THEORY OF SOLIDS : Introduction – Classical free electron theory (merits and demerits only) - Quantum Free electron theory – electrical conductivity based on quantum free electron theory – Fermi Dirac distribution function – Temperature dependence of Fermi-Dirac distribution function - expression for Fermi energy -

Density of states .

Bloch's theorem (qualitative) – Kronig-Penney model(qualitative) – energy bands in crystalline solids – E Vs K diagram – classification of crystalline solids – effective mass of electron – m* Vs K diagram - concept of hole.

Unit Outcomes:

The students will be able to

- ➢ **explain**the various electrontheories.
- ➢ **calculate**the Fermienergy.
- ➢ **analyze**the physical significance of wave function.
- ➢ **interpret**the effects of temperature on Fermi Dirac distributionfunction.
- ➢ **summarise**various types of solids based on bandtheory.

UNIT-IV (**9hrs**)

SEMICONDUCTOR PHYSICS: Introduction – Intrinsic semi conductors - density of charge carriers - Electrical conductivity – Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature – Hall effect- Hall coefficient - Applications of Hall effect - Drift and Diffusion currents – Einstein's equation.

Learning Outcomes:

The students will be able to

- ➢ **classify**the energy bands ofsemiconductors.
- ➢ **outline**the properties of n-type and p-typesemiconductors.
- ➢ **identify**the type of semiconductor using Halleffect.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT-V   (10 hrs)

MAGNETISM & DIELECTRICS: Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para & Ferro – Domain concept of Ferromagnetism - Hysteresis – soft and hard magnetic materials – applications of Ferromagnetic material.

Introduction - Dielectic polarization – Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation - Frequency dependence of polarization – Applications of dielectrics.

Unit Outcomes:
The students will be able to
- **explain**the concept of polarization in dielectricmaterials.
- **summarize**various types of polarization of dielectrics.
- **interpret**Lorentz field and Claussius- Mosotti relation indielectrics.
- **classify**the magnetic materials based on susceptibility and their temperaturedependence.
- **explain**the applications of dielectric and magnetic materials.
- **Apply** the concept of magnetism to magneticdevices.

TEXT BOOKS:

1. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G.Kshirsagar - S.Chand Publications,2017.
2. "Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press(2015).
3. "Engineering Physics" by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers,2012.

REFERENCE BOOKS:

1. "Engineering Physics" by M. R. Srinivasan, New Age international publishers(2009).
2. "Optics" by Ajoy Ghatak, 6th Edition McGraw Hill Education,2017.
3. "Solid State Physics" by A. J. Dekker, Mc Millan Publishers(2011).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
	NETWORK ANALYSIS				

UNIT – I

Introduction to Electrical Circuits : Network elements classification, Electric charge and current, Electric energy and potential, Resistance parameter – series and parallel combination, Inductance parameter – series and parallel combination, Capacitance parameter – series and parallel combination. Energy sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, Kirchoff's laws, Mesh analysis and Nodal analysis problem solving with resistances only including dependent sources also. (Text Books: 1,2,3, Reference Books: 3)

> **Fundamentals and Network Topology**: Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor- problem solving, Phase angle, Phasor representation, Addition and subtraction of phasors, mathematical representation of sinusoidal quantities, explanation with relevant theory, problem solving. Principal of Duality withexamples.

Network Topology: Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule. (Text Books: 2,3, Reference Books: 3)

UNIT – II

Transients : First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, Evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method. (Text Books: 1,2,3, Reference Books: 1,3)

UNIT – III

Steady State Analysis of A.C Circuits : Impedance concept, phase angle, series R-L, R-C, R-L-C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving. (Text Books: 1,2, Reference Books: 3)

Coupled Circuits : Coupled Circuits: Self inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, Conductively coupled equivalent circuits- problem solving.

UNIT – IV

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, Bandwidth of

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

parallel resonance, general case-resistance present in both branches, anti resonance at all frequencies. (Text Books:2,3, Reference Books: 3)

Network Theorems: Thevinin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition,Max Power Transfer, Tellegens- problem solving using dependent sources also. (Text Books: 1,2,3, Reference Books:2)

UNIT – V

Two-port Networks: Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h-parameters, Inverse h-parameters, Inverse Transmission line parameters, Relationship between parameter sets, Parallel connection of two port networks, Cascading of two port networks, series connection of two port networks, problem solving including dependent sources also. (Text Books: 1,2, Reference Books: 1,3)

 TEXT BOOKS:
>   1.Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition,2000.
>   2. Network Analysis by K.Satya Prasad and S Sivanagaraju, CengageLearning
>   3. Electric Circuit Analysis by Hayt and Kimmarle,TMH

REFERENCES:
>   1. Network lines and Fields by John. D. Ryder 2nd edition, Asia publishinghouse.
>   2. Basic Circuit Analysis by DR Cunninghan, Jaico Publishers.
>   3.Network Analysis and Filter Design by Chadha, UmeshPublications.

COURSE OBJECTIVES:

- To understand the basic concepts on RLC circuits.
- To know the behavior of the steady states and transients states in RLCcircuits.
- To know the basic Laplace transforms techniques in periods'waveforms.
- To understand the two port networkparameters.
- To understand the properties of LC networks andfilters.

COURSE OUTCOME:

- gain the knowledge on basic networkelements.
- will analyze the RLC circuits behavior indetailed.
- analyze the performance of periodicwaveforms.
- gain the knowledge in characteristics of two port network parameters (Z,Y,ABCD,h &g).
- analyze the filter design concepts in real worldapplications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
	BASIC ELECTRICAL ENGINEERING				

Preamble:

This course covers various topics related to principle of operation and performance of various electrical machines.

Course Educational Objectives:

- To understand the principle of operation, constructional details and operational characteristics of DCgenerators.
- To understand the principle of operation, characteristics of DC motor. Methods of starting and speed control methods of DCmotors.
- To learn the constructional details, principle of operation and performance of transformers.
- To study the principle of operation, construction and details of synchronousmachines.
- To learn the principle of operation, constructional details, performance, torque – slip characteristics and starting methods of 3-phase inductionmotors.

Unit I

DC Machines

Principle of operation of DC generator – emf equation – types of DC machines – torque equation of DC motor – applications – three point starter - losses and efficiency - swinburne's test - speed control methods – OCC of DC generator- Brake test on DC Shunt motor-numerical problems

Unit II

Transformers

Principle of operation of single phase transformer constructional features – EMF equation – Losses and efficiency of transformer- regulation of transformer – OC & SC tests predetermination of efficiency and regulations – Sumpner's test-Numerical Problems.

Unit III

Synchronous Generators

Principle of operation and construction of alternators – types of alternators Regulation of alternator by synchronous impedance method-EMF equation of three phase alternator

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Synchronous Motors
Construction of three phase synchronous motor - operating principle –equivalent circuit of synchronous motor.

Unit IV
Induction Machine: Principle of operation and construction of three-phase induction motors – slip ring and squirrel cage motors – slip-torque characteristics – efficiency calculation – starting methods-Brake test on 3-Phase Induction Motor.

Unit V
Special Machines: Principle of operation and construction - single phase induction motor - shaded pole motors – capacitor motors and AC servomotor.

Course Outcomes:

- Able to explain the operation of DC generator and analyze the characteristics of DC generator.
- Able to explain the principle of operation of DC motor and analyze their characteristics. Acquire the skills to analyze the starting and speed control methods of DCmotors.
- Ability to analyze the performance and speed – torque characteristics of a 3-phase induction motor and understand starting methods of 3-phase inductionmotor.
- Able to explain the operation of SynchronousMachines
- Capability to understand the operation of various specialmachines.

TEXT BOOKS:

1. Principles of Electrical Machines by V.K. Mehta & Rohit Mehta, S.Chandpublications
2. Theory & performance of Electrical Machines by J.B.Guptha, S.K.Kataria &Sons

REFERENCE BOOKS:

1.Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah,TMH Publications
2.Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications,2nd edition
3. Basic Electrical Engineering by Nagsarkar,Sukhija, Oxford Publications,2ndedition

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - II Semester		L	T	P	C
		0	0	2	1

ELECTRONIC WORKSHOP

I. Identification ofcomponents
II. Laboratoryequipment
III. Solderingpractice
IV. PCBLayout
V. Testing ofComponents
VI. CRO

I. Identification ofcomponents:

- Resistors:- Types of Resistors, Value of Resistance using color code,DRBS.
- Capacitors:- Types of capacitors, value of capacitance using color code,DCBS.
- Inductors:- Types of Inductors,DLB
- Rheostats:- Types of Rheostats, Types of potentiometers,Relays.
- Switches:- Types ofSwitches.
- Cables: Types ofCables.
- Types of Instrumentsused.

Identification of active elements.

(Two Terminal, Three Terminal Devices)
- (SC diode, Zener diode,D.AC)
- Three Terminal Devices: BJT, UJT, SCR, FET, MOSFET,TRIAC.
- Digital and Analog ICs. (TO and Flat packages) IC regulatorstypes.
- Testing of above components using Multimetros.

II. LaboratoryEquipment:
A) Meters:-
- Types of Voltmeters, Types of Ammeters both Analog andDigital.
- Types of Multi meters (Analog &Digital)
- AVO Meters.
- FET inputVoltmeter.

B) Laboratory Function Generators and AudioOscillators.
C) PowerSupplies.
D) RFgenerators.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

E) Different Types ofTransformers.
(Power, AF, RF,etc.)

III.   Solderingpractice

Tools kit including soldering iron
Tools Kit:
- Insulated noseplayer
- Insulated cuttingplayer
- Screw driverkit
- Electricaltester
- Soldering iron, Lead,Flex

IV.   PCB layout andDesign.
Materials required, centimeter graph sheets, marker.

V.   Testing of Components.
Active and Passive Components

VI.   CRO
Acquaintance with CRO
Measurements on CRO

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - II Semester		L	T	P	C
		0	0	3	1.5
BASIC ELECTRICAL ENGINEERING LAB					

Learning Objectives:
- To plot the magnetizing characteristics of DC shunt generator and understand the mechanism ofself-excitation.
- To control the speed of DCmotors.
- To determine and predetermine the performance of DCmachines.
- To predetermine the efficiency and regulation of transformers and assess theirperformance.
- To analyse performance of three phase inductionmotor.
- To understand the significance of regulation of an alternators using synchronous impedance method.

Any ten of the following experiments are to be conducted

1. Magnetization characteristics of D.C. Shunt generator.
2. Speed control of D.C. shuntmotor.
3. Brake test on DC shuntmotor.
4. Swinburne's test on DCmachine
5. Load test on DC shuntgenerator
6. Load test on DC seriesgenerator.
7. Separation of losses iun DC Shuntmotor
8. OC & SC tests on single-phasetransformer
9. Sumpner's test on single phasetransformer
10. Brake test on 3-phase Induction motor.
11. Regulation of alternator by synchronous impedancemethod.

Learning Outcomes:
The student should be able to:
- Determine and predetermine the performance of DC machines andtransformers.
- Control the DC shunt machines.
- Compute the performance of 1-phasetransformer.
- Perform tests on 3-phase induction motor and alternator to determine theirperformance characteristics.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - II Semester		L	T	P	C
		0	0	3	1.5

APPLIED PHYSIC LAB
(Any 10 of the following listed 15 experiments)

LIST OF EXPERIMENTS:

1. Determination of wavelength of a source-Diffraction Grating-Normalincidence.

2. Newton's rings – Radius of Curvature of Plano - ConvexLens.

3. Determination of thickness of a spacer using wedge film and parallel interferencefringes.

4. Magnetic field along the axis of a current carrying coil – Stewart and Gee'sapparatus.

5. Energy Band gap of a Semiconductor p - njunction.

6. Characteristics of Thermistor – TemperatureCoefficients

7. Determination of dielectric constant by charging and dischargingmethod

8. Determination of resistivity of semiconductor by Four probemethod.

9. StudythevariationofBversusHbymagnetizingthemagneticmaterial(B-Hcurve). 10

Measurement of magnetic susceptibility by Gouy'smethod.

11. Dispersive power of diffractiongrating.

12. Resolving Power oftelescope

13. Resolving power ofgrating

14. Determination of Hall voltage and Hall coefficients of a given semiconductor using Hall effect.

15. Variation of dielectric constant withtemperature.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - II Semester		L	T	P	C
		0	0	2	1
COMMUNICATION SKILLS LAB					

UNIT I:
Oral Activity: JAM, Hypothetical Situations, Self/Peer Profile
Common Errors in Pronunciation, Neutralising Accent

UNIT II:
Oral Activity: Telephonic Etiquette, Role Plays
Poster Presentations

UNIT III:
Oral Activity: Oral Presentation skills, Public speaking
Data Interpretation
UNIT IV:
Oral Activity: Group Discussions: Do's and Don'ts- Types, Modalities

UNIT V:
Oral Activity: Interview Skills: Preparatory Techniques, Frequently asked questions, Mock Interviews.
Pronunciation: Connected speech (Pausing, Tempo, Tone, Fluency etc.,)

References:

1. Infotech English, Maruthi Publications. (with Compact Disc)
2. Exercises in Spoken English Part 1,2,3,4, OUP andCIEFL.
3. English Pronunciation in use- Mark Hancock, Cambridge UniversityPress.
4. English Phonetics and Phonology-Peter Roach, Cambridge UniversityPress.
5. English Pronunciation in use- Mark Hewings, Cambridge UniversityPress.
6. English Pronunciation Dictionary- Daniel Jones, Cambridge UniversityPress.
7. English Phonetics for Indian Students- P. Bala Subramanian, Mac MillanPublications.
8. Technical Communication- Meenakshi Raman, Sangeeta Sharma, OxfordUniversity Press.
9. Technical Communication- Gajendrea Singh Chauhan, Smita Kashiramka,Cengage Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - II Semester		L	T	P	C
		0	0	2	1

ENGINEERING EXPLORATION PROJECT

COURSE OBJECTIVES:

- Build mindsets & foundations essential fordesigners
- Learn about the Human-Centered Design methodology and understand their real-world applications
- Use Design Thinking for problem solving methodology for investigating illdefined problems.
- Undergo several design challenges and work towards the final designchallenge

Apply Design Thinking on the following Streams to
- Project Stream 1: Electronics, Robotics, IOT andSensors
- Project Stream 2: Computer Science and ITApplications
- Project Stream 3: Mechanical and Electricaltools
- Project Stream4: Eco-friendly solutions for waste management, infrastructure, safety, alternative energy sources, Agriculture, Environmental science and other fields of engineering.

HOW TO PURSUE THE PROJECT WORK?
- The first part will be learning-based-masking students to embrace the methodology by exploring all the phases of design thinking through the wallet/ bag challenge and podcasts.
- The second part will be more discussion-based and will focus on building some necessary skills as designers and learning about complementary material for human- centered design.
- The class will then divide into teams and they will be working with one another for about 2 – 3 weeks. These teams and design challenges will be the basis for the final project and final presentation to bepresented.
- The teams start with **Design Challenge** and go through all the phases more in depth from coming up with the right question to empathizing to ideating to prototyping and to testing.
- Outside of class, students will also be gathering the requirements, identifying the challenges, usability, importanceetc
- At the end, Students are required to submit the final reports, and will be evaluated by the faculty.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TASKS TO BE DONE:

Task 1: Everyone is a Designer
- Understand class objectives & harness the designermindset

Task 2: The Wallet/Bag Challenge andPodcast
- Gain a quick introduction to the design thinkingmethodology
- Go through all stages of the methodology through a simple designchallenge
- Podcast: Observe, Listen and Engage with the surrounding environment and identify a designchallenge.

Task 3: Teams & Problems
- Start Design Challenge and learn about teams & problems throughthis
- Foster team collaboration, findinspiration from the environment and learn how to identifyproblems

Task 4: Empathizing
- Continue Design Challenge and learnempathy
- Learn techniques on how to empathize withusers
- Go to the field and interview people in theirenvironments
- Submit ActivityCard

Task 5: Ideating
- Continue Design Challenge and learn how to brainstorm effectively
- Encourage exploration and foster spaces forbrainstorming
- Submit ActivityCard

Task 6:Prototyping
- Continue Design Challenge and learn how to create effectiveprototypes
- Build tangible models and use them as communicationtools
- Start giving constructive feedback to classmates andteammates
- Submit Activity Card

Task 7:Testing
- Finish Design Challenge and iterate prototypes and ideas through userfeedback
- Evolve ideas and prototypes through user feedback and constructivecriticism
- Get peer feedback on individual and groupperformance
- Submit ActivityCard

Task8:
- Final Report Submission andPresentation

Note: The colleges may arrange for Guest Speakers from Various Design Fields: Graphic Design, Industrial Design, Architecture, Product Design, Organizational Design, etc to enrich the students with Design ThinkingConcept.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

REFERENCES:
1. Tom Kelly, *The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm* (Profile Books,2002)
2. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation (HarperBusiness, 2009)
3. Jeanne Liedtka, Randy Salzman, and Daisy Azer, Design Thinking for the Greater Good: Innovation in the Social Sector (Columbia Business School Publishing,2017)

OTHER USEFUL DESIGN THINKING FRAMEWORKS AND METHODOLOGIES:

- Human-Centered Design Toolkit (IDEO);https://www.ideo.com/post/design-kit
- Design Thinking Boot Camp Bootleg (Stanford D-School); https://dschool.stanford.edu/resources/the-bootcamp-bootleg
- Collective Action Toolkit (frogdesign);https://www.frogdesign.com/wpcontent/ o uploads/2016/03/CAT_2.0_English.pdf
- Design Thinking for Educators (IDEO); https://designthinkingforeducators.com/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3

ELECTRONIC DEVICES AND CIRCUITS

Course Objectives:

The main objectives of this course are

- To learn and understand the basic concepts of semiconductor physics.
- Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
- To learn and understandthe application of diodes as rectifiers with their operation and characteristics with and without filters arediscussed.
- Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and theircharacteristics.
- To learn and understandthe purpose of transistor biasing and itssignificance.
- Small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compare differentconfigurations.

UNIT-I:Review of Semi Conductor Physics: Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors

Junction Diode Characteristics : energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode,current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.

UNIT-II:

Special Semiconductor Devices: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Varactor Diode, Photodiode, Tunnel Diode, UJT, PN-PN Diode, SCR. Construction, operation and V-I characteristics.

Rectifiers and Filters: Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier,derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter(Series inductor), Capacitor filter(Stunt inductor), π-Filter,comparison of various filter circuits in terms of ripple factors.

UNIT- III: Transistor Characteristics:

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor asan amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values.

FET: FET types, construction, operation, characteristicsµ, g_m, $r_d$parameters, MOSFET-types, construction, operation,characteristics, comparison between JFET and MOSFET.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT- IV: Transistor Biasing and Thermal Stabilization : Need for biasing, operating point, load line analysis,BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in V_{BE}, Ic, and β, Stability factors, $(S,S^{'},S^{''})$, Bias compensation, Thermal runaway, Thermalstability.

FET Biasing- methods and stabilization.

UNIT- V: Small Signal Low Frequency Transistor Amplifier Models:
BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters,generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.
FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FETamplifiers.

Text Books:
1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, SecondEdition,2007
2. Electronic Devices and Circuits-K. Lal Kishore, BS Publications, FourthEdition,2016.
3. Electronics devices & circuit theory- Robert L.Boylestad andLouiNashelsky, Pearson/Prentice hall, tenth edition,2009

References:
1. Integrated Electronics-J. Millman, C. Halkias,Tata Mc-Graw Hill, SecondEdition,2009
2. Electronic Devices and Integrated Circuits – B.P. Singh,Rekha , Pearson publications,
3. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, 4ᵗʰEdition,2008.

Course Outcomes:
At the end of this course the student will be able to
- Apply the basic concepts of semiconductor physics.
- Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
- Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
- Understand the construction, principle of operation of transistors, BJT and FET withtheir V-I characteristics in different configurations.
- Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.
- Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3

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SWITCHING THEORY and LOGIC DESIGN

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Course Objectives:

- To solve a typical number base conversion and analyze new error coding techniques.
- Theorems and functions of Boolean algebra and behavior of logic gates.
- To optimize logic gates for digital circuits using various techniques.
- Boolean function simplification using Karnaugh maps and Quine-McCluskey methods.
- To understand concepts of combinational circuits.
- To develop advanced sequential circuits.

UNIT – I

REVIEW OF NUMBER SYSTEMS & CODES:

Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members.Gray code ,4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.

BOOLEAN THEOREMS AND LOGIC OPERATIONS:

Boolean theorems, principle of complementation & duality, De-morgan theorems.Logic operations ; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX-NOR operations.Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits. Study the pin diagram and obtain truth table for the following relevant ICs 7400,7402,7404,7408,7432,7486.

UNIT – II

MINIMIZATION TECHNIQUES:

Minimization and realization of switching functions usingBoolean theorems, K-Map (up to 6 variables)and tabular method(Quine-mccluskey method) with only four variables and single function.

COMBINATIONAL LOGIC CIRCUITS DESIGN:

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converts using Karnaugh method and draw the complete circuit diagrams.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT – III
COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI &LSI :
Design of encoder ,decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits . Realization of Boolean functions using decoders and multiplexers.Design of Priority encoder, 4-bit digital comparator and seven segment decoder. . Study the relevant ICs pin diagrams and their functions 7442,7447,7485,74154.
INTRODUCTION OF PLD's :
PLDs:PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table.

UNIT – IV
SEQUENTIAL CIRCUITS I:
Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop toanother flip-flop. Design of 5ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift, register.
Study the following relevant ICs and their relevant functions 7474,7475,7476,7490,7493,74121.

UNIT – V
SEQUENTIAL CIRCUITS II :
Finite state machine; state diagrams, state tables, reduction of state tables.Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa.Realization of sequence generator,Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or withoutoverlapping).

TEXT BOOKS:
1. Switching and finite automata theory Zvi.KOHAVI,Niraj.K.Jha 3rdEdition,Cambridge UniversityPress,2009
2. Digital Design by M.MorrisMano,Michael D Ciletti,4th edition PHIpublication,2008
3. Switching theory and logic design by Hill and Peterson**,**Mc-Graw Hill TMH edition, 2012.

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KAKINADA – 533 003, Andhra Pradesh, India
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REFERENCES:
1. Fundamentalsof Logic Design by Charles H. Roth Jr, JaicoPublishers,2006
2. Digital electronics by R S Sedha.S.Chand & companylimited,2010
3. Switching Theory and Logic Design by A. AnandKumar,PHI Learning pvtltd,2016.
4. Digital logic applications and design by John M Yarbough, Cengage learning,2006.
5. TTL 74-Series databook.

Course Outcomes:

- Classify different number systems and apply to generate variouscodes.
- Use the concept of Boolean algebra in minimization of switchingfunctions
- Design different types of combinational logiccircuits.
- Apply knowledge of flip-flops in designing of Registers andcounters
- The operation and design methodology for synchronous sequential circuits and algorithmic statemachines.
- Produce innovative designs by modifying the traditional designtechniques.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3

SIGNALS and SYSTEMS

Course Objectives:

The main objectives of this course are given below:

- To study about signals andsystems.
- To analyze the spectral characteristics of signal using Fourier series and Fouriertransforms.
- To understand the characteristics ofsystems.
- To introduce the concept of samplingprocess
- To know various transform techniques to analyze the signals andsystems.

UNIT- I: INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions. Related Problems.

UNIT –II: FOURIER SERIES AND FOURIER TRANSFORM:
Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relation between Trigonometric and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform.RelatedProblems.

UNIT-III: ANALYSIS OF LINEAR SYSTEMS: Introduction**,** Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system, Related problems. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT –IV:

CORRELATION: Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between Convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

SAMPLING THEOREM : Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling, Related problems.

UNIT –V:

LAPLACE TRANSFORMS: Introduction**,** Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Inverse Laplace transform, Relation between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveformsynthesis.

Z–TRANSFORMS: Concept of Z- Transform of a discrete sequence. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms. Distinction between Laplace, Fourier and Z transforms.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, BS Publications,2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI,2nd Edn,1997
3. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2ndEdition,2007

REFERENCE BOOKS:

1. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press,2015
2. Signals and Systems – T K Rawat , Oxford University press,2011

Course Outcomes: At the end of this course the student will able to:

- Differentiate the various classifications of signals andsystems
- Analyze the frequency domain representation of signals using Fourierconcepts
- Classify the systems based on their properties and determine the response ofLTI Systems.
- Know the sampling process and various types of samplingtechniques.
- Apply Laplace and z-transforms to analyze signals and Systems (continuous &discrete).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year - I Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

RANDOM VARIABLES and STOCHASTIC PROCESSES

Course Objectives:

- To give students an introduction to elementary probability theory, in preparation to learn the concepts of statistical analysis, random variables and stochasticprocesses.
- To mathematically model the random phenomena with the help of probabilitytheory Concepts.
- To introduce the important concepts of random variables and stochasticprocesses.
- To analyze the LTI systems with stationary random process asinput.

UNIT I
THE RANDOM VARIABLE: Introduction, Review of Probability Theory, Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, Properties.

UNIT II
OPERATION ON ONE RANDOM VARIABLE - EXPECTATIONS: Introduction,
Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable.

UNIT III
MULTIPLE RANDOM VARIABLES: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem: Unequal Distribution, EqualDistributions.
OPERATIONS ON MULTIPLE RANDOM VARIABLES: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variables case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT IV
RANDOM PROCESSES – TEMPORAL CHARACTERISTICS: The RandomProcess Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second-order and Wide-Sense Stationarity, N^{th}-order and Strict-Sense

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Stationarity, Time Averages and Ergodicity, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

UNIT V
RANDOM PROCESSES - SPECTRAL CHARACTERISTICS: The PowerDensity Spectrum: Properties, Relationship between Power Density Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Density Spectrum and Cross-Correlation Function.
LINEAR SYSTEMS WITH RANDOM INPUTS: Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, Autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectra of Input and Output, Band pass, Band-Limited and Narrowband Processes,Properties.

TEXT BOOKS:
1. Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles,TMH, 4th Edition,2001.
2. Probability, Random Variables and Stochastic Processes, Athanasios Papoulisand S.Unnikrisha, PHI, 4th Edition,2002.
3. Probability and Random Processes with Applications to Signal Processing, HenryStark and John W. Woods, Pearson Education, 3rdEdition,2001.

REFERANCE BOOKS:
1. Schaum's Outline of Probability, Random Variables, and Random Processes,1997.
2. An Introduction to Random Signals and Communication Theory, B.P. Lathi, International Textbook,1968.
3. Probability Theory and Random Processes, P. Ramesh Babu, McGrawHill,2015.

Course Outcomes:
After completion of the course, the student will be able to
- Mathematically model the random phenomena and solve simple probabilisticproblems.
- Identify different types of random variables and compute statistical averages ofthese randomvariables.
- Characterize the random processes in the time and frequencydomains.
- Analyze the LTI systems with randominputs.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Objectives:

This subject will help to improve

- the analytical skills of object oriented programming
- Overall development of problem solving and critical analysis.
- Formal introduction to Java programming language

Course Outcomes:

On successful completion of this course, the student should be able to:

- Show competence in the use of the Java programming language in the development of small to medium-sized application programs that demonstrate professionally acceptable coding and performance standard
- Illustrate the basic principles of the object-oriented programming
- Demonstrate an introductory understanding of graphical user interfaces, multithreaded programming, and event-driven programming.

Unit I

Introduction to Java : Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.

Objects and Classes : Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference.

Unit II

Inheritance and Polymorphism : Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.

Unit III

Event and GUI programming : Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing, Creating a swing applet, swing controls and components.

Unit IV

I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files.

Event driven model, handling events

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Unit V

Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally, Collections in java, Introduction to JavaBeans and Network Programming.

Text Books:
1) Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson.
2) Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.

Reference Books:
1) Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD.
2) Core Java Volume-I Fundamentals, Eight Edition, Horstmann & Cornell, Pearson Education.
3) The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, TMH.
4) Java Programming, D. S. Malik, Cengage Learning.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3

MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS

Course Objectives:
- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demandforecasting.
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-ProfitAnalysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms ofBusiness organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performanceevaluation.
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgetingproposals.

Unit-I
Introduction to Managerial Economics and demand Analysis:
Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

Unit – II:
Theories of Production and Cost Analyses:
Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

Unit – III:
Introduction to Markets, Theories of the Firm & Pricing Policies:
Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning andFeatures
– PhasesofaBusinessCycle.FeaturesandEvaluationofSoleTrader,Partnership,JointStockCompany
– State/Public Enterprises and theirforms.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Unit – IV:
Introduction to Accounting & Financing Analysis:
Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

Unit – V:
Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

TEXT BOOKS:
1. A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

REFERENCES:
1. Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & CompanyLtd,
2. JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New editionedition
3. N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & CompanyLtd,
4. MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House PvtLtd
5. I.M Pandey, Financial Management , Vikas Publishing House PvtLtd
6. V. Maheswari, Managerial Economics, S. Chand & CompanyLtd.

Course Outcomes:
- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for aproduct.
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination ofinputs.
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different BusinessUnits.
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools forAnalysis.
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decisionmaking.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year - I Semester		L	T	P	C
		0	0	3	1.5
	ELECTRONIC DEVICES AND CIRCUITS LAB				

Note: The students are required to perform the experiment to obtain the V-I characteristics and to determine the relevant parameters from the obtained graphs.

Electronic Workshop Practice:
1. Identification, Specifications, Testing of R, L, C Components (ColourCodes), Potentiometers, Coils, Gang Condensers, Relays, BreadBoards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs,LEDs, LCDs, SCR,UJT.
3. Soldering Practice- Simple circuits using active and passivecomponents.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog andDigital Multimeter, Function Generator, Regulated Power Supply andCRO.

List of Experiments: (Minimum of Ten Experiments has to be performed)

1. P-N Junction DiodeCharacteristics
   Part A: Germanium Diode (Forward bias& Reverse bias)
   Part B: Silicon Diode (Forward Bias only)
2. Zener DiodeCharacteristics
   Part A: V-ICharacteristics
   Part B: Zener Diode as Voltage Regulator
3. Rectifiers (without and withc-filter)
   Part A: Half-waveRectifier
   Part B: Full-wave Rectifier
4. BJT Characteristics(CEConfiguration)
   Part A: InputCharacteristics
   Part B: Output Characteristics
5. FET Characteristics(CSConfiguration)
   Part A: DrainCharacteristics
   Part B: Transfer Characteristics
6. SCRCharacteristics
7. UJTCharacteristics
8. TransistorBiasing
9. CRO Operation and itsMeasurements
10. BJT-CEAmplifier
11. Emitter Follower-CCAmplifier
12. FET-CSAmplifier

Equipment required:
1. Regulated Powersupplies

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

2. Analog/Digital StorageOscilloscopes
3. Analog/Digital FunctionGenerators
4. DigitalMulti-meters
5. Decade RésistanceBoxes/Rheostats
6. Decade CapacitanceBoxes
7. Ammeters (Analog orDigital)
8. Voltmeters (Analog orDigital)
9. Active & Passive ElectronicComponents

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year - I Semester		L	T	P	C
		0	0	3	1.5

SWITCHING THEORY and LOGIC DESIGN LAB

List of Experiments: (Minimum of Twelve Experiments has to be performed)

1. Verification of truth tables of Logicgates
   Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR
2. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital TrainerKit
3. Verification of functional table of 3 to 8 line Decoder /De-multiplexer
4. 4 variable logic function verification using 8 to 1multiplexer.
5. Design full adder circuit and verify its functionaltable.
6. Verification of functional tablesof
   (i) J K Edge triggered Flip –Flop
   (ii) J K Master Slave Flip – Flop
   (iii)D Flip -Flop
7. Design a four bit ring counter using D Flip – Flops / JK Flip Flop and verifyoutput
8. Design a four bit Johnson's counter using D Flip-Flops / JK Flip Flops and verifyoutput
9. Verify the operation of 4-bit Universal Shift Register for different Modes ofoperation.
10. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip-Flops and Test it with a low frequency clock and Sketch the outputwaveforms.
11. Design MOD – 8 synchronous counter using T Flip-Flop and verify the result and Sketch the outputwaveforms.
12. (a) Draw the circuit diagram of a single bit comparator and test theoutput
    (b) Construct 7 Segment Display Circuit Using Decoder and 7 Segment LED and testit.

ADD on Experiments:
1. Design BCD Adder Circuit and Test the Same using RelevantIC
2. Design Excess-3 to 9-Complement convertor using only four Full Adders and test the Circuit.
3. Design an Experimental model to demonstrate the operation of74154 De-Multiplexer using LEDs foroutputs.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year-I Semester		L	T	P	C
		3	0	0	0
	CONSTITUTION OF INDIA				

Course Objectives:

- To Enable the student to understand the importance ofconstitution
- To understand the structure of executive, legislature andjudiciary
- To understand philosophy of fundamental rights andduties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission ofIndia.
- To understand the central and state relation financial andadministrative.

UNIT-I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes:

After completion of this unit student will

- Understand the concept of Indianconstitution
- Apply the knowledge on directive principle of statepolicy
- Analyze the History, features of Indianconstitution
- Evaluate Preamble Fundamental Rights andDuties

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers andFunctions;

Learning outcomes:-After completion of this unit student will

- Understand the structure of Indiangovernment
- Differentiate between the state and centralgovernment
- Explain the role of President and PrimeMinister
- Know the Structure of supreme court and Highcourt

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions

Learning outcomes:-After completion of this unit student will
- Understand the structure of stategovernment
- Analyze the role Governor and ChiefMinister
- Explain the role of stateSecretariat
- Differentiate between structure and functions of statesecretariat

UNIT-IV

A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning outcomes:-After completion of this unit student will

- Understand the localAdministration
- Compare and contrast district administration role andimportance
- Analyze the role of Myer and elected representatives ofMunicipalities
- Evaluate Zillapanchayat block levelorganisation

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes:-After completion of this unit student will

- Know the role of Election Commission applyknowledge
- Contrast and compare the role of Chief Election commissioner andCommissiononerate
- Analyze role of state electioncommission
- Evaluate various commissions of viz SC/ST/OBC andwomen

References:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. NewDelhi
2. SubashKashyap, Indian Constitution, National BookTrust
3. J.A. Siwach, Dynamics of Indian Government &Politics
4. D.C. Gupta, Indian Government andPolitics

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government andPoliticsHans
7. J. Raj IndianGovernment andPolitics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. NewDelhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press2012

resources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Course Outcomes:

At the end of the semester/course, the student will be able to have a clear knowledge on the following:

➢ Understand historical background of the constitution making and its importance for building a democraticIndia.
➢ Understand the functioning of three wings of the government ie.,executive, legislative andjudiciary.
➢ Understand the value of the fundamental rights and duties for becoming good citizen of India.
➢ Analyze the decentralization of power between central, state and localself-government.
➢ Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustainingdemocracy.
    1. Know the sources, features and principles of IndianConstitution.
    2. Learn about Union Government, State government and itsadministration.
    3. Get acquainted with Local administration and PachayatiRaj.
    4. Be aware of basic concepts and developments of HumanRights.
    5. Gain knowledge on roles and functioning of ElectionCommission

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year-II Semester		L	T	P	C
		3	0	0	3
	ELECTRONIC CIRCUIT ANALYSIS				

Course Objectives:

The main objectives of this course are:

- To learn hybrid-pi parameters at high frequency and compare with low frequency parameters.
- Learn and understand the purpose of cascading of single stage amplifiers and derive the overall voltagegain.
- Analyze the effect of negative feedback on amplifier characteristics and derive the characteristics.
- Learn and understand the basic principle of oscillator circuits and perform the analysis of different oscillatorcircuits.
- Compare and analyze different Power amplifiers like Class A, Class B, Class C, Class AB and other types ofamplifiers.
- Analyze different types of tuned amplifiercircuits.

UNIT-I Small Signal High Frequency Transistor Amplifier models:

BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductance, Hybrid π capacitances, validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters , CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.

FET: Analysis of common Source and common drain Amplifier circuits at high frequencies.

UNIT-II

Multistage Amplifiers: Classification of amplifiers, methods of coupling, cascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Differential amplifier using BJT.

UNIT -III

Feedback Amplifiers : Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Unit-IV
Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wien bridge oscillators with BJT and FET and their analysis, Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators using BJT, Frequency and amplitude stability of oscillators.

UNIT-V
Power Amplifiers: Classification of amplifiers(A to H), Class A power Amplifiers, Class B Push-pull amplifiers, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heatsinks.
Tuned Amplifiers: Introduction, Q-Factor, small signal tuned amplifier, capacitance single tuned amplifier, double tuned amplifiers, , staggered tunedamplifiers

Text Books:
1. Integrated Electronics- J. Millman and C.C. Halkias, Tata McGraw-Hill,1972.
2. Electronic Devices and Circuits Theory – Robert L. Boylestad and LouisNashelsky, Pearson/Prentice Hall, Tenth Edition,2009.
3. Electronic Devices and Integrated Circuits – B.P. Singh,Rekha , Pearson publications, 2006

References:
1. Electronic Circuit Analysis and Design – Donald A. Neaman, McGrawHill,2010.
2. Microelectronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press,Sixth Edition,2011.
3. Electronic Circuit Analysis-B.V.Rao, K.R.Rajeswari, P.C.R.Pantulu,K.B.R.Murthy, PearsonPublications.

Course Outcomes:
At the end of this course the student can able to
- Design and analysis ofsmall signal high frequency transistor amplifier using BJT and FET.
- Designandanalysisofmultistageamplifiersusing BJTandFETandDifferential amplifier usingBJT.
- Derive the expressions for frequency ofoscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stabilityconcept.
- Know the classification of the power and tuned amplifiers and their analysiswith performance comparison.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year-II Semester		L	T	P	C
		3	0	0	3
	LINEAR CONTROL SYSTEMS				

Course objectives:
- To introduce the concepts of open loop and closed loop systems, mathematical models of mechanical and electrical systems, and concepts offeedback
- To study the characteristics of the given system in terms of the transfer function and introducing various approaches to reduce the overall system fornecessaryanalysis
- To develop the acquaintance in analyzing the system response in time-domain and frequency domain in terms of variousperformanceindices
- To analyze the system in terms of absolute stability and relative stability by differentapproaches
- To design different control systems for different applications as pergivenspecifications
- To introduce the concepts of state variable analysis, design and also the concepts of controllability andobservability.

UNIT I
INTRODUCTION
Concepts of System,Control Systems: Open Loop and closed loop control systems and their differences. Different examples of control systems, Feed-Back Characteristics, Effects of feedback.Mathematical models, Differential equations, Impulse Response andtransfer functions.Translational and Rotational mechanicalsystems

UNIT II
TRANSFER FUNCTION REPRESENTATION
Transfer Function of DC Servo motor - AC Servo motor- Synchro-transmitter and Receiver, Block diagram representation of systemsconsidering electrical systems as examples -Block diagram algebra– Representation by Signal flow graph - Reduction using mason'sgain formula.
TIME RESPONSEANALYSIS
Standard test signals - Time response of first order systems – CharacteristicEquation of Feedback control systems, Transient response of second ordersystems - Time domain specifications – Steady state response - Steady stateerrors and error constants.

UNIT III
STABILITY ANALYSIS IN S-DOMAIN
The concept of stability – Routh's stability criterion – qualitative stabilityand conditional stability – limitations of Routh's stability100
Root Locus Technique:
The root locus concept - construction of root loci-effects of adding polesand zeros to G(s)H(s) on the root loci.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT IV
Frequency response analysis: Introduction, Correlation between time and frequency response, Polar Plots, Bode Plots, Nyquist StabilityCriterion

UNIT V
CLASSICAL CONTROL DESIGN TECHNIQUES
Compensation techniques – Lag, Lead, Lead-Lag Controllers design infrequency Domain, PID Controllers. State Space Analysis of ContinuousSystems Concepts of state, state variables and state model, derivation ofstate models from block diagrams, Diagonalization- Solving the Timeinvariant state Equations- State Transition Matrix and it's Properties –Concepts of Controllability and Observability.

TEXT BOOKS:
1. Automatic Control Systems 8th edition– by B. C. Kuo–John wiley andson's,2003.
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal,New Age International(P) Limited, Publishers, 2nd edition,2007
3. Modern Control Engineering–by Katsuhiko Ogata – Pearson Publications, 5th edition,2015.

REFERENCE BOOKS:
1. Control Systems by A.Nagoorkani, RBA publications,3 edition,2017.
2. Control Systems by A.Anandkumar, PHI, 2 Edition,2014.

Course Outcomes:
- This course introduces the concepts of feedback and its advantages to various controlsystems
- The performance metrics to design the control system in time-domain and frequency domain areintroduced.
- Control systems for various applications can be designed using time-domain and frequency domainanalysis.
- In addition to the conventional approach, the state space approach for the analysis of control systems isalsointroduced.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year-II Semester		L	T	P	C
		3	0	0	3

ELECTROMAGNETIC WAVES and TRANSMISSION LINES

Course objectives:

The main objectives of this course are to understand

- Fundamentals of steady electric and magnetic fields using variouslaws
- Apply the concept of static and time varying Maxwell equations and power flow using pointingtheorem
- Wave characteristics in different media for normal and obliqueincidence
- Implement various concepts of transmission lines and impedancemeasurements

SYLLABUS:

Prerequisites: Understanding of Cartesian co-ordinates, spherical & cylindrical systems

UNIT I:

Transmission Lines - I : Types, Parameters, T&π Equivalent Circuits, Transmission Line Equations,Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and GroupVelocities, Infinite Line, Lossless lines, distortion less lines, Illustrative Problems.

UNIT II:

Transmission Lines – II: Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. Low loss radio frequency lines and UHF Transmission lines, UHF Lines as Circuit Elements; ImpedanceTransformations,$\lambda/8$,$\lambda/4$ andλ /2 Lines –. Smith Chart – Construction and Applications, Quarter wave transformer,Single Stub Matching, Illustrative Problems.

UNIT III:

Review of Co-ordinate Systems, **Electrostatics:**, Coulomb's Law, Electric Field Intensity, Electric Flux Density,Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density,Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems.

UNIT IV:

Magneto Statics : Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density,Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to MagneticFields, Ampere's Force Law, Inductances and Magnetic Energy. IllustrativeProblems**.**

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere'sLaw and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements.Conditions at a Boundary Surface.Illustrative Problems.

UNIT V:

EM Wave Characteristics : Wave Equations for Conducting and Perfect Dielectric Media,

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UniformPlane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossydielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Polarization & Types,Illustrative Problems.

Reflection and Refraction of Plane Waves – Normal and ObliqueIncidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total InternalReflection, Surface Impedance. Poynting Vector and Poynting Theorem.Illustrative Problems.

TEXT BOOKS:
1. Elements of Electromagnetic – Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed.,2001.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI,2nd Edition,2000.

REFERENCE BOOKS:
1. Electromagnetic Field Theory and Transmission Lines –GSN Raju, Pearson Education2006
2. Engineering Electromagnetic – William H. Hayt Jr. and John A. Buck, TMH, 7th ed.,2006.
3. Electromagnetic Field Theory and Transmission Lines: G SasiBhushana Rao,WileyIndia 2013.
4. Networks,LinesandFieldsJohn D. Ryder,Second Edition, PearsonEducation,2015.

Course Outcomes:
At the end of this course the student can able to
- Determine E and H using various laws and applications of electric & magneticfields
- Apply the Maxwell equations to analyze the time varying behavior of EMwaves
- Gain the knowledge in uniform plane wave concept and characteristics of uniformplane wave invariousmedia
- Calculate Brewster angle, critical angle and total internalreflection
- Derive andCalculate the expressions for input impedance of transmission lines,reflection coefficient, VSWR etc. using smithchart

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year-II Semester		L	T	P	C
		3	0	0	3
	ANALOG COMMUNICATIONS				

Course Objectives:

Students undergoing this course are expected to

- Familiarize with the fundamentals of analog communicationsystems.
- Familiarize with various techniques for analog modulation and demodulation of signals.
- Distinguish the figure of merits of various analog modulationmethods.
- Develop the ability to classify and understand various functional blocks of radio transmitters andreceivers.
- Familiarize with basic techniques for generating and demodulating various pulse modulatedsignals.

UNIT I

AMPLITUDE MODULATION : Introduction to communication system, Need for modulation, Frequency Division Multiplexing , Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector.

UNIT II

DSB & SSB MODULATION: Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems,FDM.

UNIT III

ANGLE MODULATION: Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop. Comparison of FM & AM.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT IV

TRANSMITTERS & RECEIVERS: Radio Transmitter - Classification of Transmitter, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter – Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter. **Radio Receiver** - Receiver Types - Tuned radio frequency receiver, Super hetro dyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting. Communication Receivers, extensions of super heterodyne principle and additional circuits.

UNIT V

NOISE: Review of noise and noise sources, noise figure**,** Noise in Analog communication Systems, Noise in DSB& SSB System, Noise in AM System, Noise in Angle Modulation Systems, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis
PULSE MODULATION: Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, Time Division Multiplexing, TDM Vs FDM

TEXT BOOKS:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe,TMH, 3rd Edition,2007.
2. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Edition,2007.
3. Modern Digital and Analog Communication Systems –B.P.Lathi,Zhi Ding,Hari Mohan Gupta,Oxford University Press,4th Edition,2017

REFERENCES:

1. Electronics & Communication System – George Kennedy and Bernard Davis,TMH 2004.
2. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH,2007.
3. Electronic Communication systems – Tomasi, Pearson, fourth Edition,2007.

Course Outcomes:

After undergoing the course, students will be able to

- Differentiate various Analog modulation and demodulationschemes and their spectralcharacteristics
- Analyze noise characteristics of various analog modulationmethods
- Analyze various functional blocks of radio transmitters andreceivers
- Design simple analog systems for various modulationtechniques.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year-II Semester		L	T	P	C
		3	0	0	3

COMPUTER ARCHITECTURE and ORGANIZATION

Course objectives:
- To understand the architecture of amodern computer with its variousprocessingunits. Also the Performance measurement of thecomputersystem.
- To understand the memory management systemofcomputer.
- To Understand the various instructions, addressingmodes
- To Understand the concept of I/Oorganization

UNIT -I:
Basic Structure Of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.
Machine Instruction and Programs:
Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types,

UNIT -II:
Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, shift and Rotate Instructions
Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

UNIT -III:
INPUT/OUTPUT ORGANIZATION: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access,
Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

UNIT -IV:
The MEMORY SYSTEMS: Basic memory circuits, Memory System Consideration, Read-Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory,
Cache Memories: Mapping Functions, INTERLEAVING
Secondary Storage: Magnetic Hard Disks, Optical Disks,

UNIT -V:
Processing Unit: Fundamental Concepts: Register Transfers, Performing an Arithmetic Or

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Logic Operation, Fetching A Word From Memory,Execution of Complete Instruction, Hardwired Control,

Micro programmed Control: Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field

TEXTBOOKS:
1. Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5thEdition, McGrawHill,2011.
2. Computer Architecture and Organization, John P. Hayes ,3rdEdition, McGrawHill,2002.

REFERENCE BOOKS:
1. Computer Organization and Architecture – William Stallings SixthEdition,Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th EditionPHI/Pearson, 2012.
3. Fundamentals or Computer Organization and Design, - SivaraamaDandamudiSpringer Int.Edition,2003.
4. "Computer Organization and Design: The Hardware/Software Interface" by DavidA. Patterson and John L.Hennessy, 1998.
5. J .P. Hayes, "Computer Architecture and Organization",McGraw-Hill,1998.

Course Outcomes:
- Students can understand the architecture ofmoderncomputer.
- They can analyze the Performance of a computer usingperformanceequation
- Understanding of differentinstructiontypes.
- Students can calculate the effective address of an operand byaddressingmodes
- They can understand how computer stores positive andnegativenumbers.
- Understand the concepts of I/O Organization and Memorysystems.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year-II Semester		L	T	P	C
		3	0	0	3

MANAGEMENT and ORGANISATIONAL BEHAVIOUR

Course Objectives:
- To familiarize with the process of management, principles, leadership styles andbasic concepts onOrganization.
- To provide conceptual knowledge on functional management that is on Human resource management and Marketingmanagement.
- To provide basic insight into select contemporary management practices and Strategic Management.
- To learn theories of motivationand also deals with individual behavior, their personality and perception ofindividuals.
- To understand about organizations groups that affect the climate of anentire organizations which helps employees in stressmanagement.

Unit I
Introduction: Management and organizational concepts of management and organization-Nature and Importance of Management, Functions of Management, System approach to Management - Taylor's Scientific Management Theory, Fayol's Principles of Management, Leadership Styles, Social responsibilities of Management. Designing Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, MBO, Process and concepts.

Unit II
Functional Management: Human Resource Management (HRM) Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Wage and Salary Administration Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating. - Marketing Management: Concepts of Marketing, Marketing mixelements and marketingstrategies.

Unit III
Strategic Management: Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and implementation, Generic Strategy alternatives. Bench Marking and Balanced Score Card as Contemporary Business Strategies.

Unit IV
Individual Behavior: Perception-Perceptual process- Impression management- Personality development – Socialization – Attitude- Process- Formation- Positive attitude- Change – Learning – Learning organizations- Reinforcement Motivation – Process- Motives – Theories of

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Motivation: Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation,

Unit V
Group Dynamics: Types of Groups, Stages of Group Development, Group Behaviour and Group Performance Factors, Organizational conflicts: Reasons for Conflicts, Consequences of Conflictsin
Organization, Types of Conflicts, Strategies for Managing Conflicts, Organizational Climate and Culture, Stress, Causes and effects, coping strategies of stress.

Reference Books:
1. Subba Rao P., *Organizational Behaviour,* Himalaya Publishing House.Mumbai.
2. Fred Luthans *Organizational Behaviour*, TMH, NewDelhi.
3. Robins, Stephen P., *Fundamentals of Management,* Pearson,India.
4. Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI,2007
5. Koontz & Weihrich: *Essentials of Management*, 6/e, TMH,2007
6. Kanishka Bedi, *Production and Operations Management*, Oxford University Press,2007.

Course Outcomes:
- After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizationalstructure.
- Will familiarize with the concepts of functional management that is HRM and Marketing of new productdevelopments.
- The learner is able to think in strategically through contemporary managementpractices.
- The learner can develop positive attitude through personality development and can equip with motivationaltheories.
- The student can attain the group performance and grievance handling in managing the organizationalculture.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year-II Semester		L	T	P	C
		0	0	3	1.5
	ELECTRONIC CIRCUIT ANALYSIS LAB				

Note: The students are required to design the circuit and perform the simulation using Multisim/ Equivalent Industrial Standard Licensed simulation software tool**.** Further they are required to verify the result using necessary hardware equipment.

List of Experiments :(Minimum of Ten Experiments has to be performed)
1. Determination of f_T of a giventransistor.
2. Voltage-Series FeedbackAmplifier
3. Current-Shunt FeedbackAmplifier
4. RC Phase Shift/Wien BridgeOscillator
5. Hartley/ Colpitt'sOscillator
6. Two Stage RC CoupledAmplifier
7. Darlington PairAmplifier
8. Bootstrapped EmitterFollower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A PowerAmplifier
11. Class B Push-Pull PowerAmplifier
12. Complementary Symmetry Class B Push-Pull PowerAmplifier
13. Single Tuned VoltageAmplifier
14. Double Tuned VoltageAmplifier

Equipment required:
  Software:
   i. Multisim/ Equivalent Industrial Standard Licensed simulation softwaretool.
   ii. Computer Systems with requiredspecifications

Hardware Required:
1. Regulated Powersupplies
2. Analog/Digital StorageOscilloscopes
3. Analog/Digital FunctionGenerators
4. DigitalMultimeters
5. Decade RésistanceBoxes/Rheostats
6. Decade CapacitanceBoxes
7. Ammeters (Analog orDigital)
8. Voltmeters (Analog orDigital)
9. Active & Passive ElectronicComponents

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year-II Semester		L	T	P	C
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	ANALOG COMMUNICATIONS LAB				

List of Experiments:

 (Twelve experiments to be done- **The students have to calculate the relevant parameters**)–

(a. Hardware, b.MATLABSimulink,c. MATLAB Communication toolbox)

- A. Amplitude Modulation - Modulation &Demodulation
- B. AM - DSB SC - Modulation &Demodulation
- C. Spectrum Analysis of Modulated signal usingSpectrumAnalyzer
- D. DiodeDetector
- E. Pre-emphasis&De-emphasis
- F. Frequency Modulation - Modulation&Demodulation
- G. AGCCircuits
- H. Verification ofSamplingTheorem
- I. Pulse Amplitude Modulation&Demodulation
- J.   PWM, PPM –Modulation&Demodulation
- K.   PLL IC-565 as FM demodulator
- L. Radioreceivercharacteristics
- M. Radio Receiver/TV Receiver Demo kits orTrainees.

Note: All the above experiments are to be executed/completed using hardware boards and also to be simulated on Mat lab.

Equipment& Softwarerequired:

  Software :

- i)   Computer Systems withlatestspecifications
- ii)   Connected inLAN(Optional)
- iii)   Operating system(Windows/Linuxsoftware)
- iv)   Simulations software (Simulink&MATLAB)

Equipment:

- 1. RPS   -   0 – 30V
- 2. CRO   -   0 – 20 M Hz.
- 3. FunctionGenerators   -   0 – 1 MHz
- 4. Components andBreadboards
- 5. Multimeters and othermeters
- 6. SpectrumAnalyzer

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester		L	T	P	C
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LINEAR INTEGRATED CIRCUITS and APPLICATIONS

Course objectives::
- To understand the basic operation &performance parameters of differentialamplifiers.
- To understand & learn the measuring techniques of performance parameters ofOp-Amp
- To learn the linear and non-linear applications of operationalamplifiers.
- To understand the analysis & design of different types of active filters usingop-amps
- To learn the internal structure, operation and applications of different analogICs
- To Acquire skills required for designing and testing integratedcircuits

UNIT I
Introduction: InternalBlock Diagram of various stages of Op-Amp and Roll of each Stage. Differential Amplifier using BJTs and With R_E DC and AC Analysis, Basic Current Mirror Circuit, Improved Version of current mirror circuit, current repeated circuit, Wilson current source.
OP-Amp Block Diagram (Symbolic Representation), Characteristics of Op-Amp, Ideal and Practical Op-Amp specifications, DC and AC Characteristics, Definitions of Input and Output Off-set voltage and currents slow rate, CMRR, PSRR.etc, Measurements of Op-Amp Parameters. Three-Terminal Voltage Regulators 78xx& 79xx Series, current Booster,adjustable voltage, Dual Power Supply with 78xx &79xx.

UNIT II
LINEAR and NON-LINEAR APPLICATIONS OF OP-AMPS: Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, ACamplifier, V to I, I to V converters, Buffers. Non- Linear function generation, Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti log Amplifiers, Precision rectifiers.

UNITIII
ACTIVE FILTERS, ANALOG MULTIPLIERS AND MODULATORS: Design & Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.
Four Quadrant Multiplier, IC 1496, Sample & Hold circuits.

UNIT IV
TIMERS & PHASE LOCKED LOOPS: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger; PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators. Applications of VCO (566).

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT V

DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC.DAC and ADC Specifications, Specifications AD 574 (12 bit ADC).

TEXT BOOKS:
1. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p)Ltd, 2ndEdition,2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad,PHI,1987.
3. Linear Integrated Circuits by Salivahan-3rd-Edition, McGrawHill,2018

REFERENCES:
1. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma ;SK Kataria& Sons; 2ndEdition,2010
2. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin& FredrickDriscoll, PHI, 6th Edition,2000.
3. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition,2011.
4. LinearIntegratedCircuits,byGaneshBabuT.RandSuseelaB.Scitech, 5th-Editon, 2014.

Course Outcomes:
- Design circuits using operational amplifiers for variousapplications.
- Analyze and design amplifiers and active filters usingOp-amp.
- Diagnose and trouble-shoot linear electroniccircuits.
- Understand the gain-bandwidth concept and frequency response of the amplifier configurations.
- Understand thoroughly the operational amplifiers with linear integratedcircuits.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester		L	T	P	C
		3	0	0	3

MICROPROCESSOR AND MICROCONTROLLERS

Course objectives::

The main objectives of this course are

- To acquire knowledge on microprocessors andmicrocontrollers.
- To select processors based onrequirements.
- To acquire the knowledge on interfacing various peripherals, configure and develop programs to interfaceperipherals/sensors.
- To develop programs efficiently on ARM Cortex processors anddebug.

UNIT–I

Introduction: Basic Microprocessor architecture, Harvard and Von Neumann architectures with examples, Microprocessor Unit versus Microcontroller Unit, CISC and RISC architectures.

8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum modeconfiguration.

UNIT–II

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT-III

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interruptcontrollers.

UNIT-IV

Intel 8051 MICROCONTROLLER

Architecture, Hardware concepts, Input/output ports and circuits, external memory, counters/timers, serial data input/output,interrupts.

Assembly language programming: Instructions, addressing modes, simple programs.

Interfacing to 8051: A/D and D/A Convertors, Stepper motor interface, keyboard, LCD Interfacing, Traffic light control.

UNIT–V

ARM Architectures and Processors: ARM Architecture, ARM Processors Families, ARM Cortex-M Series Family, ARM Cortex-M3 Processor Functional Description, functions and interfaces.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Programmers Model – Modes of operation and execution, Instruction set summary, System address map, write buffer, bit-banding, processor core register summary, exceptions.
ARM Cortext-M3 programming – Software delay, Programming techniques, Loops, Stack and Stack pointer, subroutines and parameter passing, parallel I/O, Nested Vectored Interrupt Controller – functional description and NVIC programmers' model.

TEXTBOOKS:
1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,1994.
2. The 8051 Microcontrollers and Embedded systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; Pearson 2-Edition, 2011.
3. The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors by JosephYou.

REFERENCE BOOKS:
1. Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach in English, by Dr. Alexander G. Dean, Published by Arm Education Media,2017.
2. Cortex -M3 Technical ReferenceManual.

Course Outcomes:
At the end of this course the student will be able to:
- Understand the architecture of microprocessor/ microcontroller and theiroperation.
- Demonstrate programming skills in assembly language for processors andControllers.
- Analyze various interfacing techniques and apply them for the design of processor/Controller basedsystems.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester		L	T	P	C
		3	0	0	3

DIGITAL COMMUNICATIONS

Course Objectives:

The student will be able to

- Understand pulse digital modulation systems such as PCM, DPCM andDM.
- Understand various digital modulation techniques and able to analyze various systems for their performance in terms of probability oferror.
- Study the concepts of information theory and need for sourcecoding.
- Study Block codes, cyclic codes and convolutioncodes.

UNIT I

PULSE DIGITAL MODULATION: Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems(DPCM). Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems.

UNIT II

DIGITAL MODULATION TECHNIQUES: Introduction, ASK, FSK, PSK, DPSK, DEPSK, QPSK, M-ary PSK, ASK, FSK, similarity of BFSK and BPSK.

UNIT III

DATA TRANSMISSION : Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK, calculation of error probability of ASK, BPSK, BFSK,QPSK.

UNIT IV

INFORMATION THEORY: Discrete messages, concept of amount of information and its properties. Average information, Entropy and its properties.Information rate, Mutual information and itsproperties.

SOURCE CODING: Introductions, Advantages, Shannon's theorem, Shanon-Fano coding, Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel, bandwidth –S/N trade off.

UNIT V

LINEAR BLOCK CODES: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation, BCH Codes.

CONVOLUTION CODES: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TEXT BOOKS:
1. Digital communications - Simon Haykin, John Wiley,2005
2. Digital and Analog Communication Systems - Sam Shanmugam, John Wiley,2005.

REFERENCES:
1. Principles of Communication Systems – H. Taub and D. Schilling, TMH,2003
2. Digital Communications – John Proakis, TMH, 1983. Communication Systems Analog& Digital – Singh & Sapre, TMH,2004.
3. Modern Digital and Analog Communication Systems –B.P.Lathi,Zhi Ding,Hari Mohan Gupta,Oxford University Press,4th Edition,2017

Course Outcomes:

After going through this course the student will be able to
- Analyze the performance of a Digital Communication System for probability of error and are able to design a digital communicationsystem.
- Analyze various source codingtechniques.
- Compute and analyze Block codes, cyclic codes and convolutioncodes.
- Design a coded communicationsystem.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester		L	T	P	C
		3	0	0	3

ELECTRONIC MEASUREMENTS & INSTRUMENTATION

Course Objectives:

- Learn and understand functioning of various measuring system and metrics for performance analysis.
- Acquire knowledge of principle of operation, working of differentelectronic
- Instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
- To Compare various measuring bridges and their balancingconditions.
- Learn and understand the use of various measuring techniques for measurement of different physical parameters using different classes oftransducers.

UNIT I

Performance characteristics of instruments, Static characteristics; Accuracy, Resolution, Precision, Expected value, Error, Sensitivity.Dynamic Characteristics; speed of response, Fidelity, Lag and Dynamic error.Types of errors in measurements and their analysis. Design of multi-range AC , DC meters (voltmeter &ammeter) and ohmmeter(series &shunt type) using D'arsonval movement. True rms meter.

UNIT II

Specifications and designing aspects of Signal Generators - AFsine and square wave signal generators, Function Generators, Random noise generators, Arbitrary waveform generators. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital FourierAnalyzers.

UNIT III

Oscilloscopes- general purpose CROs; block diagram , functions and implementation of various blocks, specifications, various controls and their functions , types of probes used in CROs. Measurement of frequency and phase difference using Lissajous patterns.

Special purpose CROs; sampling oscilloscope, analog storage oscilloscope, digital storage oscilloscope.

UNIT IV

Bridge circuits- Wheat stone bridge, measurement of very low resistance, Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance-Schearing Bridge.Wien Bridge, Errors and precautions in using bridges.

Q-meter; principle of operation, measurement methods and sources of errors.

Counters : principle of operation -modes of operation- totalizing mode, frequency mode and time period mode- sources of errors.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT V

Transducers- active & passive transducers: Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers.
Measurement of physical parameters temperature, force, pressure, velocity, acceleration and displacement.

TEXTBOOKS :
1. Electronic instrumentation, second edition - H.S. Kalsi, Tata McGrawHill,2004.

2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrickand W.D. Cooper, PHI, 5th Edition, 2002.

REFERENCES :
1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 3rd Edition,2013.
2. Electrical and Electronic Measurement and Instrumentation A.K. Sawhney. Dhanpat Rai & Co, 12thEdition,2002.

Course Outcomes:
The student will be able to
- Select the instrument to be used based on therequirements.
- Understand and analyze different signal generators andanalyzers.
- Understand the design of oscilloscopes for differentapplications.
- Design different transducers for measurement of differentparameters.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester		L	T	P	C
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INFORMATION THEORY & CODING
(Professional Elective 1)

Course objectives:

The main objectives of this course are given below
- Understand the concept of Entropy and sourcecoding
- Understand the concept of channel and its capacity
- Encoding and Decoding of Digital DataStreams
- Be Aware of Compression and DecompressionTechniques
- Learn the Concepts of MultimediaCommunication

UNIT I
INFORMATION THEORY AND SOURCE CODING

Uncertainty, information, entropy and its properties, entropy of binary memory less source and its extension to discrete memory less source, source coding theorem, data compression, prefix coding, Huffman coding, Lempel-Ziv coding, Source with memory and itsentropy.

UNIT II
DISCRETE CHANNELS

Binary Symmetric Channel, mutual information & its properties, Channel capacity, channel coding theorem and its application to BSC, Shannon's theorem on channel capacity, capacity of a channel of infinite bandwidth, bandwidth - S/N trade off, practical communication systems in light of Shannon's theorem, Fading channel, channels withmemory.

UNIT III
GROUPS, FIELDS AND LINEAR BLOCK CODES

Galois field and its construction in $GF(2^m)$ and its basic properties, vector spaces and matrices in GF(2), Linear block codes, systematic codes and its encoding circuit, syndrome and error detection, minimum distance, error detecting and correcting capabilities of block code, decoding circuit, probability of undetected error for linear block code in BSC, Hamming code and their applications.

UNIT IV
CYCLIC CODES AND BCH CODES

Basic properties of Cyclic codes, Generator and parity check matrix of cyclic codes, encoding and decoding circuits, syndrome computation and error detection, cyclic Hamming codes, encoding and decoding of BCH codes, error location andcorrection.

UNIT V
CONVOLUTIONALCODES

Introduction to convolution code, its construction and Viterbi algorithm for maximum likelihood decoding.Automatic repeat request strategies and their throughput efficiency considerations.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Text Books:
1. Sklar, Digital Communication, Pearson Education Asia, 2nd Edition,2001.
2. Shu Lin and Costello, Error Control Coding: Fundamentals and Applications, 2ndEdition, Pearson,2004.

Reference Books:
1. Haykin Simon, Digital Communication, Wiley Publications,2013.
2. Information theory and coding, Muralidhar Kulkarni, KS AShiva prakash,2015.
3. JS Chithode, Information theory and coding, Technical publishers, 1st Edition,2014.

Course Outcomes:
At the end of this course the student will be able to
- Design an Application with Error-Controlcoding
- Use Compression and DecompressionTechniques
- Perform source coding and channelcoding

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester		L	T	P	C
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DIGITAL SYSTEM DESIGN USING HDL
(Professional Elective 1)

Course objectives:
The student will be able to
- Learn and understand the architectures of Field-programmable GateArrays
- Translate a software application into hardware logic for FPGAarchitectures
- Design synthesizable systems based on industry-standard codingmethods
- Build test benches and create data models to verify bit-true accuratedesigns.

UNIT-I
INTRODUCTION: Hardware Description Languages, FPGA Boards and Software Tools.
Field-Programmable Gate Arrays: Transistor as a Switch, Logic Gates from Switches, FPGA Building Blocks, Layout of the Xilinx Artix-7 XC7A35T FPGA, Input/output Blocks, Configurable Logic Blocks, Interconnect Resources, Block RAM, DSP Slices, Clock Management, The XADC Block, High-Speed Serial I/O Transceivers, Peripheral Component Interconnect Express Interface, FPGA-Based Digital System Design Philosophy, How to Think While Using FPGAs, Advantages and Disadvantages of FPGAs, Usage Areas of FPGAs
Introduction to Verilog: Verilog Fundamentals, Module Representation, Timing and Delays in Modelling, Hierarchical Module Representation, Test bench Formation in Verilog, Structure of a Verilog Test bench File, Displaying TestResults.

UNIT-II
VERILOG DATA TYPES AND OPERATORS: Data Types in Verilog, Net and Variable Data Types, Data Values, Naming a Net or Variable, Defining Constants and Parameters, Defining Vectors, Operators in Verilog, Arithmetic Operators, Concatenation and Replication Operators, Application on Data Types and Operators, FPGA Building Blocks Used in Data Types and Operators, Implementation Details of Vector Operations, Implementation Details of Arithmetic Operations.

UNIT-III
COMBINATIONAL CIRCUITS: Combinational Circuit Analysis, Logic Function Formation between Input and Output, Boolean Algebra, Gate-Level Minimization, Combinational Circuit Implementation, Truth Table-Based Implementation, Combinational Circuit Design.
COMBINATIONAL CIRCUIT BLOCKS: Adders in Verilog, Comparators in Verilog, Decoders in Verilog, Encoders in Verilog, Multiplexers in Verilog, Parity Generators and Checkers in Verilog, Applications on Combinational Circuits, Implementing the Home Alarm System, Implementing the Digital Safe System, Implementing the Car Park Occupied Slot Counting System, FPGA Building Blocks Used in Combinational Circuits.
DATA STORAGE ELEMENTS: Latches in Verilog, Flip-Flops in Verilog, Register, Memory, Read-Only Memory, ROM in Verilog, ROM Formation Using IP Blocks, Random Access

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Memory, Application on Data Storage Elements, FPGA Building Blocks Used in Data Storage Elements.

UNIT-IV
SEQUENTIAL CIRCUITS: Sequential Circuit Analysis, State Table, State Diagram, State Representation in Verilog, Timing in Sequential Circuits, Synchronous Operation, Asynchronous Operation, Shift Register as a Sequential Circuit, Shift Registers in Verilog, Multiplication and Division Using Shift Registers, Counter as a Sequential Circuit, Synchronous Counter, Asynchronous Counter, Counters in Verilog, Frequency Division Using Counters, Sequential Circuit Design, Applications on Sequential Circuits.

UNIT-V
DIGITAL INTERFACING: Universal Asynchronous Receiver/Transmitter(UART) in Verilog, UART Applications, Serial Peripheral Interface (SPI) in Verilog, , SPI Application, Inter-Integrated Circuit (I^2C) in Verilog, , I2C Application, Video Graphics Array (VGA) in Verilog, VGA Application, Universal Serial Bus (USB) Receiving Module in Verilog, USB Keyboard Application, Ethernet, FPGA Building Blocks Used in Digital Interfacing.
ADVANCED APPLICATIONS: Vending Machine, Digital Clock, Moving Wave via LEDs, Translator, Air Freshener Dispenser, Obstacle-Avoiding Tank, Intelligent Washing Machine, Non-Touch Paper Towel Dispenser, Car Parking Sensor System. Digital Table Tennis Game.

TEXT BOOKS:
1. CemUnsalan, BoraTar"DigitalSystemDesignwithFPGAImplementationUsing Verilog and VHDL" McGraw-Hill Education,2017
2. Design through Verilog HDL – T.R. Padmanabhan and B. Bala Tripura Sundari, WSE, IEEE Press,2004.

REFERENCES:
1. Advanced Digital Design with Verilog HDL – Michael D. Ciletti, PHI,2005.
2. Fundamentals of Logic Design with Verilog – Stephen. Brown andZvonkoVranesic, TMH,2005.
3. A Verilog Primer – J. Bhasker, BSP,2003.

Course Outcomes:
At the end of this course the student will be able to
- Understand the architecture of FPGAs, tools used in modelling of digitaldesign
- Analyze and design basic digital circuits with combinatorial and sequential logic circuits using VerilogHDL.
- Model complex digital systems at several levels ofabstractions.
- Design real time applications such as vending machine and washing machinesetc.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester		L	T	P	C
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DATASTRUCTURES and ALGORITHMS
(Professional Elective 1)

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Course objectives:
- Explain the systematic methods of efficiently organizing and accessing data in data structures andalgorithms.
- Identify the properties and structural patterns in datastructures.
- Apply abstract data types to the design of datastructures.
- Analyze algorithms using a mathematical notation and experimentalstudies.
- Perform comparative analysis of the typical data structures andalgorithms.
- Design and analyze recursive algorithms in datastructures

UNIT – I:
Data Structures Basics: Structure and Problem Solving, Data structures, Datastructure Operations, Algorithm: complexity, Time- spacetrade-off.
Linked List: Introduction, Linked lists, Representation of linked lists in Memory, traversing a linked list, Searching a linked list, Memory allocation and Garbage collection, insertion into linked list, Deletion from a linked list, Types of linkedlist.

UNIT – II:
Stack and Queue: Introduction, Array Representation of Stack, Linked List Representation of stack, Application of stack, Queue, Array Representation of Queue, Linked List Representation of Queue.
Trees: Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Sequential and Other Representations of Trees, Tree Traversal.

UNIT – III:
Graphs: Matrix Representation of Graphs, List Structures, Other Representations of Graphs, Breadth First Search, Depth First Search, Spanning Trees. Directed Graphs Types of Directed **Graphs;** Binary Relation as a Digraph; Euler's Digraphs; Matrix Representation of Digraphs.
Applications of Graphs: Topological Sorting, Shortest-Path Algorithms – Weighted Shortest Paths – Dijkstra's Algorithm, Minimum spanning tree- Prim's Algorithm, Introduction to NP-Completeness.

UNIT – IV:
Searching and Sorting Techniques: Sorting Techniques – Bubblesort, Merge sort, Selection sort, Heap sort, Insertion Sort, Searching Techniques – SequentialSearching, Binary Searching, Search Trees.
Elementary Algorithms: Notation for Expressing Algorithms; Role and Notation for Comments; Example of an Algorithm; Problems and Instances; Characteristics of anAlgorithm;

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Building Blocks of Algorithms; Procedure and Recursion – Procedure, Recursion; Outline of Algorithms; Specification Methods for Algorithms.

UNIT – V:
Mathematical Functions and Notations: Functions and Notations; Modular Arithmetic / Mod Function; Mathematical Expectation in Average Case Analysis; Efficiency of an Algorithm; Well Known Asymptotic Functions and Notations; Analysis of Algorithms – Simple Examples; Well Known Sorting Algorithms – Insertion sort, Bubble sort, Selection sort, Shell sort, Heap sort.

Divide and Conquer: Divide and Conquer Strategy; Binary Search; Max. And Min.; Merge sort; Quick sort. Greedy Method: Greedy Method Strategy; Optimistic Storage on Tapes; Knapsack Problem; Job Sequencing with Deadlines; Optimal Merge Pattern; Single Source ShortlistPaths.
Dynamic Programming: Dynamic Programming Strategy; Multistage Graphs; All Pair Shortest Paths; Travelling Salesman Problems. Backtracking Strategy, 8-Queens Problem, Sum of Subsets, Knapsack Problem.

TEXTBOOKS:
1. Data structures and Algorithm Analysis in C++, M. A. Weiss, 3rdEdition, Addison-Wesley,2005.
2. Data structures in C++, Malik D.S, 2nd Edition, Cengage Learning,2009.
3. Data structures, Richard F.Gilberg andBehrouz A. Forouzan, 2nd Edition, Cengage Learning,2007.

REFERENCE BOOKS:
1. Data Structures and Algorithms: Concepts – Techniques and Applications, G. A. V. Pai, 1st Edition, McGraw HillEducation,2017.
2. Classic Data Structures, Debasis Samanta, 2nd Edition, PHI,2009.
3. Data structures, Seymour Lipschutz, 1st Edition, McGraw Hill Education,2014.

Course Outcomes:

At the end of the course, students will be able to
- Demonstrate analytical comprehension of concepts such as abstract datatypes
- Analyze various generic programmingtechniques,
- Compare various sorting algorithms and perform their efficiencyanalysis.
- Demonstrate the ability to analyze, design, apply and use data structures and algorithms to solve engineering problems and evaluate theirsolutions.
- Demonstrate the ability of using generic principles for data representation & manipulation with a view for efficiency, maintainability, andcode-reuse.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester		L	T	P	C
		3	0	0	3
SOFT COMPUTING TECHNIQUES AND PYTHON PROGRAMMING **(Professional Elective 1)**					

Course Objectives:

The objectives of this course include

- Teach an example of scripting and interpretative language and compare it with classical compiled programminglanguages
- Introduce the student to Python programmingfundamentals
- Expose students to application development and prototyping usingPython
- Learn to apply fundamental problem solvingtechnique
- Introduce the student to soft computing and genetic algorithms with relevantapplications

UNIT-I:

Introduction: History of Python, Need of Python Programming, how a program works, Variables, Operators in python, type conversions, expressions, if, if-elif-else, for, while, break, continue, pass.

UNIT – II:

Types, Data structures and functions: Types - Integers, Strings, Booleans; Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions. Defining Functions, Calling Functions, Passing Arguments, types of arguments, Anonymous Functions, Scope of the Variables in a Function - Global and Local Variables, introduction to modules, creating modules, name spacing.

UNIT –III: Design with classes and GUI - Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding, polymorphism, working with instances. GUI Programming, using the tkinter module, display text with label widgets, widgets with frames, button widgets and info dialog boxes, getting input with entry widget, check buttons, radio buttons, Turtle Graphics.

UNIT – IV: Introduction to soft computing and fuzzy systems: Evolutionary computing, soft computing vs hard computing, soft computing methods, recent trends in soft computing, characteristics of soft computing, applications of soft computing, fuzzy sets, fuzzy relations, fuzzy logic, fuzzy rule-based systems

UNIT – V: Genetic Algorithms: Basic concepts, basic operators for genetic algorithms, crossover and mutation properties, genetic algorithm cycle, fitness function. Rough sets, rule induction and discernibility matrix, integration of soft computing techniques.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TEXT BOOKS :
1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage learning.
2. Think Python First Edition, by Allen B. Downey, O'rielly publishing,2001.
3. Python Programming, vamsi kurama, Pearson,2017.
4. Soft Computing – Advances and applications – Jan 2015 by B.K. Tripathy and J.Anuradha CengageLearning

REFERENCE BOOKS:
1. Introduction to Computation and programming using python. John v. guttag, the MIT press, 2nd Edition,2016.
2. James Payne, beginning python using python 2.6 and python 3, Wrox publishing,2010.

Course Outcomes:
- Understand and comprehend the basics of pythonprogramming.
- Demonstrate the principles of structured programming and be able to describe,design, implement, and test structured programs using currently acceptedmethodology.
- Explain the use of the built-in data structures list, sets, tuples anddictionary.
- Make use of functions and itsapplications.
- Identify real-world applications using oops, files and exceptionhandling provided by python.
- Formulate and implement a program to solve a real-world problem using GUI and Turtle graphics.
- Understand soft computing applications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester		L	T	P	C
		3	0	0	3
SIMULATION & MATHEMATICAL MODELING **(Professional Elective 1)**					

OBJECTIVE:
To introduce various system modelling and simulation techniques and highlight their applications in different areas. It includes modelling, design, simulation, planning, verification andvalidation.

UNIT – I:
Introduction to Simulation
When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study. The basics of Spreadsheet simulation, Simulation example: Simulation of queuing systems in a spreadsheet. General Principles, Simulation software: Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling; List processing.

UNIT –II:
Mathematical Models
Statistical Models in simulation – Concepts, Discrete Distribution, Continuous Distribution, Poisson Process, Empirical Distributions, Queuing Models – Characteristics, Notation, Queuing Systems, Markovian Models, Generation of Pseudo Random numbers, Properties of random numbers, Techniques for generating random numbers, Testing random number generators, Generating Random-Variates, Inverse Transform technique, Acceptance- Rejection technique, Composition & Convolution Method

UNIT – III:
Analysis of Simulation Data
Input modelling: Data Collection; Identifying the distribution with data, Parameter estimation, Goodness of Fit Tests, fitting a non-stationary Poisson process, Selecting input models without data, Multivariate and Time-Series input models.
Estimation of Absolute Performance: Types of simulations with respect to output analysis; Stochastic nature of output data; Absolute measures of performance and their estimation; Output analysis for terminating simulations; Output analysis for steady-state simulations.

UNIT – IV:
Verification, Calibration, and Validation
Optimization: Model building, verification and validation; Verification of simulation models; Calibration and validation of models, Optimization via Simulation
Simulation of computer systems and case studies

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Simulation tools, Model input, high level computer system simulation, comparison of systems via simulation, simulation programming techniques, development of simulationmodels.

UNIT – V:
Case Studies
City traffic simulation, Indoor air quality simulation of a building, machine health simulation (DC motorhealth)

TEXTBOOKS:
1. Discrete Event System Simulation, Jerry Banks and John S. Carson II, 5thEdition, Pearson,2010.
2. Simulation Modelling and Analysis, Averill M. Law, 4thEdition, McGraw Hill,2007.
3. Introduction to probability models, Sheldon M. Ross, 7th Edition, Academic Press,2000.

REFERENCE BOOKS:
1. Simulation, Sheldon M. Ross, 5th Edition, Elsevier,2012.
2. System Modelling and Simulation – An Introduction, Frank L. Severance, Wiley,2001.
3. System Simulation, Geoffrey and Gordon, 2nd Edition, PHI,2002.
4. Handbook of simulation: Principles, Methodology, Advances, Applications and Practice, Jerry Banks, 1st Edition, Wiley,1998.

Course Outcomes:

At the end of the course, students will be able to
- Solve real world problems which cannot be solved strictly by mathematicalapproaches.
- Understand the principles within mathematic modelling of materialsscience.
- Demonstrate the ability describe the mathematical components in mechanical and thermal analyses.
- beable to describe the conditions in numerical code for solving stress loadingproblems.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester		L	T	P	C
		0	0	3	1.5

LINEAR INTEGRATED CIRCUITS and APPLICATIONS LAB

List of Experiments: (Minimum Twelve Experiments to be conducted)

1. Study of OP AMPs – IC 741, IC 555, IC 565, IC 566, IC 1496 – functioning,parameters andSpecifications.
2. OP AMP Applications – Adder, Subtractor, ComparatorCircuits.
3. A. Integrator and DifferentiatorCircuits.
4. B. Waveform Generator using single OP-AMP with variable dutycycle
5. Active Filter Applications – LPF, HPF (firstorder)
6. Active Filter Applications – BPF, Band Reject (Wideband) and NotchFilters.
7. Oscillator Circuits – Phase Shift and Wien Bridge Oscillators using singleOP-AMP
8. Function Generator using OPAMPs.
9. IC 555 Timer – Monostable Operation Circuit, Astable OperationCircuit
10. Design Schmitt Trigger Circuits – using Single OP-AMP with Referencevoltage.
11. PLL Operation and Estimation of Capture and Lockrange.
12. IC 566 – VCOApplications.
13. Design of Dual Power Supply using 78XX and 79XX (use full wave BridgeRectifier
14. with shunt capacitancefilters.

Equipment required for Laboratories:
1. DualTRPS
2. CRO
3. Function Generators1MHz
4. Multi Meters (Digital, FET inputVoltmeters)
5. Analog IC TrainerKits
7. Bread Boards
8. Components: - IC741, IC555, IC565, IC1496, IC723, 7805, 7809, 7912,8038 and other

Essential components:
1. Analog IC Tester.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Add on Experiments:

1. Design a 4-bit R-2R Ladder network with OP-AMP Buffer and Measure theoutput waveform for various inputcombinations.
2. Construct Waveform Generator using 8038 for a fixed frequency and trace theoutput waveform.
3. Design and Construct ± 12V DC Power Supply using Three terminal VoltageRegulators 7812and7912.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester		L	T	P	C
		0	0	3	1.5

DIGITAL COMMUNICATIONS LAB

List of Experiments: Minimum Twelve Experiments to be conducted:

1. Time divisionmultiplexing.
2. Pulse codemodulation.
3. Differential pulse codemodulation.
4. Deltamodulation.
5. Frequency shiftkeying.
6. Phase shiftkeying.
7. Differential phase shiftkeying.
8. Companding
9. Source Encoder andDecoder
10. Linear Block Code-Encoder andDecoder
11. Binary Cyclic Code - Encoder andDecoder
12. Convolution Code - Encoder andDecoder
13. BCH Codes

Equipment required for Laboratories:
1. RPS - 0 – 30 V
2. CRO - 0 – 20 MHz.
3. Function Generators - 0 – 1 MHz
4. RF Generators - 0 – 1000 M Hz./0 – 100 MHz.
5. Rated Voltmeters andAmmeters
6. Lab Experimental kits for DigitalCommunication
7. Components
8. Breadboards and Multimeters
9 Spectrum Analyzer

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester		L	T	P	C
		0	0	3	1.5

MICROPROCESSOR and MICROCONTROLLERS LAB

List of Experiments:

PART- A: (Minimum of 5 Experiments has to be performed)
8086 Assembly Language Programming and Interfacing

1. Programs for 16 -bit arithmetic operations (using Various AddressingModes).
   a. Addition of n-BCDnumbers.
   b. Multiplication and Divisionoperations.
2. Program for sorting anarray.
3. Program for Factorial of givenn-numbers.
4. Interfacing ADC to8086
5. Interfacing DAC to8086.
6. Interfacing stepper motor to8086.

PART-B: (Minimum of 5 Experiments has to be performed)
8051 Assembly Language Programming and Interfacing
1. Finding number of 1's and number of 0's in a given 8-bit number
2. Average ofn-numbers.
3. Program and verify Timer/ Counter in8051.
4. Interfacing Traffic Light Controller to8051.
5. UART operation in8051
6. Interfacing LCD to8051.

PART-C (Minimum of 2 Experiments has to be performed)
Conduct the following experiments using ARM CORTEX M3 PROCESSOR USING KEIL MDK ARM
1. Write an assembly program to multiply of 2 16-bit binarynumbers.
2. Write an assembly program to find the sum of first 10 integersnumbers.
3. Write a program to toggle LED every second using timerinterrupt.

Equipment Required:
1. Regulated Powersupplies
2. Analog/Digital StorageOscilloscopes
3. 8086 Microprocessorkits
4. 8051 microcontrollerkits
5. ADCmodule
6. DACmodule
7. Stepper motormodule

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

8. Keyboardmodule
9. LED, 7-SegemtUnits
10. DigitalMultimeters
11. ROM/RAM Interfacemodule
12. Bread Boardetc.
13. ARM CORTEX M3
14. KEIL MDKARM

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester		L	T	P	C
		0	0	3	1.5
MINI PROJECT WITH HARDWARE DEVELOPMENT					

Mini Project is introduced during V semester. The student may execute the mini project during summer vacation for a period of 6 weeks i.e. between IV and V Semesters. The student shall submit a diary and a technical report for evaluation. This shall be evaluated in the V semester for 50 marks by a committee consisting of external examiner, Head of the Department along with supervisor and two senior faculty members of the Department. Mini Project work may involve carrying out a detailed feasibility study, literature survey along with the implementation results and preparing a work plan for major project. A student shall acquire 1.5 credits assigned, when he/she secures 40% or more marks for the total of 50 marks. In case, if a student fails, he/she shall reappear as and when the VII semester supplementary examinations are conducted.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester		L	T	P	C
		3	0	0	0

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Course Objectives:
To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system
- The course aim of the importing basic principle of third process reasoning and inference sustainability is at the course of Indian traditional knowledgesystem
- To understand the legal framework and traditional knowledge and biological diversity act 2002 and geographical indication act2003
- The courses focus on traditional knowledge and intellectual property mechanism of traditional knowledge andprotection
- To know the student traditional knowledge in differentsector

Course Outcomes:
After completion of the course, students will be able to:
- Understand the concept of Traditional knowledge and itsimportance
- Know the need and importance of protecting traditionalknowledge
- Know the various enactments related to the protection of traditionalknowledge
- Understand the concepts of Intellectual property to protect the traditionalknowledge

UNIT I
Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge
Learning Outcomes:
At the end of the unit, the student will able to:
- Understand the traditionalknowledge.
- Contrast and compare characteristics importance kinds of traditionalknowledge.
- Analyze physical and social contexts of traditionalknowledge.
- Evaluate social change on traditionalknowledge.

UNIT II
Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.
Learning Outcomes:
At the end of the unit, the student will able to:
- Know the need of protecting traditionalknowledge.
- Apply significance of tkprotection.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

- Analyze the value of tk in globaleconomy.
- Evaluate role ofgovernment

UNIT III

Legal framework and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act);B:The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

Learning Outcomes:

At the end of the unit the student will able to:

- Understand legal framework ofTK.
- Contrast and compare the ST and other traditional forestdwellers
- Analyze plant variantprotections
- Evaluate farmers rightact

UNIT IV

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

Learning Outcomes:

At the end of the unit, the student will ableto:

- Understand TK andIPR
- Apply systems of TKprotection.
- Analyze legal concepts for the protection ofTK.
- Evaluate strategies to increase the protection ofTK.

UNIT V

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

Learning Outcomes:

At the end of the unit, the student will able to:

- Know TK in differentsectors.
- Apply TK inengineering.
- Analyze TK in varioussectors.
- Evaluate food security and protection of TK in thecountry.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Reference Books:
1) Traditional Knowledge System in India, by Amit Jha,2009.
2) Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, PratibhaPrakashan2012.
3) Traditional Knowledge System in India by Amit Jha Atlantic publishers,2002
4) "Knowledge Traditions and Practices of India" Kapil Kapoor, MichelDanino

e-Resources:
1) https://www.youtube.com/watch?v=LZP1StpYEPM
2) http://nptel.ac.in/courses/121106003/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
		3	0	0	3
WIRED and WIRELESS TRANSMISSION DEVICES					

Course objectives:
The student will be able to

- understand the applications of the electromagnetic waves in freespace.
- introduce the working principles of various types ofantennas
- discuss the major applications of antennas with an emphasis on how antennas are employed to meet electronic systemrequirements.
- understand the concepts of radio wave propagation in theatmosphere.

UNIT I
MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applicationsof Microwaves. Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular Guide, Impossibility of TEM mode.Related Problems, Excitation techniques-waveguides
MICROSTRIP LINES– Introduction, Z_0 Relations, Effective Dielectric Constant, Losses, Q factor

UNIT II
ANTENNA FUNDAMENTALS: Introduction, Radiation Mechanism – single wire, 2 wire, dipoles, Current Distribution on a thin wire antenna. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beam widths, Polarization, Radiation Intensity, Directivity, Gain Antenna Apertures, Aperture Efficiency, Effective Height, illustrated Problems.

UNIT III
THIN LINEAR WIRE ANTENNAS: Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance, Beam widths, Directivity, Effective Area and Effective Height, Antenna Theorems – Applicability and Proofs for equivalence of directional characteristics, Loop Antennas: Small Loops - Field Components, Concept of short magnetic dipole, D and R_r relations for smallloops.
ANTENNA ARRAYS: Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, Binomial Arrays, Arrays with Parasitic Elements. Yagi-Uda Arrays, Folded Dipoles and theircharacteristics.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT IV
NON-RESONANT RADIATORS: Introduction, Traveling wave radiators, Long wire antennas, Rectangular Patch Antennas –Geometry and Parameters, Impact of different parameters on characteristics. Helical Antennas, Geometry, basic properties
VHF, UHF AND MICROWAVE ANTENNAS: Reflector Antennas: Corner Reflectors. Parabolic Reflectors – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Cassegrain Feeds.
Horn Antennas – Types, Optimum Horns, Lens Antennas – Geometry, Features, Dielectric Lenses and Zoning, Applications.

UNIT V
WAVE PROPAGATION: Concepts of Propagation – frequency ranges and types of propagations. Ground Wave Propagation–Characteristics, Fundamental Equation for Free-Space Propagation, Basic Transmission Loss Calculations, Space Wave Propagation–Mechanism, LOS and Radio Horizon, Tropospheric Wave Propagation – Radius of Curvature of path, Effective Earth's Radius, Effect of Earth's Curvature, Field Strength Calculations.
ANTENNA MEASUREMENTS – Patterns, Set Up, Distance Criterion, Directivity, VSWR, Impedance and Gain Measurements (Comparison, Absolute and 3-Antenna Methods)

TEXT BOOKS
1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition,2000.
2. Antennas and wave propagation- Sisir K Das, Annapurna Das, TMH,2013.

REFERENCES
1. Antennas – John D. Kraus, McGraw-Hill, 2nd Edition,1988.
2. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors,Delhi,2009.
3. Antennas and wave propagation by Prof G S N Raju, Pearsion Publications, First impression,2016

Course Outcomes:
After going through this course the student will be able to
- Identify basic antennaparameters.
- Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro stripantennas
- Quantify the fields radiated by various types ofantennas
- Design and analyze antennaarrays
- Analyze antenna measurements to assess antenna'sperformance
- Identify the characteristics of radio wavepropagation

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
		3	0	0	3

VLSI DESIGN

OBJECTIVES:

The main objectives of this course are:

- To learn the MOS Process Technology
- To understand the operation of MOS devices
- Understand and learn the characteristics of CMOS circuit construction.
- Describe the general steps required for processing of CMOS integrated circuits.
- To impart in-depth knowledge about analog and digital CMOS circuits.

UNIT-I:

INTRODUCTION AND BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS: VLSI Design Flow, Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology, MOS Layers, Stick Diagrams, Design Rules and Layout, Layout Diagrams for MOS circuits

UNIT-II:

BASIC CIRCUIT CONCEPTS: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, some area Capacitance Calculations, The Delay Unit, Inverter Delays, driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.

SCALING OF MOS CIRCUITS: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic.

UNIT-III:

BASIC BUILDING BLOCKS OF ANALOG IC DESIGN: Regions of operation of MOSFET, Modelling of transistor, body bias effect, biasing styles, single stage amplifier with resistive load, single stage amplifier with diode connected load, Common Source amplifier, Common Drain amplifier, Common Gate amplifier, current sources and sinks.

UNIT-IV:

CMOS COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUIT DESIGN:

Static CMOS Design: Complementary CMOS, Rationed Logic, Pass-Transistor Logic.

Dynamic CMOSDesign: Dynamic Logic-Basic Principles, Speed and Power Dissipation of Dynamic Logic, Issues in Dynamic Design, Cascading Dynamic Gates, Choosing a Logic Style,

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Gate Design in the Ultra Deep-Submicron Era, Latch Versus Register, Latch based design, timing decimation, positive feedback, instability,Metastability, multiplexerbased latches, Master-Slave Based Edge Triggered Register, clock to q delay, setup time, hold time, reduced clock load master slave registers, Clocked CMOSregister. Cross coupled NAND and NOR, SR Master Slave register, Storage mechanism, pipelining

UNIT-V:
FPGA DESIGN: FPGA design flow, Basic FPGA architecture, FPGA Technologies, Introduction to FPGA Families.
INTRODUCTION TO ADVANCED TECHNOLOGIES: Giga-scale dilemma, Short channel effects, High–k, Metal Gate Technology, FinFET, TFET.

TEXTBOOKS:
1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell And SholehEshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. Design of Analog CMOS Integrated Circuits by BehzadRazavi , McGraw Hill, 2003
3. Digital Integrated Circuits, Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic,2nd edition,2016.

REFERENCES:
1. "Introduction to VLSI Circuits and Systems", John P. Uyemura, John Wiley & Sons, reprint 2009.
2. Integrated Nanoelectronics: Nanoscale CMOS, Post-CMOS and Allied Nanotechnologies Vinod Kumar Khanna, Springer India, 1st edition, 2016.
3. FinFETs and other multi-gate transistors, ColingeJP, Editor New York, Springer,2008.

OUTCOMES:
At the end of this course the student will be able to:
- Demonstrate a clear understanding of CMOS fabrication flow and technology scaling.
- Apply the design Rulesand draw layout of a given logic circuit.
- Design MOSFET based logic circuit.
- Design basic building blocks in Analog IC design.
- Analyze the behaviour of amplifier circuits with various loads.
- Design various CMOS logic circuits for design of Combinational logic circuits.
- Design amplifier circuits using MOS transistors.
- Design MOSFET based logic circuits using various logic styles like static and dynamic CMOS.
- Analyze the behaviour of static and dynamic logic circuits.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
		3	0	0	3
	DIGITAL SIGNAL PROCESSING				

Course Objectives:

The student will be able to
- Analyze the discrete-time signals and systems in time and frequencydomains.
- Know the importance of FFT algorithm for computation of Discrete FourierTransform
- Understand the various implementations of digital filterstructures
- Learn the FIR and IIR Filter designprocedures
- Learn the concepts of DSPProcessors

UNIT I INTRODUCTION: Introduction to Digital Signal Processing: Discrete-time signals & sequences, Classification of discrete-time systems, stability and causality of LTI systems, Response of LTI systems to arbitrary inputs. Solution of linear constant coefficient difference equations. Discrete-time Fourier Transform (DTFT), Frequency domain representation of discrete-time signals and systems. Review of Z-transforms, solution of difference equations using Z-transforms, Systemfunction.

UNIT II DISCRETE FOURIER SERIES & FOURIER TRANSFORMS: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT)-Radix-2 decimation-in-time and decimation-in-frequency FFT Algorithms, Inverse FFT, Circular convolution and linear convolution using DFT.

UNIT III DESIGNOF IIRDIGITAL FILTERS& REALIZATIONS: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

UNIT IV DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS: Characteristics of FIR Digital Filters, Frequency response. Design of FIR Digital Filters using Window technique and Frequency Sampling technique, Comparison of IIR & FIR filters. Basic structures of FIR systems.

UNIT V INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs, Multiple Access Memory, Multiported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals.
Architecture of ARM processors: Technical details of ARM Processors, Introduction to

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Cortex-M3 and cortex M4 processors - Processor type, processor architecture, instruction set, block diagram, memorysystems.

TEXT BOOKS:
1. Digital   Signal Processing, Principles, Algorithms and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI,2007.
2. Discrete Time Signal Processing, A. V. Oppenheim and R. W. Schaffer,PHI,2010.
3. Digital Signal Processors, Architecture, Programming andApplications, B.Venkataramani, M. Bhaskar, TMH,2002.
4. Digital Signal Processing Using the ARM Cortex M4, Donald S.Reay,2015.

REFERENCE BOOKS:
1 Digital Signal Processing: MH Hayes, Schaum's Outlines, TMH,2007.
2 Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling,Sandra L. Harris, Thomson, 2007.
3 Digital Signal Processing, Alan V. Oppenheim, Ronald W. Schafer, PHI Ed.,2006
4 Digital Signal Processing, Tarun Kumar Rawat by OXFORD Publishers

Course Outcomes:
After going through this course the student will be able to
- Formulate engineering problems in terms of DSPoperations
- Analyze digital signals andsystems
- Analyze discrete time signals in frequencydomain
- Design digital filters and implement with differentstructures
- Understand the keyarchitectural

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
		3	0	0	3

CELLULAR & MOBILE COMMUNICATION (Professional Elective 2)

Course Objectives:

The student will be introduced to:

- Understand the basic cellular concepts like frequency reuse, cell splitting, cell sectoring etc and various cellularsystems.
- Understand the different types of interference s influencing cellular andmobile communication.
- Understand the frequency management, channel assignment and variouspropagation effects in Cellularenvironment.
- Understand the different types antennas used at cell site andmobile.
- Understand the concepts of handoff and types ofhandoffs.
- Understand the architectures of GSM and 3G cellularsystems.

UNIT I
CELLULAR MOBILE RADIO SYSTEMS: Introduction to Cellular Mobile System, uniqueness of mobile radio environment, operation of cellular systems, consideration of the components of Cellular system, Hexagonal shaped cells, Analog and Digital Cellular systems.
CELLULAR CONCEPTS: Evolution of Cellular systems, Concept of frequency reuse, frequency reuse ratio, Number of channels in a cellular system, Cellular traffic: trunking and blocking, Grade of Service; Cellular structures: macro, micro, pico and femto cells; Cell splitting, Cell sectoring.

UNIT II
INTERFERENCE: Types of interferences, Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni-directional Antenna system, design of Antenna system, antenna parameters and their effects, diversity receiver, non-cochannel interference-different types.

UNIT III
FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT: Numbering and grouping, setup access and paging channels, channel assignments to cell sites and mobile units: fixed channel and non-fixed channel assignment, channel sharing and borrowing, overlaidcells.
CELL COVERAGE FOR SIGNAL AND TRAFFIC: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, straight line path loss slope, general formula for mobile propagation over water and flatopen area, near and long distance propagation, antenna height gain, form of a point to pointmodel.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT IV
HANDOFF STRATEGIES:
Concept of Handoff, types of handoff, handoff initiation, delaying handoff, forced handoff, mobile assigned handoff, intersystem handoff, soft and hard hand offs, vehicle locating methods, dropped call rates and their evaluation.

UNIT V
DIGITAL CELLULAR NETWORKS: GSM architecture, GSM channels, multiple access schemes; TDMA, CDMA, OFDMA.3G and 4G Wireless Standards GSM , GPRS , WCDMA , LTE , Wi-MAX, Introduction to 5G standards.

TEXT BOOKS:
1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2nd Edn.,2006.
2. Principles of Mobile Communications – Gordon L. Stuber, Springer International2nd Edition,2007.
3. Advanced Wireless Communications-4G By. Savo G Glisic, John Wiley & Sons Publication 2ndEdition

REFERENCES:
1. Wireless Communications – Theodore. S. Rapport, Pearson education, 2nd Edn.,2002.
2. Wireless Communication and Networking – Jon W. Mark and WeihuaZhqung, PHI,2005.
3. Fundamentals of Wireless CommunicationBy. David Tse and Pramod Viswanath, Cambridge UniversityPress

Course Outcomes:
At the end of this course the student can able to:
- Identify the limitations of conventional mobile telephone systems; understandthe concepts of cellularsystems.
- Understand the frequency management, channel assignment strategies and antennasin cellularsystems.
- Understand the concepts of handoff and architectures of various cellularsystems.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
		3	0	0	3
	DIGITAL IC DESIGN (Professional Elective-2)				

Course objectives:

The main objectives of this course are:

- The student will be able to understand theMOSDesign.
- In this course, students can study Combinational MOS Logic Circuits and Sequential MOSLogicCircuits.
- Another main object of this course is to motivate the graduate students to design andto develop the Digital Integrated Circuits for differentApplications.
- The concepts of Semiconductor Memories, Flash Memory, RAMarrayorganization

UNIT-I

MOS DESIGN: Pseudo NMOS Logic – Inverter, Inverter threshold voltage, output high voltage, Output Low voltage, gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II

COMBINATIONAL MOS LOGIC CIRCUITS: MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT-III

SEQUENTIAL MOS LOGIC CIRCUITS: Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

DYNAMIC LOGIC CIRCUITS: Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

UNIT-IV

INTERCONNECT: Capacitive Parasitics, Resistive Parasitics, InductiveParasitics, Advanced Interconnect Techniques.

UNIT-V

SEMICONDUCTOR MEMORIES: Memory Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NANDflash.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TEXTBOOKS:
1. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, AnanthaChandrakasan, Borivoje Nikolic,2ndEd.,PHI,2016.
2. Digital Integrated Circuit Design – Ken Martin, Oxford UniversityPress,2011.

REFERENCES:
1. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed.,2011.
2. CMOS VLSI Design – Neil H.E Weste, David harris, Ayan Banerjee 3rdEdition,Pearson,2006.

Course Outcomes:
At the end of this course the student will be able to:
- Understand the concepts ofMOSDesign.
- Design and analysis of Combinational and SequentialMOSCircuits.
- Extend the Digital IC Design toDifferentApplications.
- Understand the Concepts of Semiconductor Memories, Flash Memory, RAM arrayorganization

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
		3	0	0	3

BUSINESS INTELLIGENCE & ANALYTICS   **(Professional Elective 2)**

OBJECTIVE:

To make students to extract insights from large volumes of data in various forms, by employing statistical mathematics techniques for drawing conclusions about that information

UNIT – I

Essentials of Data analysis - Data Collection, Data Cleansing, Data Exploration, Statistical Analysis, Reporting, Decision

Statistical Methods: Arithmetic mean, The Arithmetic mean of grouped Data, The Median, The mode; The variance and standard deviation, Interpretation of SD, Chebyshev's Lemma or Rule (for sample), Skewness and Kurtosis, Skewness and its measurement, Kurtosis and its measurements.

Probability Distribution & Statistical Inference: Elements of Probability, Random Variable, Probability distribution/density functions (Normal, Binomial, Poisson), Point Estimate, Interval Estimate, Testing of hypothesis

UNIT – II

Visualization: Comparison, Distribution, Relationship, Composition, Visual Charts – Bar chart, Column chart, variable width column chart, Line chart, Column histogram, Line histogram, Scatter chart, stacked column chart, stacked 100% column chart, waterfall chart, pie chart, stacked area chart, 3D area chart, stacked 100% area chart, Bubble chart, Geometric Forms, Pictorial Diagrams, ParetoDiagrams

Applications: Graphical representation of data from Battery health monitoring, Indoor Air Quality, $CO2$ emissions by country/region (Practice using MS-Excel & R/Python)

UNIT – III

Time series Analysis: Characteristics Movements in a time series; Time series models; Measurement of Trend; Secular Trend; Seasonal Movements; Cyclical Movements; Irregular Movements; Long Cycles,

Applications: Analyze the trends of population growth, global temperatures, solar radiation, wind patterns. (Practice using MS-Excel &R/Python).

UNIT – IV

Business Intelligence and Analytics: What is Business Intelligence and Analytics? The need for BI and analytics, how to determine requirements, Using the BI tools for extracting insights for data driven decisions

Microsoft Power BI - Part I: Understanding key concepts in business intelligence, data analysis, and data visualization. Getting Started with Power BI and Analytics - Creating account, Power BI Desktop, Working with Data - Connect, Import, Shape and Transform data, Creating Visualization,AuthorReportsandScheduleautomatedrefreshofreports,PublishingDatatoBI

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

online, Using Quick Insights, Use natural language queries, Create real-time dashboards, Create custom visualizations which can be re-usable in reports and dashboards, Sharing dashboard effectively based on needs.

UNIT – V
Microsoft Power BI - Part II: Exploring live connections to data with Power BI, connecting directly to data bases, Introduction to Power BI Development API, Leveraging custom visuals in Power BI, Introduction to DAX

TEXTBOOKS:
1. Statistics Concepts and applications, Nabendu pal & Sahadeb sarkar, PHI Learning Pvt. Ltd.,2008.
2. Effective Data Visualization: The Right Chart for the Right Data 1st Edition, Dr. Stephanie D. H. Evergreen, SAGEPublications
3. Introducing Microsoft Power BI, Alberto Ferrari and Marco Russo,2016.

REFERENCE BOOKS
1. Applied Microsoft Power BI: Bring your data to life! Teo Lachev,2015
2. Microsoft Power BI guidedlearning.

CourseOutcomes:
The student will be ableto

- Understand the essentials of data analytics and the correspondingterminologies
- Determine the relevance of data tobusiness
- Be familiar with the steps involved in the analyticsprocess
- Understand and use statistical and graphical analysis to bring insights out from thedata
- Understand and use BI tools to present data in the form of Dashboards andreports

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
		3	0	0	3

PATTERN RECOGNITION
(Professional Elective 2)

Course Objectives

- To equip students with basic mathematical and statistical techniques commonly used in Patternrecognition.
- To introduce students to a variety of pattern recognitionalgorithms.
- Enable students to apply machine learning concepts in real lifeproblems.

Unit I
Introduction to Pattern Recognition: Problems, applications, design cycle, learning and adaptation, examples, Probability Distributions, Parametric Learning - Maximum likelihood and Bayesian Decision Theory- Bays rule, discriminate functions, loss functions and Bayesian error analysis

Unit II
Linear models: Linear Models for Regression, linear regression, logistic regression Linear Models for Classification

Unit III
Neural Network: perception, multi-layer perception, back propagation algorithm, error surfaces, practical techniques for improving back propagation, additional networks and training methods, Ad boost, Deep Learning

Unit IV
Linear discriminate functions - decision surfaces, two-category, multi-category, minimum-squared error procedures, the Ho-Kashyap procedures, linear programming algorithms, Support vector machine

Unit V
Algorithm independent machine learning – lack of inherent superiority of any classifier, bias and variance, re-sampling for classifier design, combining classifiers
Unsupervised learning and clustering – k-means clustering, fuzzy k-means clustering, hierarchical clustering

TEXT BOOKS:
1. Richard O. Duda, Peter E. Hart, David G. Stork, "Pattern Classification", 2nd Edition John Wiley & Sons,2001.
2. Machine learning by Saikat Dutt, S. Chandramouli and A.K.Das , Pearson publishing,2018.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

REFERENCE BOOKS:
1. C. Bishop, "Pattern Recognition and Machine Learning", Springer,2006
2. Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, "The Elements of Statistical Learning", 2nd Edition, Springer,2009.

Course Outcomes:
At the end of this course, students will be able to
- Study the parametric and linear models forclassification
- Design neural network and SVM forclassification
- Develop machine independent and unsupervised learningtechniques.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
		3	0	0	3
	ROBOTICS and AUTOMATION **(Professional Elective 2)**				

OBJECTIVE:
To impart knowledge about basic mathematics related to industrial robots for their control, design and application in robotics & automationIndustries.

UNIT – I
Introduction to Robotics
Types and components of a robot, classification of robots
Study components of an industrial robot (PUMA, KUKA, FANUC, MTAB, UR, etc.) and its DH parameters.

UNIT – II
Robot Kinematics and Dynamics:
Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Forward and inverse kinematics, Jacobian, Singularity, and Statics.
Dynamic Modelling: Forward and inverse dynamics, Equations of motion using Euler-Lagrange formulation, Newton Euler formulation.
Sensors
Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc. Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean / Similarity / Affine / Projective transformations, Vision applications in robotics

UNIT – III
Robot Actuation Systems
Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.
Robot Control:
Robot control, Independent joint control, PD and PID feedback, actuator models, nonlinearity of manipulator models, issues in nonlinear control, force feedback, hybrid control, Motion Planning, Obstacle avoidance, configuration space, road map methods, graph search algorithms, potential fieldmethods

UNIT – IV
Control Hardware and Interfacing:
Embedded systems: Microcontroller Architecture and integration with sensors, actuators, components, Programming Applications for Industrial robot - programming in – VAL II
Case Study: Bin Picking in Industrial Warehouse.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT – V
AI in Robotics:
Applications in unmanned systems, defence, medical, industries, Robotics and Automation for Industry 4.0 Robot safety and social robotics

TEXTBOOKS:
1. Introduction to Robotics – Mechanics and Control, John J. Craig, 3rd Edition, Pearson Prentice Hall,2004.
2. Industrial Robots, Groover M. P. and Ashish Dutta, McGrawHill,2012
3. Robots Dynamics & Control, Spong M. W. and Vidyasagar M., John Wiley & Sons (ASIA) PteLtd.

REFERENCE BOOKS
1. Introduction to Robotics: Analysis, Control, Applications, Saeed B. Niku, 3rdEdition, Wiley,2019
2. Robotics Engineering, R. Klafter,PHI.
3. Robotics, Subir K. Saha, McGrawHill.

Course Outcomes:
The student will be able to:
- Perform kinematic and dynamic analyses withsimulation.
- Design control laws for a simplerobot.
- Integrate mechanical and electrical hardware for a real prototype of roboticdevice.
- Select a robotic system for given industrialapplication.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
		3	0	0	3
	Data Mining **Open Elective (OE1)**				

Course objectives:

The main objectives of this course are:

- Students will be enabled to understand and implement classical models and algorithms in data warehousing and datamining.
- They will learn how to analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
- They will further be able to assess the strengths and weaknesses of various methods and algorithms and to analyze theirbehavior.

UNIT–I:

INTRODUCTION: Need of Data Warehouse, Need and Usage of Data Mining Technologies, Types of Data and Patterns to be mined, In Real Time Applications. Brief Introduction of Pattern Recognition: Pattern, Feature, Database Query Vs Mining, Curse of Dimensionality, Need for Efficiency. Major Issues in Data Mining. Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity

UNIT–II:

DATA PRE-PROCESSING: Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

UNIT–III:

CLASSIFICATION: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction. Bayes' Theorem, Naïve Bayesian Classification, Bayesian Belief Networks

UNIT–IV:

ASSOCIATION ANALYSIS: BASIC CONCEPTS AND ALGORITHMS: Problem Defecation, Frequent Item Set generation, Rule generation, compact representation of frequent item sets, FP-Growth Algorithm. **(Tan &Vipin)**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT–V:
CLUSTER ANALYSIS: BASIC CONCEPTS AND ALGORITHMS: OVERVIEW: Basics and Importance of Cluster Analysis, Clustering techniques, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN:Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. **(Tan&Vipin)**

TEXT BOOKS:
1. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar,Pearson.
2. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber,Elsevier.

REFERENCE BOOKS:
1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, CengageLearning.
2. Data Mining:VikramPudi and P. Radha Krishna,Oxford.
3. Data Mining and Analysis - Fundamental Concepts and Algorithms; Mohammed J.Zaki, Wagner Meira, Jr,Oxford
4. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith,TMH.
5. http://onlinecourses.nptel.ac.in/noc18_cs14/preview
   (NPTEL course by Prof.PabitraMitra)
6. http://onlinecourses.nptel.ac.in/noc17_mg24/preview
   (NPTEL course by Dr. Nandan Sudarshanam& Dr. Balaraman Ravindran)
http://www.saedsayad.com/data_mining_map.htm

Course Outcomes:
At the end of this course the student will be able to:
- Understand Data MiningPrinciples
- Identify appropriate data mining algorithms to solve real world problems
- Compare and evaluate different data mining techniques like classification, prediction, clustering and association rulemining

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
		3	0	0	3

POWER ELECTRONICS
Open Elective (OE1)

Course objectives:

The main objectives of this course are:
- To study the characteristics of various power semiconductor devices and gate drivecircuits.
- To understand the operation of single phase full–wave converters and analyze harmonics in the inputcurrent.
- To study the operation of three phase full–waveconverters.
- To understand the operation of different types of DC-DCconverters.
- To understand the operation of inverters and application of PWM techniques forvoltage control and harmonicmitigation.

UNIT–I:

Power Semiconductor Devices: Operation of SCR, power MOSFET and power IGBT and their characteristics–Gate drive circuits for SCR, IGBT and MOSFET-protection circuits for power IGBT and power MOSFETs.

UNIT–II:

AC-DC Single-Phase Converters: 1-phase fully-controlled bridge rectifiers feeding R load, RL, RLE loads (continuous and discontinuous current conduction mode of operation)– 1-phase semi-controlled bridge rectifiers feeding R, RL and RLE loads (continuous and discontinuous current conduction mode of operation)– HarmonicAnalysis.

UNIT–III:

AC-DC Three-Phase Converters: 3-phase Full converter feeding R, RL and RLE loads (continuous current conduction mode only)– 3-phase semi-converter feeding R, RL and RLE loads (continuous current conduction mode only)–Harmonic analysis -Dual converter.

UNIT–IV:

DC–DC Converters: Analysis of Buck, boost, buck-boost converters in Continuous Conduction Mode (CCM) and Discontinuous Conduction Modes (DCM) – Output voltage equations using volt-sec balance in CCM & DCM- output voltage ripple & inductor current ripple for CCM only – Principle operation of forward and fly back converters inCCM.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT – V:

DC–AC Converters and AC-AC converters: 1- phase half-bridge and full bridge inverters with R and RL loads – Unipolar and bipolar switching-Quasi-square wave pulse width modulation-3-phase square wave inverters – 120^0 conduction and 180^0 conduction modes of operation – Sinusoidal pulse width modulation –single-phase Current Source Inverter (CSI)-single-phase AC-AC voltage regulator with R and RLload.

TEXT BOOKS:

1. Power Electronics: converters, applications & design -by Nedmohan, Tore M.Undeland, Robbins by Wiley India Pvt.Ltd.
2. Power Electronics- by Daniel W.Hart, Mc Graw Hillpublications
3. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hallof India

REFERENCE BOOKS:

1. Power Electronics: Essentials & Applications by L.Umanand, Wiley, Pvt. Limited, India,2009

2. Elements of Power Electronics–Philip T.Krein. Oxfordpublishers.

3. Power Electronics – by P.S.Bhimbra, KhannaPublishers.

Course Outcomes:
At the end of this course the student will be able to:
- Explain the characteristics of various power semiconductor devicesand understand the gate drivercircuits.
- Explain the operation of single-phase full wave converters and performharmonic analysis.
- Explain the operation of three phase full–wave converters and performharmonic analysis.
- Analyze the operation of different types of DC-DCconverters.
- Explain the operation of inverters and application of PWM techniques for voltagecontrol and harmonicmitigation.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
		3	0	0	3
	MEMS and its applications **Open Elective (OE1)**				

Course objectives:

- To introduce the basic concepts of micro systems and advantages ofminiaturization.
- To study the various materials and their properties used for micromachiningtechniques.
- To analyze the fundamentals of micromachining and micro fabricationtechniques.
- To impart knowledge ofthe basic concept of electromechanical effects, thermal effects Micro fluidics and Integratedfluidicsystems.
- To study the fundamentals of pressure sensors and accelerometer sensors throughdesign andmodeling.

UNIT I: Overview of MEMS and Microsystems: MEMS and Microsystems, Typical MEMS and Microsystem products, Evolution of Microfabrication, Microsystem and Microelectronics, The Multidisciplinary nature of microsystem design and manufacture, Microsystem and Miniaturization. Application of Microsystems in the automotive industry, Application of Microsystems in other industries: Health care industry, Aerospace industry, Industrial products, Consumer products, Telecommunications. Markets for Microsystems.

UNIT II: Working Principles of Microsystems: Introduction, Microsensors: Acoustic Wave Sensors, Biomedical sensors and Biosensors, Chemical sensors, Pressure sensors, Thermal sensors. Micro actuation: Actuation using thermal forces, shaped memory alloys, Piezoelectric crystals, Electrostatic forces. MEMS with Micro actuators: Microgrippers, Micromotors, Microvalves, Micropumps, Micro accelerators, Microfluidics.

UNIT III: Scaling Laws in Miniaturization: Introduction to scaling, Scaling in Geometry, Scaling in Rigid-Body Dynamics, Scaling in Electrostatic Forces, Scaling in Electromagnetic Forces, Scaling in Electricity, Scaling in Fluid Mechanics, Scaling in Heat Transfer.

Materials for MEMS and Microsystems: Introduction, Substrates and wafers, Active substrate materials, Silicon as a substrate material. Silicon compounds, Silicon piezo resistors, Gallium Arsenide, Quartz, Piezoelectric crystals, Polymers, Packing materials.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT IV: Micro system Fabrication Process: Photolithography, Ion Implantation, Diffusion, Oxidation,ChemicalVapourDeposition,PhysicalVapourDeposition,DepositionbyEpitaxy, Etching.

Overview of Micro manufacturing and Applications: Bulk Micro manufacturing- any one example of application, Surface Micromachining- any one example of application. LIGA Process- any one example of application.

UNIT V: Applications of MEMS-Switching: Introduction, Switch parameters, Basics of switching, Mechanical switches, Electronic switches for RF and microwave applications, Mechanical RF switches, PIN diode RF switches.

Text Books:

1. Tai-Ran Hsu, "MEMS and Microsystems: Design and Manufacture", Tata McGraw Hill, (2002).
2. Gabriel M. Rebeiz, "RF MEMS Theory, Design and Technology", Wiley India PvtLtd.

Reference Books:

1. Stephen D. Senturia, "Microsystem Design", Springer International Edition,(2010).
2. Mohamed Gad-el-Hak, "The MEMS Handbook", CRC Press,(2002).
3. Chang Liu, "Foundations of MEMS", Second Edition, PearsonPublication.

E-resources:
1. https://nptel.ac.in/courses/117105082/4
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-777j-design-and-fabrication-of-microelectromechanical-devices-spring-2007/lecture-notes/
3. https://www.edx.org/course/micro-nanofabrication-mems-epflx-memsx-0

Course Outcomes:

- Understand the basic overview of MEMS and Microsystems with broad category ofMEMS & Micro systemapplications.
- Understanding the working principles ofMicrosystems
- Understand the Scaling Laws in Miniaturization and Materials for MEMS andMicrosystems
- Understand the Micro system Fabrication Process and Analyze the different Micro manufacturing process andApplications.
- Study and Analyze the different types of RF switches, Various Switching Mechanismand theirapplications..

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
		3	0	0	3
	Artificial Neural Networks **Open Elective (OE1)**				

Course objectives:

The main objectives of this course are:

- To provide an introduction to thefield of artificial neural networks and machinelearning.
- To teach students how to solve practical problems via implementation of these techniques via simulation.
- To promote further independent learning on the topics of artificial neural networks and machinelearning.

UNIT-I:

INTRODUCTION: History of Neural Networks, Structure and Functions of Biological and Artificial Neuron, Neural Network Architectures, Characteristics of ANN, Basic Learning Laws and Methods.

UNIT-II:

SUPERVISED LEARNING: Single Layer Neural Network and architecture, McCulloch-Pitts Neuron Model, Learning Rules, Perceptron Model, Perceptron Convergence Theorem, Delta learning rule, ADALINE, Multi-Layer Neural Network and architecture, MADALINE, Back Propagation learning, Back Propagation Algorithm.

UNIT-III:

UNSUPERVISED LEARNING-1: Outstar Learning, Kohenen Self Organization Networks, Hamming Network And MAXNET, Learning Vector Quantization, Mexican hat.

UNIT-IV:

UNSUPERVISED LEARNING-2: Counter Propagation Network -Full Counter Propagation network, Forward Only Counter Propagation Network, Adaptive Resonance Theory (ART) - Architecture, Algorithms.

UNIT V:

ASSOCIATIVE MEMORY NETWORKS: Introduction, Auto Associative Memory, Hetero Associative Memory, Bidirectional Associative Memory(BAM) -Theory and Architecture, BAM Training Algorithm, Hopfield Network: Introduction, Architecture of Hopfield Network.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TEXT BOOKS:
1. B. Yegnanarayana" Artificial neural networks" PHI, New Delhi.
2. S.N. Sivanandam, S.N. Deepa, "Introduction to Neural Networks using MATLAB6.0", TATA MCGraw- Hillpublications.
3. J.M. Zurada," Introduction to Artificial neural systems" –Jaicopublishing.

REFERENCE BOOKS:
1. S.Rajasekaran and G.A.Vijayalakshmipai "Neural Networks.Fuzzy Logicand genetic Algorithms".
2. James A Freeman and Davis Skapura" Neural Networks Algorithm, applications and programming Techniques", Pearson Education,2002.
3. Simon Hakins "Neural Networks " PearsonEducation.

Course Outcomes:
At the end of this course the student will be able to:
- Survey of attractive applications of Artificial NeuralNetworks.
- practically approach for using Artificial Neural Networks in various technical, organizational and economicapplications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
		3	0	0	3
	INTERNET OF THINGS				

Course Objectives:
- To learn and understand elements of IoTsystem.
- Acquire knowledge about various protocols ofIoT.
- To learn and understand design principles and capabilities ofIoT.

UNIT I: Introduction to IoT
Introduction to IoT, Architectural Overview, Design principles and needed capabilities, Basics of Networking, M2M and IoT Technology Fundamentals- Devices andgateways, Data management, Business processes in IoT, Everything as a Service (XaaS), Role ofCloud in IoT, Security aspects inIoT.

UNIT II: Elements of IoT
Hardware Components- Computing- Arduino, Raspberry Pi, ARM Cortex-A class processor, Embedded Devices – ARM Cortex-M class processor, Arm Cortex-M0 Processor Architecture, Block Diagram, Cortex-M0 Processor Instruction Set, ARM and Thumb Instruction Set.

UNIT III: IoT Application Development
Communication, IoT Applications, Sensing, Actuation, I/O interfaces.
Software Components- Programming API's (using Python/Node.js/Arduino) for CommunicationProtocols-MQTT, ZigBee, CoAP, UDP, TCP, Bluetooth.
Bluetooth Smart Connectivity
Bluetooth overview, Bluetooth Key Versions, Bluetooth Low Energy (BLE) Protocol, Bluetooth, Low Energy Architecture, PSoC4 BLE architecture and Component Overview.

UNIT IV: Solution framework for IoT applications
Implementation of Device integration, Data acquisitionand integration, Device data storage- Unstructured data storage on cloud/local server,Authentication, authorization of devices.

UNIT V: IoT Case Studies
IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture,Healthcare, HomeAutomation.

Text Books:
1. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education,2017.
2. The Definitive Guide to the ARM Cortex-M0 by JosephYiu,2011
3. Vijay Madisetti, ArshdeepBahga, Internet of Things, "A Hands on Approach", UniversityPress,2015.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

References:
1. Cypress Semiconductor/PSoC4 BLE (Bluetooth Low Energy) Product TrainingModules.
2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: EnablingTechnologies, Platforms, and Use Cases", CRC Press,2017.

Course Outcomes:
The student will be able to:
- Understand internet of Things and its hardware and softwarecomponents.
- Interface I/O devices, sensors &communicationmodules.
- Remotely monitor data and controldevices.
- Design real time IoT basedapplications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
		0	0	3	1.5
	VLSI LAB				

List of Experiments

PART (A): FPGA Level Implementation (Any Seven Experiments)

Note 1: The students need to develop Verilog /VHDLSource code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary Synthesizer.

Note 2: All the experiments need to be implemented on the latest FPGA/CPLD Hardware in the Laboratory

1. Realization of Logic gates

   Design and Implementation of the following:

2. 4-bit ripple carry and carry look ahead adder using behavioural, dataflow and structural modeling
3. a) 16:1 mux through 4:1 mux
   b) 3:8 decoder realization through 2:4 decoder
4. 8:3 encoder
5. 8-bit parity generator and checker
6. Flip-Flops
7. 8-bit synchronous up-down counter
8. 4-bit sequence detector through Mealy and Moore state machines.

EDA Tools/Hardware Required:

1. EDA Tool that supports FPGA programming including Xilinx Vivado /Altera (Intel)/ Cypress/Equivalent Industry standard tool along with corresponding FPGA hardware.
2. Desktop computer with appropriate Operating System that supports the EDA tools.

PART (B): Back-end Level Design and Implementation (Any Five Experiments)

Note: The students need to design the following experiments at schematic level using CMOS logic and verify the functionality. Further students need to draw the corresponding layout and verify the functionality including parasites. Available state of the art technology libraries can be used while simulating the designs using Industry standard EDA Tools.

Design and Implementation of the following

    a. Universal Gates
    b. An Inverter
2. Full Adder
3. Full Subtractor

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

4. Decoder
5. D-Flip-flop

EDA Tools/Hardware Required:

- Mentor Graphics Software / Cadence/Synopsys/Tanner or Equivalent Industry Standard/CAD Tool.
- Desktop computer with appropriate Operating System that supports the EDA tools.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
		0	0	3	1.5
DIGITAL SIGNAL PROCESSING LAB					

(Note: Students have to perform at least FOUR experiments from each part.)

PART-A

List of the Experiments

1. Generation of DTsignals.
2. Verify the Linear Convolution of two DT signals
    a) UsingMATLAB
    b) Using Code ComposerStudio(CCS)
3. Verify the Circular Convolution of two DTsignals
    a) UsingMATLAB
    b) Using Code ComposerStudio(CCS)
4. Find the sum of DT sinusoidalsignals.
5. Computation of Discrete Fourier Transform (DFT) and Inverse DiscreteFourier Transform(IDFT)
    a) UsingMATLAB
    b) Using Code ComposerStudio(CCS)
6. Transfer Function Stability Analysis: using pole-zero plot, bode plot and Nyquist plot.

PART-B

Following Experiments are to be done using a TI DSP Starter Kit**.**

7. Generation of a sinusoidalsignal.
8. Linear and circular convolution of DTsequences.
9. Compute N-point DFT of a given DTsequence.
10. Design and implementation of FIRfilters.
11. Design and implementation of IIRfilters.

PART-C

Following Experiments are to be done using **Cypress FM4 Starter Kit.**

12. Verification of samplingtheorem.
13. Implementation of FFTalgorithm.
14. Implementation of FIRfilters.
15. Implementation of IIRfilters.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
		3	**0**	**0**	**0**
	Intellectual Property Rights (IPR) & Patents				

UNIT I

Introduction to Intellectual Property Rights (IPR): Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual PropertyRights.

UNIT II

Copyrights and Neighboring Rights: Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip ProtectionAct.

UNIT III

Patents: Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer –– Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing –– Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer relatedInnovations

UNIT IV

Trademarks: Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities

Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT V
Trade Secrets & Cyber Law and Cyber Crime: Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets–
Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law.
Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions –
E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

References:
1) Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, NewDelhi.
2) Deborah E.Bouchoux: Intellectual Property, Cengage Learning, NewDelhi.
3) PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, NewDelhi
4) Richard Stim: Intellectual Property, Cengage Learning, NewDelhi.
5) Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
6) Cyber Law - Texts & Cases, South-Western's Special TopicsCollections.
7) R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
8) M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, SerialsPub.

Course Outcomes:
- IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seekPatents
- Student get an insight on Copyrights, Patents and Software patents which are instrumental for furtheradvancements
- advanced Technical and Scientific disciplines
- Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latestdevelopments

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester		L	T	P	C
		3	0	0	3

MICROWAVE and OPTICAL COMMUNICATION ENGINEERING

Course Objectives:

The student will able to

- Understand fundamental characteristics of waveguides and Micro strip lines through electromagnetic fieldanalysis.
- Understand the basic properties of waveguide components and Ferrite materials composition
- Understand the function, design, and integration of the major microwave components oscillators, poweramplifier.
- Understand a Microwave test bench setup formeasurements.

UNIT I

MICROWAVE TUBES (Qualitative treatment only): Cavities**,** Re-entrant Cavities, Two Cavity Klystrons-Structure, Velocity Modulation and Bunching process, Reflex Klystrons-Structure, principle of working.

HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT.

M-TYPE TUBES

Introduction, Cross-field effects, Magnetrons – 8-Cavity Cylindrical Travelling Wave Magnetron.

MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, LSA Mode of operation

UNIT II

WAVEGUIDE COMPONENTS AND APPLICATIONS- I (Qualitative treatment only):

Waveguide Attenuators – Resistive Card, Rotary Vane types, Scattering matrix parameters: Definition, Properties, Salient Features -S- parameters of two port, three port, four port networks. 2 Hole, Bethe Holetypes.

UNIT III Over view of optical fiber communication, Total Internal Reflection, Numerical Aperture, Graded index fibers, Cut off wavelength.

OPTICAL FIBER CONNECTORS-Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing- Splicing techniques, Splicing single mode fibers, Multimode fiber joints, single mode fiber joints.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT I V

OPTICAL SOURCES and Detectors: Qualitative treatment, Structures, Materials, Quantum efficiency, Physical principles and comparison of: Optical sources and detectors, Related problems.
Optical system design- Point to point links – Component Choice and considerations, Link power budget, Line coding in Optical links, WDM, Necessity, Principles, Eye pattern.

UNIT –V: MEASUREMENTS:

a. MICROWAVE MEASUREMENTS: Description Of Microwave Bench- Different Blocks, Microwave Power Measurement- Bolometer Method. Measurement of Attenuation by Reflection Method, VSWR, ImpedanceMeasurement
b. OPTICAL MEASUREMENTS: OTDR, Attenuation, DetectorCharacteristics

TEXT BOOKS :

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rdEdition,1994.
2. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley,2nd Edition,2002.
3. Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition,3rd Edition,2000.

REFERENCES :

1. Microwave Engineering- Annapurna Das and Sisir K.Das, Mc Graw HillEducation, 3rdEdition,2014.
2. Microwave Engineering – G S N Raju , I K International Publishing House Pvt. Limited,2008.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Ediition, 2004.

Course Outcomes: After going through this course the student will be able to
- Design different modes in waveguidestructures
- Calculate S-matrix for various waveguide components and splitting the microwave energy in a desireddirection
- Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency devices.
- Measure various microwave parameters using a Microwave testbench

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester		L	T	P	C
		3	0	0	3

DATA COMMUNICATIONS & COMPUTER NETWORKS

Course Objectives:
- To introduce the Fundamentals of data communicationnetworks
- To demonstrate the Functions of various protocols of Data linklayer.
- To demonstrate Functioning of various Routingprotocols.
- To introduce the Functions of various Transport layer protocols.
- To understand the significance of application layerprotocols

UNIT I:

Introduction to Data Communications: Components, Data Representation, Data Flow, Networks-Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks Interconnection of Networks, The Internet - A Brief History, The Internet Today, Protocol and Standards - Protocols, Standards, Standards Organizations, Internet Standards. Network Models, Layered Tasks, OSI model, Layers in OSI model, TCP/IP Protocol Suite, Addressing Introduction, Wireless Links and Network Characteristics, WiFi: 802.11 Wireless LANs -The 802.11 Architecture,

UNIT II:

Data Link Layer: Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC) , Framing, Flow Control and Error Control protocols , Noisy less Channels and Noisy Channels, HDLC, Multiple Access Protocols, Random Access ,ALOHA, Controlled access, Channelization Protocols. 802.11 MAC Protocol, IEEE 802.11 Frame.

UNIT III:

The Network Layer: Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks-Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks, Inside a Router-Input Processing, Switching, Output Processing, Queuing, The Routing Control Plane, The Internet Protocol(IP):Forwarding and Addressing in the Internet-Datagram format, Ipv4 Addressing, Internet Control Message Protocol(ICMP), IPv6

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT IV:
Transport Layer: Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP -UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N(GBN), Selective Repeat(SR), Connection Oriented Transport: TCP - The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control - The Cause and the Costs of Congestion, Approaches to CongestionControl

UNIT V:
Application Layer: Principles of Networking Applications – Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP,- FTP Commands and Replies, Electronic Mail in the Internet-STMP, Comparison with HTTP, DNS-The Internet's Directory Service – Service Provided by DNS, Overview of How DNS Works, DNS Records andmessages.

TEXT BOOKS:

1. Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6thEdition , Pearson,2017.
2. Data Communications and Networking Behrouz A.Forouzan4th Edition McGraw Hill Education,2017.

REFERENCES:
1. Data communication and Networks - Bhusan Trivedi, Oxford university press,2016
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, PearsonEducation,2003.
3. Understanding Communications and Networks,3rdEdition,W.A.Shay,CengageLearning,2003.

Course Outcomes:
Upon completing this course, the student will be able to

- Know the Categories and functions of various Data communication Networks
- Design and analyze various error detectiontechniques.
- Demonstrate the mechanism of routing the data in networklayer
- Know the significance of various Flow control and Congestion controlMechanisms

- Know the Functioning of various Application layerProtocols.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester		L	T	P	C
		3	0	0	3

DIGITAL IMAGE and VIDEO PROCESSING

Course Objectives:
- To study the image fundamentals and mathematical transforms necessary for image Processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.
- To study the basics of Video processing and 2-D Motion estimation

UNIT I:
Fundamentals of Image Processing and Image Transforms:
Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing. Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform Discrete cosine transform, KL transform, singular value decomposition, comparison of different image transforms.

UNIT II:
Image Enhancement:
Spatial domain methods: point processing techniques, Histogram processing, Fundamentals of Spatial filtering, smoothing spatial filters, sharpening spatial filters. Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.
Image Restoration:
Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind de-convolution.

UNIT III:
Image Segmentation:
Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform.
Image Compression:
Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Fundamentals of information theory, Run length coding, Shannon – Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression, Image

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

compression standard, Wavelet-based image compression, JPEG Standards.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT IV:
Basic Steps of Video Processing:
Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, filtering operations.

UNIT V:
Motion Estimation: Optical flow, General Methodologies, Pixel Based Motion Estimation, Block-Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Videocoding.

TEXT BOOKS
1. Digital Image Processing – Gonzaleze and Woods, 3rdEd,Pearson,2008.
2. Digital Video Processing – M. Tekalp, Prentice Hall International.2ndEd.2015.

REFERENCE BOOKS
1. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH,2009.
2. Video Processing and Communication – Yao Wang, JoemOstermann and Ya–quin Zhang.1st Ed., PH Int,2017
3. Digital Image Processing and Analysis-Human and Computer Vision Applicationwith CVIP Tools – ScotteUmbaugh, 2nd Ed, CRC Press,2011.

Course Outcomes:
- Defining the digital image, representation of digital image, importance of image resolution, applications in imageprocessing.
- Know the advantages of representation of digital images in transform domain, application of various imagetransforms.
- Know how an image can be enhanced by using histogram techniques, filtering techniques etc
- Understand image degradation, image restoration techniques using spatial filtersand frequencydomain
- Know the detection of point, line and edges in images, edge linking through local processing, globalprocessing.
- Understand the redundancy in images, various image compressiontechniques.
- Know the video technology from analog color TV systems to digital video systems,how video signal is sampled and filtering operations in videoprocessing.
- Know the general methodologies for 2D motion estimation, various coding used invideo processing.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester		L	T	P	C
		3	0	0	3

COMMUNICATION STANDARDS and PROTOCOLS
(Professional Elective 3)

Objective:
- Acquire knowledge about transferring data into cloud using variousWired/Wireless communicationtechnologies.

Prerequisites:
Basic knowledge on Digital numbering system; Micro Controller Peripheral Programming, interfacing different types of sensors using I2C,SPI, UART ; wired and wireless communications.

Unit-I:
Introduction to Communication and Networking : Communications**,** Signal Types and its characteristics (Analog/Digital), Data Transmission Types (Serial/Parallel), Communication Techniques (Asynchronous, Synchronous),Data Transmission Modes (Simplex, Half/Full Duplex), Network Topologies (Star, Ring, Mesh, Point to Point, Tree, Bus, Daisy chain, Multi drop) and its applications, Modulation need and types.

Unit-II:
OSI Layers: Communication Layers and its applications, Communication media (Twisted Pair, Coaxial, Fiber Optics), Introduction to Errors (Error types, Detection, Correction) and Flow Control and its applications.

Unit-III:
Wired Communication Protocols: Ethernet (Types, Socket, MAC, IP, ARP, ICMP, TCP, UDP, DHCP), CAN, Mod-bus(RTU, ASCII), UART (RS485,RS232), OFC and Advantages, Disadvantages and its applications, Introduction to Dial up Modems, Leased line modems.

Unit-IV:
Wireless Communication Protocols: Zigbee, Bluetooth, Wi-Fi, GPRS, GSM , NFC , IR, Satellite Communication. Advantages, Disadvantages and its applications.

Unit-V:
Network Types: Introduction to LAN,WAN,PAN, Internet and Intranet, sensor networks (wired/wireless) and its applications.
Network Security : Introduction to NAT, PAT, DNS, Network Routing algorithms, Introduction to Switch, Hub, Bridges and its working, Network Security and Introduction to Firewall and its applications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Text books:
1. Introduction to data communication and networking by Wayne Tomasi, PearsonPrentice Hall,2005
2. Introduction to data communication and networking by Behrouz Forouzan ,4th Edition McGraw HillEducation,2017.
3. Basics of data communications by WilliamStallings.

Reference books:
1. Basics of computer networking by Thomas Robertazzi Stony BrookUniversity,2011
2. Wireless Networking Absolute Beginner's Guide by MichaelMiller:
3. Designing and Deploying 802.11n Wireless Networks by Jim Geier 2nd Edition, Kindle Edition.
4. CAN System Engineering from Theory to Practical Applications,2nd Edition,Springer,2013

Course Outcomes:
- Able to develop sensornetworks
- Able to communicate data via Wired/Wirelesscommunication
- Configure and test communicationtechnologies

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester		L	T	P	C
		3	0	0	3

ANALOG IC DESIGN
(Professional Elective 3)

Course Objectives:

The student will be able to

- Understand the behavior of MOS Devices and Small-Signal & Large-Signal Modeling of MOS Transistor and AnalogSub-Circuits.
- Learn and understand CMOS Amplifiers like Differential Amplifiers, Cascode Amplifiers, Output Amplifiers, and OperationalAmplifiers.
- Design and Develop the Analog CMOS Circuits for different Analogoperations.
- Learn and understandthe concepts of Open-Loop Comparators and Different Types of Oscillators like Ring Oscillator, LC Oscillatoretc.

UNIT -I:

MOS Devices and Modelling: The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modelling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOSModel.

UNIT -II:

Analog CMOS Sub-Circuits: MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT -III:

CMOS Amplifiers: Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

CMOS Operational Amplifiers: Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT -IV:

Comparators: Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

UNIT -V:

Oscillators & Phase-Locked Loops: General Considerations, Ring Oscillators, LC Oscillators, Voltage Controlled Oscillators.

Simple PLL, Charge Pump PLLs, Non-Ideal Effects in PLLs, Delay Locked Loops, Applications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TEXT BOOKS:
1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition,SecondEdition.
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition,2010.

REFERENCES:
1. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition,2010.
2. Analog Integrated Circuit Design- David A.Johns, Ken Martin, Wiley Student Edn,2013.

Course Outcomes:
After going through this course, the student will be able to
- Model and simulate different MOS Devices using small signalModel.
- Design and analyze any Analog Circuits in real timeapplications.
- Apply the concepts Analog Circuit Design to develop various Applications in RealTime.
- Analyze and comparedifferentOpen-Loop Comparators andOscillators.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester		L	T	P	C
		3	0	0	3

SMART SENSORS
(Professional Elective 3)

OBJECTIVE:
To make student to acquire the knowledge on types of sensors/transducers, working principles, selection procedure, applications of sensing systems

UNIT – I
Introduction to Measurement: Measurement units, applications, elements, choosing appropriate measuring instruments. Instrument Types and Performance Characteristics: Review of instrument types, Static characteristics, dynamiccharacteristics
Error during measurement process: Sources of systematic error, reduction and quantification of systematic errors, random errors, aggregation of measurement system errors.
Calibration: Calibration of measuring instruments, Primary calibration, secondary calibration and field calibration. Calibration methods for different parameters (temperature, pressure, humidity, flow...etc.). Automatic Calibration mechanisms.

UNIT – II
Temperature Sensors: Thermo-resistive, Resistance Temperature Detectors, Silicon Resistive, Thermistors, Semiconductor, Optical, Acoustic, Piezoelectric
Humidity and Moisture Sensors: Capacitive, Electrical Conductivity, Thermal Conductivity, Optical Hygrometer, Time Domain Reflectometer.
Pressure and Force Sensors: Mercury Pressure, Bellows, Membranes, and Thin Plates, Piezoresistive, Capacitive, Optoelectronic, Vacuum, Strain Gauges, Tactile, Piezoelectric Force
Applications: Case studies in processing industries, indoor environment monitoring in offices, cold storages

UNIT – III
Occupancy and Motion Detectors: Ultrasonic, Microwave Motion, Capacitive Occupancy, Visible and Near-Infrared Light, Far-Infrared Motion, PIR Motion, Position, Displacement, and Level Sensors: Potentiometric, Gravitational, Capacitive, Inductive and Magnetic, Optical, Ultrasonic, Radar
Velocity and Acceleration Sensors: Capacitive Accelerometers, Piezoresistive Accelerometers, Piezoelectric Accelerometers, Thermal Accelerometers, Heated-Plate Accelerometer, Heated-Gas Accelerometer, Gyroscopes, Piezoelectric Cables
Applications: Case studies in manufacturing industries, robotics

UNIT – IV
Flow Sensors: Pressure Gradient Technique, Thermal Transport, Ultrasonic, Electromagnetic, and Micro flow, Coriolis Mass Flow, Acoustic Sensors: Resistive Microphones, Fiber-Optic, Piezoelectric, Solid-State microphone, Light & Radiation Sensors: Photodiodes, Phototransistor, Photo resistors, Thermal detectors

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Chemical Sensors: Metal-Oxide Chemical, ChemFET, Electro-chemical, Potentiometric, Conduct metric, Amperometric, Optical Chemical, Mass Detector
Applications: Case studies in processing industries, oil and gas industries, water SCADA, pharmaceutical industries

UNIT – V
Introduction to wireless sensor networks, Challenges for wireless sensor networks, Applications for wireless sensor networks, enabling technologies for wireless sensor networks.
Single node architecture – Hardware components, Energy consumption of Sensor nodes (only Operation states with different power consumption, Relationship between computation and communication, Power consumption of sensor and actuators is included), Deployment environments
Sensor Network Architecture - Sensor Network Scenarios, Optimization goals and figures of merit, Design principles of WSN, Service interfaces of WSNs, Gateway-concepts.

TEXT BOOKS:
1. Measurement and Instrumentation Principles - Morris, AlanS
2. An Introduction to Error Analysis by John R.Taylor
3. Sensor Technology Handbook, John S.Wilson
4. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks" John-Wiley,First-Edition-2014.

REFERENCE BOOKS
1. Mechanical Measurements – Beckwith, Marangoni,Lienhard
2. Measurement of Systems - Application and design - Earnest O.Doeblin
3. Electronic Instrumentation and Measurement Technique - Albert DHelfrick
4. Kazem Sohraby, Daniel Minoli, &Taieb Znati, "Wireless Sensor Networks- Technology, Protocols, AndApplications", John Wiley,2007.

Course Outcomes : The student will be able to
- Understand measuring parameters, measuring systems, effects ofenvironment, characteristics and parameters to be considered for designing aninstrument
- Understand different types of sensors/transducers, working principles,selection procedure, applications of sensingsystems
- Understand Challenges and applications of sensors and sensornetworks
- Select a sensor/sensing system for arequirement
- Test, install and collect the data from a group ofsensors.
- Derive sensor-based solution for differentapplications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
	ADVANCED DIGITAL SIGNAL PROCESSING **(Professional Elective 3)**				

Course Objectives:
The main objectives of the course are
- To study about discrete time systems and to learn about FFTalgorithms.
- To study the design techniques for FIR and IIR digitalfilters
- To study the finite word length effects in signalprocessing
- To study the properties of random signal, Multirate digital signal processing andabout QMFfilters

UNIT –I: Review of DFT, FFT, IIR Filters and FIR Filters: Introduction to filter structures (IIR & FIR). Implementation of Digital Filters, specifically 2nd Order Narrow Band Filter and 1st Order All Pass Filter. Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Back ward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT - II: Non-Parametric Methods: Estimation of spectra from finite duration observation of signals, Nonparametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametricmethods

UNIT – III: Parametric Methods: Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models – Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

UNIT –IV: Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion. Examples of up-sampling using an All Pass Filter.

UNIT –V: Applications of Multi Rate Signal Processing: Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Sub-band Coding of Speech Signals, Quadrature Mirror Filters, Transmultiplexers, Over Sampling A/D and D/AConversion.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TEXT BOOKS:
1. J.G.Proakis & D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms & Applications", 4th Edition,PHI,2008.
2. Alan V Oppenheim & Ronald W Schaffer, "Discrete Time signal processing ", PHI. 2nd Edition,1999.
3. Emmanuel C. Ifeacher, Barrie. W. Jervis, "DSP – A Practical Approach", 2nd Edition, PearsonEducation,2000.

REFERENCE BOOKS:
1. S. M .Kay, "Modern spectral Estimation: Theory & Application ", 1988,PHI.
2. P.P.Vaidyanathan, "Multi Rate Systems and Filter Banks", PearsonEducation.
3. Kaluri V. Rangarao, Ranjan K. Mallik, "Digital Signal Processing: A Practitioner's Approach", ISBN: 978-0-470-01769-2, 210 pages, November 2006 JohnWeley.
4. S.Salivahanan, A.Vallavaraj, C.Gnanapriya, "Digital Signal Processing",2000,TMH

Course Outcomes:
On completion of the course, students will be able to:
- Comprehend the DFT, FFT and IIRfilters.
- To study the modern digital signal processing algorithms andapplications.
- Have an in-depth knowledge of use of digital systems in real timeapplications
- Acquire the basics of multi rate digital signal processing and apply the algorithms for wide area of recentapplications.
- Analyze the power spectrum estimation and Comprehend the Finite word length effects in Fixed point DSPSystems.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester		L	T	P	C
		3	0	0	3
	AUGMENTED REALITY **(Professional Elective 3)**				

OBJECTIVE:

The course is designed to impart the fundamentals of augmented reality (AR), and teach how to build an AR experience.

UNIT – I:

Introduction to Augmented Reality: Definition and Scope, a brief history of Augmented Reality, Examples, Other related fields: Virtual Reality, Mixed Reality Continuum, Ubiquitous Computing.

Understanding Virtual Space: Defining visual space and content, defining position and orientation in three dimensions, navigation

UNIT – II:

Understanding human senses and their relationship to Output/Input Devices: The mechanics of sight – visual pathway, spatial vision and depth cues, The mechanics of hearing, mechanics of feeling, Multimodal displays, Visual perception, Requirements and Characteristics, Spatial display model, Visual displays

UNIT – III:

Sensors for tracking position, orientation and motion – Tracking, calibration and registration, coordinate systems, characteristics of tracking technology, Stationary tracking systems, Mobile sensors, optical tracking, sensor fusion, Computer vision for augmented reality – market tracking, multiple-camera infrared tracking, natural feature tracking by detection, incremental tracking, simultaneous localization and mapping, outdoortracking

Devices to enable navigation and interaction – 2D versus 3D interaction and navigation, the importance of a manual interface, hand and gesture tracking, whole body tracking, gaming and entertainment interfaces, navigating with mind.

UNIT – IV:

Software architectures – AR application requirements, software engineering requirements, Distributed object systems, dataflow, scene graphs, developer support.

Applications of Augmented and Virtual Reality: Gaming and Entertainment, Architecture and construction, Health and medicine, Aerospace and defence, education, information control and big data visualization, Tele-robotics and telepresence.

UNIT – V:

Human factors, legal and social considerations – human factor considerations, legal and social considerations, The future of AR – what may drive business cases, an AR developer's wish list, taking AR outdoors, interfacing with smart objects, confluence of VR and AR, augmented humans, AR as dramatic medium, AR as social computing platform.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TEXTBOOKS:
1. Augmented Reality – Principles and Practice, Dieter Schmalstieg and Tobias Höllerer, 1st Edition,Addison-Wesley
2. Practical Augmented Reality – A guide to the technologies, applications, and human factors for AR and VR, Steve Aukstakalnis, 1st Edition,Addison-Wesley
3. Understanding Augmented Reality, Concepts and Applications, Alan B. Craig,1st Edition, Morgan Kaufman

REFERENCE BOOKS:
1. Handbook of Virtual Environments: Design, Implementation, and Applications, Kelly S. Hale and Kay M. Stanney, 2nd Edition, CRCPress
2. Designing Virtual Systems: The Structured Approach, Gerard Jounghyun Kim,Springer
3. Spatial Augmented Reality: Merging Real and Virtual Worlds, Oliver Bimber and Ramesh Raskar, 1st Edition, A K Peters/CRC press.

Course Outcomes:
At the end of the course, students will
- Understand the basics of AugmentedReality
- Understand human senses and their relationship todevices
- Understand various application scenarios of AR
- Understand softwarearchitecture

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester		L	T	P	C
		3	0	0	3

SOFTWARERADIO
(Professional Elective4)

Pre-requisite(s): Basic knowledge of signal processing, concepts in wireless Communication and networks.

Course Objectives: This course enables the students to:
- Understand the basic components of software definedradio.
- Understand the distortion parameters and nonlinear Distortion in TransmittedSignals.
- Calculate power requirement in power amplifier forSDR.
- Understand Digital Pre-distortion Techniques for Linear/NonlinearDistortion.
- Appraise Digital Pre-distortionTechniques.

UNIT 1: Basic components of software defined radios, Software defined radio architectures Part A, Software defined radio architectures- Part B.

UNIT 2: Distortion parameters, Sources and metrics of distortion in a transceiver, Nonlinear distortion and nonlinearity specifications, Power amplifiers: Nonlinear Distortion in Transmitted Signals.

UNIT 3: Power amplifier Line-up for linearity & power requirement calculations, Linearization Techniques for nonlinear distortion in SDR.

UNIT 4: Predistortion Techniques for nonlinear distortion in SDR.

UNIT 5: Digital Predistortion Techniques for Linear/Nonlinear Distortion.

Textbook:
1. Jeffrey H. Reed "Software Radio: A Modern Approach to radio Engineering", Pearson EducationAsia,2002

References:
1. Sanjay Kumar, "Wireless Communication the Fundamental and AdvancedConcepts" River Publishers, Denmark, 2015 (Indianreprint)
2. https://onlinecourses.nptel.ac.in/noc18_ec01/preview.

Course Outcomes: After the completion of this course, students will be to:
- Able to analyze the basic components of software definedradio.
- Demonstrate understanding about distortion parameters and nonlinear Distortionin TransmittedSignals
- Able to calculate power requirement in power amplifier forSDR
- Demonstrate understanding about Digital Pre-distortion Techniques forLinear/Nonlinear Distortion
- Design and analyze the various algorithms used for software definedradio.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester		L	T	P	C
		3	0	0	3

LOW POWER VLSI DESIGN
(Professional Elective 4)

Course Objectives:

- Known the low power low voltage VLSIdesign
- Understand the impact of power onsystemperformances.
- Known about differentDesignapproaches.
- Identify suitable techniques to reduce power dissipation in combinational and sequentialcircuits.

UNIT –I:

Fundamentals: Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot ElectronEffect.

UNIT –II:

Supply Voltage Scaling for Low Power: Device Feature Size Scaling, Constant-Field Scaling, Constant-Voltage Scaling, Architectural-Level Approaches: Parallelism for Low Power, Pipelining for Low Power, Combining Parallelism with Pipelining, Voltage Scaling Using High-Level Transformations: Multilevel Voltage Scaling Challenges in MVS Voltage Scaling Interfaces, Static Timing Analysis Dynamic Voltage and Frequency Scaling

UNIT -III

Low-Power Design Approaches: Low-Power Design through Voltage Scaling – VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel Processing Approaches.Power Gating, Clock Gating Versus Power Gating, Power-Gating Issues, Isolation Strategy, State Retention Strategy, Power-Gating Controller, Power Management, Combining DVFS and PowerManagement.

UNIT –IV:

Low-Voltage Low-Power Adders: Introduction, Standard Adder Cells, CMOS Adder's Architectures – Ripple Carry Adders, Carry Look- Ahead Adders, Carry Select Adders, Carry Save Adders, Low-Voltage Low-Power Design Techniques –Trends of Technology and Power Supply Voltage.

Low-Voltage Low-Power Multipliers: Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh- Wooley Multiplier, Introduction to Wallace Tree Multiplier.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT –V:
Low-Voltage Low-Power Memories: Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Pre-charge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

TEXT BOOKS:
1. CMOS Digital Integrated Circuits – Analysis and Design – Sung-Mo Kang, Yusuf Leblebici,TMH,2011.
2. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH ProfessionalEngineering,1st edition,2004

REFERENCE BOOKS:
1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRCPress,2011
2. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons,2000.
3. Practical Low Power Digital VLSI Design – Gary K. Yeap, Kluwer Academic Press,2002.
4. Leakage in Nanometer CMOS Technologies– Siva G. Narendran, Anatha Chandrakasan,Springer,2005.

Course Outcomes:
Upon completing this course, the student will be able to
- Understand the need of Low power circuitdesign.
- Attain the knowledge of architecturalapproaches.
- Analyze and design Low-Voltage Low-Power combinationalcircuits.
- Known the design of Low-Voltage Low-PowerMemories

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester		L	T	P	C
		3	0	0	3
	EMBEDDED SYSTEMS **(Professional Elective 4)**				

Course Objectives:

The main objectives of this course are given below:

- The basic concepts of an embedded system areintroduced.
- The various elements of embedded hardware and their design principles areexplained.
- Different steps involved in the design and development of firmware for embedded systems iselaborated.
- Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design isdiscussed.
- Fundamental issues in hardware software co-design were presented andexplained.
- Familiarize with the different IDEs for firmware development for different family of processors/controllers and embedded operatingsystems.
- Embedded system implementation and testing tools are introduced anddiscussed.

UNIT-I

INTRODUCTION: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT-II

EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT-III

EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versusCross-compiler.

UNIT-IV

REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronization.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware andFirmware.

UNIT-V:
EMBEDDED SYSTEM DEVELOPMENT, IMPLEMENTATION AND TESTING: The integrated development environment, Types of files generated on cross-compilation, Deassembler/Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Embedded Software development process and tools, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

Text Books:
1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications,2013.
2. Embedded Systems-By Shibu. K.V-Tata McGraw Hill Education Private Limited,2013.

References:
1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications,2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications,2013.

Course Outcomes:
At the end of this course the student can able to:
- Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specificfunction.
- The hardware components required for an embedded system and the design approach of an embeddedhardware.
- The various embedded firmware design approaches on embeddedenvironment.
- Understand how to integrate hardware and firmware of an embedded system using real time operatingsystem.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester		L	T	P	C
		3	0	0	3

DSP PROCESSORS and ARCHITECTURES **(Professional Elective 4)**

Course Objectives:
- To recall the various techniques of digital signalprocessing.
- To introduce the architectural features of programmable DSP Processors ofTexas Instruments (TI) and Analog devices(AD).
- To understanding the practical examples of DSP Processorarchitectures.
- To develop programming knowledge by using Instruction set of DSPProcessors.
- To know the interfacing techniques to I/O devices andmemory.

UNIT-I:

Introduction to Digital Signal Processing

Introduction, a Digital signal-processing system, the sampling process, discrete time sequences, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation andinterpolation.

Computational Accuracy in DSPImplementations

Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT-II:

Architectures for Programmable DSP Devices

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT-III:

Programmable Digital Signal Processors

Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX Instructions and Programming, On-ChipPeripherals, Interrupts of TMS320C54XX Processors, Pipeline Operation of TMS320C54XX Processors.

UNIT-IV:

Analog Devices Family of DSP Devices

Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor.

Introduction to Black fin Processor - The Black fin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT-V:
Interfacing Memory and I/O Peripherals to Programmable DSP Devices
Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS:
1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications,2004.
2. A Practical Approach To Digital Signal Processing - K Padmanabhan,R. Vijayarajeswaran, Ananthi. S, New Age International,2006/2009
3. Embedded Signal Processing with the Micro Signal Architecture: Woon-SengGan,Sen M.Kuo, Wiley-IEEE Press,2007

REFERENCE BOOKS:
1. Digital Signal Processors, Architecture, Prog and Applications-B.Venkataramani and M. Bhaskar, 2002,TMH.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. 2000, S. Chand &Co.
3. Digital Signal Processing App Using the ADSP-2100 Family by TheApplications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar,PHI
4. The Scientist and Engineer's Guide to Digital Signal Processing bySteven W. Smith, Ph.D., California Technical Publishing, ISBN 0-9660176-3-3,1997.

Course Outcomes:
Upon the completion of course, student able to
- Understand the basic concepts of Digital SignalProcessing.
- To differentiate the architectural features of General purpose processors and DSP processors.
- Understand the architectures of TMS320C54xx devices and ADSP 2100 DSPdevices.
- Write the simple assembly language programs by using instruction set ofTMS320C54xx.
- To interface the various devices to DSPProcessors.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester		L	T	P	C
		3	0	0	3
MULTI MEDIA COMMUNICATION **(Professional Elective 4)**					

Course objectives: This course will enable students to
- Define the Multimedia CommunicationModels
- Explain Multimedia Transport in WirelessNetworks
- Solve the Security issues in multimedianetworks
- Illustrate real-time multimedia networkapplications.
- Explain different network layer basedapplication.

Unit-I: Introduction and tools used for MM content development , Media interaction, bimodality of human speech, Lip reading, speech driven talking heads, Lip synchronization, Lip tracking, Audio to visual mapping.

Unit-II: Biomodal person verification, Joint AV coding, Multimedia processing, Digital media, Signal processing elements, Challenges in MM processing, Perceptual coding of Digital Audio.

Unit-III: Transform audio coders, Image coding, video coding, Water marking techniques, Organization, Storage and retrieval, ANNs for MMSP.

Unit-IV: Distributed MM systems, Multimedia processors, Multimedia OS, Multimedia communication standards, MPEG-1, MPEG-2, MPEG-4, MPEG-7.

Unit–V: Real time multimedia across Internet, packet audio/video multimedia transport across IP/ATM Network, Wireless multimedia, mobile multimedia access for internet, multimedia PCS.

Text Book:
1. Multimedia Communication Systems: Techniques and Standards, KR RAO et al, Pearson, 2002.
2. Insight into Mobile Multimedia Communication : D. BULL et al, Academic Press,1999
3. Multimedia Systems Design : PK ANDLEIGH , K. THAKKAR,PHI,2002
4. Multimedia, TAY VAUGHAN,5/e, TMH,2001

Course Outcomes:
- Develop the multimedia content using multimediatools
- Understand various audio, video and joint codingtechniques.
- Identify the requirements of real time multimedia transfer on IPnetworks.
- Study different types of multimediaprocessors

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester		L	T	P	C
		0	0	3	1.5
	INTERNET OF THINGS LAB				

List of Experiments:

1. Introduction to Raspberry Pi Board/ Arduino/NodeMCU.
2. Familiarization with ARM keil MDK for programming and debugging an application on the PSoC 4 BLE chip and perform necessary softwareinstallation.
3. To interface Push button/Digital sensor (IR/LDR) with ARM keil MDK on PSoC 4 BLE chip and write a program to turn ON LED when push button is pressed or at sensor detection.
4. Set up a Bluetooth Low Energy (namely Bluetooth Smart) connection between the PSoC BLE kit and a smart phone and use an app to send and receive data to and from the BLE Pioneerkit.
5. To interface capacitor sensor (touch sensor) with smart phone and write a program to turn RGB LED ON/OFF when '1'/'0' is received from smart phone usingBluetooth.
6. Automatic street light control to control the street light (Turn on and off based on the light) using Arduino/ Node MCU/RaspberryPi
7. Smoke Detection using MQ-2 GasSensor
8. Detecting obstacle with IR Sensor and Arduino/ Node MCU/RaspberryPi
9. Arduino board interfacing with the temperature and humidity sensor and prints theoutput on LCD / serialmonitor
10. Write an Arduino program for interfacing Arduino board with the Ultrasonicsound sensor and print the output on Serialmonitor.

Equipment required for Laboratories:

Arduino/Node MCU/Raspberry Pi + PSoC 4 BLE Bluetooth Low Energy Pioneer Kit + Hardware, MQ-2 Gas Sensor, Ultrasonic sound sensor.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - I Semester		**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

MICROWAVE AND OPTICAL COMMUNICATION ENGINEERING LAB

Minimum Twelve Experiments to be conducted:

Part-A (Any 7 Experiments (8 & 9 Compulsory))
1. Reflex Klystron Characteristics.
2. Gunn DiodeCharacteristics.
3. AttenuationMeasurement.
4. Directional CouplerCharacteristics.
5. Impedance and FrequencyMeasurement.
6. Scattering parameters ofCirculator.
7. Scattering parameters of MagicTee.
8. Radiation Pattern of Horn and ParabolicAntennas.
9. Synthesis of Microstip antennas (Rectangular Structure) Using any Industrystandard SimulationSoftware.

Part – B (Any 5 Experiments) :
10. Characterization ofLED.
11. Characterization of LaserDiode.
12. Intensity modulation of Laser output through an opticalfiber.
13. Measurement of Data rate for Digital Opticallink.
14. Measurement ofNA.
15. Measurement of losses for Analog Opticallink.

Equipment required for Laboratories:
1. Regulated Klystron Power Supply, Klystronmount
2. VSWRMeter
3. MicroAmmeter
4. Multimeter
5. CRO
6. GUNN Power Supply, PinModulator
7. Crystal Diodedetector
8. Micro wave components(Attenuation)
9. FrequencyMeter
10. Slotted linecarriage
11. Probe detector
12. Wave guideshorts
13. SSTuner
14. DirectionalCoupler
15. E, H, MagicTees
16. Circulators, Isolator
17. MatchedLoads

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

18. Pyramidal Horn and ParabolicAntennas
19. Turntable for AntennaMeasurements
20. Fiber Optic Analog Trainer basedLED
21. Fiber Optic Analog & Trainer basedlaser
22. Fiber OpticTrainer
23. Fiber cables - (Plastic,Glass)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - II Semester		L	T	P	C
		3	0	0	3
	WIRELESS COMMUNICATION **(Professional Elective 5)**				

Course Objectives:

The student will be introduced to:

- The Aim of this course is to introduce the fundamental technologies forwireless Communication andnetworking
- Introducing the concepts of Multiple AccessSchemes
- Introducing the comprehensive exposure to the fast-evolving high-tech fields of Wirelesscommunications
- It introduces the latest technologies such as CDMA, OFDM, and MIMO, whichform The bedrock of 3G/4G wirelessnetworks

UNIT I

Introduction to 3G/4G Wireless Communications: Introduction, 2G Wireless Standards, 3GWireless Standards, 4G Wireless Standards, Overview of Cellular Service ProgressionPrinciples of Wireless Communications: The Wireless Communication Environment,Modeling of Wireless Systems, System Model for Narrowband Signals, Rayleigh FadingWireless Channel, BER Performance of Wireless Systems: SNR in a Wireless System, BER inWireless Communication System, Rayleigh BER at High SNR. Intuition for BER in a FadingChannel. Channel Estimation in Wireless Systems, Diversity in Wireless Communication.

UNIT II

Code Division for Multiple Access (CDMA): Introduction to CDMA, Basic CDMAMechanism, Fundamentals of CDMA Codes, Spreading Codes based on Pseudo-Noise (PN)Sequences, Correlation Properties of Random CDMA Spreading Sequences, Multi-UserCDMA, Advantages of CDMA.

UNIT III

Multiple-Input Multiple-Output Wireless Communications: Introduction to MIMOWireless Communications, MIMO System Model, MIMO Zero-forcing (ZF) Receiver, MIMOMMSE Receiver, Singular Value Decomposition (SVD) of the MIMO Channel,Singular Value Decomposition (SVD) and MIMO Capacity

UNIT IV

Orthogonal Frequency-Division Multiplexing: Introduction, Motivation and MulticarrierBasics, OFDM Example, Bit-Error Rate (BER) for OFDM, MIMO-OFDM, Effect ofFrequency Offset in OFDM, OFDM – Peak-to-Average Power Ratio (PAPR), SC-FDMA.

UNIT V

Satellite-Based Wireless Systems: Introduction, Satellite Orbits, Use of Satellites forCommunication, Satellites and Transponders, Signal and Noise Calculations,Systems

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UsingGeostationary Satellites, Systems Using Low-Earth-Orbit Satellites, Systems Using MediumEarth-Orbit Satellites.

TEXTBOOKS:
1. Principles of Modern Wireless Communication Systems – Aditya K Jagannathan,Mc Graw Hill publishers,2017
2. Wireless Communication Technology – Blake,Delmar/Cengage Learning India, first Edition,2012

REFERENCES:
1. Wireless Communications and Networking – Vijay K. Garg,MorganKaufmann,2007

Course Outcomes:
After going through this course, the student will be able to
- Know about the Wireless systems and Standards (1G/2G/3Gsystems).
- Concept and analysis of CDMA-based wirelessnetworks.
- Understand the concepts of Multiple-Input Multiple-Output(MIMO).
- Understand the modern wireless systems usingOFDM.
- Analysis of Satellite-Based Wirelesssystems.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
	VLSI TESTING & TESTABILITY **(Professional Elective 5)**				

Course Objectives:
- To impart knowledge on the basic faults that occur in digitalsystems
- To describe fault detection techniques in combinationalcircuits.
- To outline procedures to generate test patterns for detecting single stuck faults in combinational and sequentialcircuits.
- To explain design for testability techniques with improved faultcoverage.
- To introduce BIST concepts and specificarchitectures.
- To give exposure to approaches for introducing BIST into logic circuits, memories and embeddedcores.

UNIT I
Introduction to Test and Design for Testability (DFT) Fundamentals Modelling: Modelling digital circuits at logic level, register level and structural models, Levels of modelling. Logic Simulation: Types of simulation, Delay models, Element evaluation, Hazard detection, Gate level event driven simulation.

UNIT II
Fault Modelling – Logic fault models, Fault detection and redundancy, Fault equivalence and fault location. Single stuck and multiple stuck – Fault models. Fault simulation applications, General techniques for Combinationalcircuits.

UNIT III
Testing for single stuck faults (SSF), Automated test pattern generation (ATPG/ATG) for SSFs in combinational and sequential circuits, Functional testing with specific fault models, Vector simulation – ATPG vectors, formats, Compaction and compression, Selecting ATPGTool.

UNIT IV
Design for testability – testability trade-offs, techniques. Scan architectures and testing – controllability and Observability generic boundary scan, full integrated scan, storage cells for scan design. Board level and system level DFT approaches. Boundary scan standards. Compression techniques – different techniques, syndrome test and signature analysis

UNIT V
Built-in self-test (BIST): BIST Concepts and test pattern generation. Specific BIST Architectures – CSBL, BEST, RTS, LOCST, STUMPS, CBIST, CEBS, RTD, SST, CATS, CSTP, BILBO, Brief ideas on some advanced BIST concepts and design for self-test at board level. Memory BIST (MBIST): Memory test architectures and techniques – Introduction to memory test, Types of memories and integration, Embedded memory testing model. Memory test requirements for MBIST, Brief ideas on embedded coretesting

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TEXT BOOKS:
1. Miron Abramovici, Melvin A. Breur, Arthur D. Friedman, Digital Systems Testing and Testable Design, Jaico Publishing House,2001.
2. Alfred Crouch., Design for Test for Digital ICs & Embedded Core Systems, Prentice Hall.

REFERENCES:
1. Robert J. Feugate, Jr., Steven M. Mentyn, Introduction to VLSI Testing, Prentice Hall, Englehood Cliffs, 1998.
2. Bushnell, M., and Agrawal, Vishwani D, Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits, Kluwer AcademicPublishers,2002

Course Outcomes:
- Model digital circuits at logic and RTLlevels
- Simulate digital ICs in the presence of faults and evaluate the given test set for fault coverage
- Generate test patterns for detecting single stuck faults in combinational and sequential circuits
- Identify schemes for introducing testability into digital circuits with improved fault coverage
- Compare different approaches for introducing BIST into logic circuits, memories and embedded cores

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - II Semester		L	T	P	C
		3	**0**	**0**	**3**
	MACHINE LEARNING & ARTIFIICIAL INTELLIGENCE (**Professional Elective 5**)				

OBJECTIVE:

To familiarize students with basic concepts, theories and advancements in ML and AI and help them in understanding the mathematics behind algorithms and apply them in real world scenarios

UNIT – I

Introduction to ML/AI - AI Foundation, history of AI, latest advancements and applicationsMachine Learning – I: Linear Regression - Learn to implement linear regression and predict continuous data values, Clustering - Learn how to create segments based on similarities using K-Means and Hierarchical clustering

UNIT – II

Machine Learning – II:Naïve Bayes and Logistic regression - Understand how supervised learning is used for classification, Support vector machines - Learn to classify data points using support vectors, decision trees - Tree-based model that is simple and easy to use. Learn the fundamentals on how to implement them

Natural Language Processing: Basics of text processing, lexical processing - Learn to extract features from unstructured text and build machine learning models on text data, syntax and semantics - Conduct sentiment analysis, learn to parse English sentences and extract meaning from them

UNIT – III

Deep learning & Neural Networks: Information flow in neural networks - Understand the components and structure of artificial neural networks, Training a neural network - Learn the latest techniques used to train highly complex neural networks, Convolutional neural networks - Use CNN's to solve complex image classification problems, Recurrent neural networks - Study LSTMs and RNN's applications in text analytics, Creating and deploying networks using TensorFlow and Keras (Deep Learning Library) - Build and deploy your own deep neural networks on a website, learn to use Tensor Flow API and Keras.

UNIT – IV

Graphical Models: Introduction to Bayesian methods, Graphical models - Study probabilistic way of modelling systems - Markov properties, Factor Graphs and Bayesian belief networks, Learning and Inference - Learn how graphics models are used for supervised and unsupervised learning

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT – V
Reinforcement Learning: Introduction to RL, understand how machines can be programmed to learn by themselves, Exact methods - Learn the math behind Exact Statistics - Dynamic Programming, Monte Carlo methods, Temporal Difference Learning, Approximate Methods - Learn policy gradient methods and their applications in learning

TEXTBOOKS:
1. Machine Learning, by Tom M Mitchell, Indian Edition, McGraw Hill, first Edition2017.
2. Deep Learning by Goodfellow, Bengio, Courville. The MIT Press,2016
3. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill,3rd Edition 2008.

REFERENCE BOOKS
1. UnderstandingMachine Learning: From Theory to Algorithms, by Shai Shalev-Shwartzand Shai Ben-David, 1st Edition, Cambridge UniversityPress,2014.
2. Artificial Intelligence - A Modern Approach by Stuart Russell & Peter Norvig, Prentice Hall,3rdEdition,2009.

Course Outcomes:
The student should be able to:
- Understand machine learning concepts and range of problems that can be handled by machinelearning.
- Apply the machine learning concepts in real lifeproblems.
- Understand artificial neural networks concept and apply techniques to train the neural networks
- Understand how graphical models are used for supervised and unsupervisedlearning
- Understand Reinforcement Learning concept andapplications
- Modify the algorithms based onneed

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - II Semester		L	T	P	C
		3	0	0	3
	SPEECH PROCESSING **(Professional Elective 5)**				

Course Objectives:

The main objectives of the course are as follows:
- Understand the mechanism of human speech production andarticulation
- Understand time and frequency domain methods of speechprocessing
- Understand linear predictive analysis for speech signals andLPC
- Study the algorithms and models involved for speaker and speech recognitionsystems

Unit I
Mechanics of speech
Speech production: Mechanism of speech production, Acoustic phonetics, The Acoustic Theory of Speech Production: Uniform lossless tube, Effects of losses in the vocal tract, Digital models for speech signals: Vocal tract, Radiation, Excitation, Auditory perception: psycho acoustics. Representations of speech waveform: Sampling of speech signals, Quantization.

Unit II
Time and frequency domain methods for speech processing
Time domain parameters of Speech signal: Short-Time Energy, Average Magnitude, Average Zero crossing Rate, Silence Discrimination using ZCR and energy, Short Time Auto Correlation Function, Pitch period estimation using Auto Correlation Function.
Short Time Fourier analysis: Fourier transform and linear filtering interpretations, Sampling rates in time and frequency, Pitch detection, Analysis by Synthesis, Analysis synthesis systems: Phase vocoder, Channel Vocoder, Median Smoothing, Spectrographic displays

Unit III
Linear predictive analysis of speech
Basic Principles of linear predictive analysis: Auto correlation method, Covariance method, Solutionof LPC equations: Cholesky method, Durbin's Recursive algorithm, Application of LPC parameters: Pitch detection using LPC parameters, Formant analysis using LPC parameters, VELP. Relations Between the Various Speech Parameters,CELP.

Unit IV
Application of speech processing
Voice response systems: General considerations in the design of voice response systems, A multiple output digital voice response system, Speaker recognition systems: Speaker verification system, Speaker identification system.

UNIT V
Speech recognition systems: Isolated digit recognition system, Continuous digit recognition system. Typical applications of computer voice response systems: Wiring communication equipment, Information retrieval systems

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Text books:
1. L. R. Rabiner and R. W. Schaffer, Digital Processing of Speech signals, Prentice Hall,2004
2. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley andSons Inc., Singapore,2004

References:
1. Quatieri, Discrete-time Speech Signal Processing, Prentice Hall,2001
2. L.R. Rabiner and B. H. Juang, Fundamentals of speech recognition, Prentice Hall, 1999.

Course Outcomes:
At the end of this course the student will be able to:
- Summarize the mechanism of human speech production andarticulation
- Identify the time domain speech signalparameters
- Differentiate time and frequency domain methods of speechprocessing
- Attribute linear predictive analysis for speechsignals
- Explain the solutions for LPCequations
- Implement the different algorithms and models involved for speaker andspeech recognitionsystems

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - II Semester		L	T	P	C
		3	0	0	3
	INDUSTRIAL INTERNET OF THINGS **(PROFESSIONAL ELECTIVE-5)**				

Course Objectives:

The main objectives of this course are:

- Learn and understand the Importance of IoT in industrialapplications
- Know how IoT has become a game changer in the new economy where the customersare looking for integratedvalue.
- Apply the IoT concepts in building solutions to Industrialproblems
- Learn and understand the tools and techniques that enable IoT solution andSecurity aspects.

UNIT-I

INTRODUCTION: Introduction to IoT, IoT Vs. IIoT, History of IIoT, Components of IIoT - Sensors, Interface, Networks, People &Process, Hype cycle, IOT Market, Trends& future Real life examples, Key terms of IoT– IoT Platform, Interfaces, API, clouds, Data Management Analytics, Mining &Manipulation; Role of IIoT in Manufacturing Processes Use of IIoT in plant maintenance practices, Sustainability through Business excellence tools Challenges and Benefits in implementing IIoT.

UNIT-II

ARCHITECTURES: Overview of IoTcomponents,Various Architectures of IoT and IIoT, Advantages & disadvantages, Industrial Internet - Reference Architecture; IIoT System components: Sensors, Gateways, Routers, Modem, Cloud brokers, servers and its integration, WSN, WSN network design for IoT.

SENSORS AND INTERFACING: Introduction to sensors, Transducers, Classification, Roles of sensors in IIoT, Various types of sensors, Design of sensors, sensor architecture, special requirements for IIoT sensors, Role of actuators, types of actuators. Hardwire the sensors with different protocols such as HART, MODBUS-Serial & Parallel, Ethernet, BACnet, Current, M2M etc.

UNIT-III

PROTOCOLS AND CLOUD: Need of protocols; Types of Protocols, Wi-Fi, Wi-Fi direct, Zigbee, Z wave, BACnet, BLE, Modbus, SPI, I2C, IIoT protocols –COAP, MQTT, 6LoWPAN, LWM2M, AMPQ IIoT cloud platforms: Overview of COTS cloud platforms, Predix, PTC Thing Worx, Microsoft Azure etc. Data analytics, cloud services, Business models: SaaS, PaaS, IaaS.

UNIT-IV

SECURITY: Introduction to web security, Conventional web technology and relationship with IIoT, Vulnerabilities of IoT, Privacy, Security requirements, Threat analysis, Trust, IoT security tomography and layered attacker model, Identity establishment, Access control, Message

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

integrity, Non-repudiation and availability, Security model for IoT, Network security techniques Management aspects of cyber security.
ANALYTICS: IoT Analytics: Role of Analytics in IoT, Data visualization Techniques.

UNIT-V
DIGITAL TWIN: Introduction to Digital Twin, need for Digital Twin, Elements of Digital Twin, Digital Twin process design and information requirements, Digital twin conceptual architecture - create, communicate, Aggregate, Analyze, Insight, Act, driving business value through digital twin.
DIGITAL TWIN FOR ASSET: Digitalizing asset behaviour using simulated mathematical modelling and building Digital Twin - Need, Benefits, Architecture, Models and Use cases - Predictive and Prescriptive maintenance.

TEXT BOOKS:
1. Building the Internet of Things with IPv6 and MIPv6: The EvolvingWorld of M2M Communications, by Daniel Minoli,.Bernd Scholz-Reiter, Florian,WillyPublication

2. Digital Twin Technologies and Smart Cities by Farsi, M., Daneshkhah, A.,Hosseinian-Far, A., Jahankhani, H., Springer International Publishing,2020.
3. Architecting the Internet of Things ,by Michahelles, Springer,2011

REFERENCES:
1. The Internet of Things Connecting Objects to the Web" by HakimaChaouchi,, WillyPublications
2. The Internet of Things: Key Applications and Protocols, Olivier Hersent,David Boswarthick, Omar Elloumi,, 2nd Edition, WillyPublications
3. Inside the Internet of Things (IoT), Deloitte UniversityPress
4. Internet of Things- From Research and Innovation toMarket Deployment; By Ovidiu& Peter; River PublishersSeries
5. Five thoughts from the Father of the Internet of Things; by Phil Wainewright - Kevin Ashton
6. How Protocol Conversion Addresses IIoT Challenges: White Paper By RedLion.
7. https://www.ge.com/digital/applications/digital-twin
8. https://www2.deloitte.com/us/en/insights/focus/industry-4-0/digital-twin-technology-smart-factory.html

Course Outcomes:
At the end of this course the student will be able to:
- Understand the elements of IoT to build a total control plane in an Industrialapplication
- Apply M2M protocols for development of IoT Applications.
- Learn and understand the concept of digitalization and dataacquisition.
- Build smart factory based on the IoTconcepts
- Build Industrial DigitalTwins.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - II Semester		L	T	P	C
		3	0	0	3
	3D PRINITING **Open Elective (OE2)**				

Course Objectives:

The main objectives of this course are:

- The course aims at the importance of Additive Manufacturing, classifications, models, specifications of various Additive ManufacturingTechniques.
- Principles and operation of 3Dp, Various types of3DP
- Techniques of printingelectronics
- To learn the data formats and soft-waresrequired
- The applications ofRP

UNIT-I

Introduction to Prototyping, Traditional Prototyping Vs Rapid Prototyping (RP), Need for time compression in product development, Distinction between RP and CNC and other related technologies, Classification of RP, commonly used terms, advantages and limitations of rapid prototyping.

UNIT-II

Three-Dimensional Printing (3DP)

Overview of 3DP, 3D Printer, 3D Systems, and Z Corporation, ExOne - Metal and Molding Sand Printer, Metal Line: Direct Metal Printer, Molding Sand Line: Direct Core and Mold-Making Machine, Soligen - Direct Shell Production Casting (DSPC), Voxel jet- 3D Printing System, Optomec - Maskless Mesoscale Material Deposition (M3D),

UNIT-III

Techniques for printing electronics,printing electronics,2D-printing technologies-Flexographic, Offset, Gravure, screen printing, Processes in 3D-printing electronics - Improved building process for 3D devices, Fictionalization of 3D surfaces, Current trends in 3D-printed electronics- antennas, flexible electronics, batteries, The market for 3D-printed electronics And integrated machines

UNIT – IV

RAPID PROTOTYPING DATA FORMATS: STL Format, STL File Problems, consequence of building valid and invalid tessellated models, STL file Repairs: Generic Solution, other Translators, Newly Proposed Formats.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

RAPID PROTOTYPING SOFTWARE'S: Features of various RP software's like Magics, Mimics, Solid View, View Expert, 3 D View, Velocity 2, STL View 3 Data Expert and 3 D doctor.

UNIT –V
RP APPLICATIONS: Application in engineering, analysis and planning, aerospace industry, automotive industry, jewelry industry, coin industry, GIS application, arts and architecture. RP medical and bioengineering applications: planning and simulation of complex surgery, customized implants & prosthesis, design and production of medical devices, forensic science and anthropology, visualization of bimolecular.

TEXT BOOKS:

1. Chua Chee Kai., Leong Kah Fai., Chu Sing Lim, Rapid Prototyping: Principles and Applications in Manufacturing, World Scientific,2010.
2. Andreas Gebhardt Jan-Steffen Hotter, Additive Manufacturing: 3D Printing for prototyping and Manufacturing, Hanser Publications, 6915 Valley Avenue, Cincinnati, Ohio.
3. Ian Gibson., David W Rosen., Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer,2010.

REFERENCE BOOKS:

1. Rapid Manufacturing / D.T. Pham and S.S.Dimov/Springer
2. Wohlers Report 2000 /Terry T Wohlers/WohlersAssociates
3. Rapid Prototyping & Manufacturing / Paul F.Jacobs/ASMEPress
4. Rapid Prototyping / Chua&Liou

Course Outcomes:
At the end of this course the student will be able to:
- Identify the importance of RP in presentscenario.
- Gain the knowledge on3DP
- Application of 3DP in electronics.
- Minimize various errors that are occurring during conversion of CADmodels.
- Applications ofRP.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
	BLOCKCHAIN TECHNLOGY **Open Elective (OE2)**				

Course Objectives:

The main objectives of this course are:

- Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact withthem,
- Design, build, and deploy smart contracts and distributedapplications,
- Integrate ideas from block chain technology into their ownprojects.

Unit I:

Introduction: Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain.

Evolution of Blockchain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players inMarket.

Unit II:

Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

Unit III:

Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications, Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.

Unit IV:

Ethereum Blockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEtherWallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, OpenZeppelinContracts

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Unit V:
Hyperledger Blockchain Implementation: Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.
Advanced Concepts in Blockchain: Introduction, InterPlanetary File System (IPFS),
Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

TEXT BOOKS:
1) "Blockchain for Enterprise Application Developers", Ambadas, Arshad SarfarzAriff, Sham - Wiley
2) "Mastering Bitcoin: Programming the Open Blockchain", Andreas M. Antonpoulos,O'Reilly

REFERENCES:
1) Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc GrawHill.
2) Blockchain: Blueprint for a New Economy, Melanie Swan,O'Reilly

E-RESOURCES:
https://github.com/blockchainedindia/resources

Course Outcomes:
At the end of this course the student will be able to:
- Demonstrate the foundation of the Block chain technology and understand the processes in payment andfunding.
- Identify the risks involved in building Block chainapplications.
- Review of legal implications using smartcontracts.
- Choose the present landscape of Blockchain implementations and Understand Crypto currencymarkets
- Examine how to profit from trading cryptocurrencies.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - II Semester		L	T	P	C
		3	0	0	3
	CYBER SECURITY & CRYPTOGRAPHY **Open Elective (OE2)**				

Course Objectives:
- Able to identify security risks and take preventive steps
- To understand the forensicsfundamentals.
- To understand the evidence capturingprocess.
- To understand the preservation of digitalevidence.

Unit I : Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector,· Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks,

Unit II: Tools and Methods : Proxy Servers and Anonymizers, Phishing, Password Cracking,· Keyloggers and Spywares,Virus and Worms,· Trojan Horses and Backdoors,· Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow,· Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration

Unit III : Cyber Crime Investigation: Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure ofComputers, Recovering Deleted Evidences, Password Cracking.

Unit IV: Computer Forensics and Investigations: Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools**:** Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics

Unit V: Cyber Crime Legal Perspectives: Introduction,· Cybercrime and the Legal Landscape around the World,The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India,· Consequences of Not Addressing the Weakness in Information Technology Act,· Digital Signatures and the Indian IT Act,· Amendments to the Indian IT Act,· Cybercrime and Punishment,· Cyberlaw, Technology and Students: Indian Scenario**.**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TEXT BOOKS:

1. Sunit Belapure Nina Godbole "Cyber Security: Understanding Cyber Crimes,Computer Forensics and Legal Perspectives", WILEY,2011.
2. NelsonPhillipsandEnfingerSteuart,"ComputerForensicsandInvestigations",Cengage Learning, New Delhi,2009.

REFERENCE BOOKS:

1. Michael T. Simpson, Kent Backman and James E. Corley, "Hands on EthicalHacking and Network Defence", Cengage,2019.
2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3. Alfred Basta, Nadine Basta,Mary Brown and Ravinder Kumar "Cyber Security and Cyber Laws" ,Cengage,2018.

Web References:

1. CERT-In Guidelines- http://www.cert-in.org.in/

2. https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks[OnlineCourse]

3. https://computersecurity.stanford.edu/free-online-videos[Free OnlineVideos]

4. Nickolai Zeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu. License:Creative Commons BY-NC-SA.

Course Outcomes:

At the end of the course, student will be able to

- Explain the computer forensicsfundamentals.
- Describe the types of computer forensicstechnology
- Analyze various computer forensicssystems.
- Illustrate the methods for data recovery, evidence collection and dataseizure.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

OPEN ELECTIVES OFFERED BY ECE

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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	PRINCIPLES OF COMMUNICATION **Open Elective (OE1)**				

Course objectives:

This course will enable students to:

- Understand simple systems for generating and demodulating AM, DSB, SSB andVSB signals
- Understand the concepts in Angle modulation for the design of communicationsystems
- Study simple systems for generating and demodulating frequency modulatedsignals
- Learn the concepts of random process and various types ofnoise.
- Study the performance of the communication system in presence ofnoise.
- Learn pulse modulation and samplingtechniques

UNIT-1

Amplitude modulation: Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector.

Double side band-suppressed carrier modulation: Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing.

Single side–band and vestigial sideband methods ofmodulation: SSB Modulation, VSB Modulation, FrequencyTranslation, Frequency- Division Multiplexing,Theme Example: VSB Transmission of Analog and Digital Television

UNIT-II

Angle modulation: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM StereoMultiplexing,

Phase–Locked Loop: Nonlinear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Super heterodyne Receiver

UNIT-III

Random variables & process: Introduction, Probability, Conditional Probability, Random variables, Several Random Variables. Statistical Averages: Function of a random variable, Moments, Random Processes, Mean, Correlation and Covariance function: Properties of autocorrelation function, Cross–correlation functions.

Noise: Shot Noise, Thermal noise, White Noise, Noise EquivalentBandwidth, Noise Figure.

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UNIT-IV
Noise in analog modulation: Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasise inFM.

UNIT-V
Digital representation of analog signals: Introduction,Why Digitize Analog Sources?, The Sampling process, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, The Quantization Process, Quantization Noise,
Pulse Code Modulation: Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing

Text books:
1. Principles of Communication Systems – H Taub & D. Schilling, GautamSahe, TMH, 2007, 3rdEdition.
2. Communication Systems – B.P. Lathi, BS Publication,2006.

References:
1. Principles of Communication Systems - Simon Haykin, John Wiley,2ndEdition.
2. Electronics & Communication System – George Kennedy and Bernard Davis,TMH 2004.
3. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH,2007.

Course Outcomes:
At the end of the course, students will be able to:
- Analyze the performance of analog modulation schemes in time and frequencydomains.
- Analyze the performance of angle modulatedsignals.
- Characterize analog signals in time domain as random processes andnoise
- Characterize the influence of channel on analog modulatedsignals
- Determine the performance of analog communication systems in terms ofSNR
- Analyze pulse amplitude modulation, pulse position modulation, pulse code modulation and TDM systems.

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EMBEDDED SYSTEMS **Open Elective (OE2)**					

Course Objectives:

The main objectives of this course are given below**:**

- The basic concepts of an embedded system areintroduced.
- The various elements of embedded hardware and their design principles areexplained.
- Different steps involved in the design and development of firmware for embedded systems iselaborated.
- Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design isdiscussed.
- Fundamental issues in hardware software co-design were presented andexplained.
- Familiarize with the different IDEs for firmware development for different family of processors/controllers and embedded operatingsystems.
- Embedded system implementation and testing tools are introduced anddiscussed.

UNIT-I

INTRODUCTION: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT-II

EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT-III

EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versusCross-compiler.

UNIT-IV

REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronisation.

HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware andFirmware.

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UNIT-V:
EMBEDDED SYSTEM DEVELOPMENT, IMPLEMENTATION AND TESTING: The integrated development environment, Types of files generated on cross-compilation, Deassembler/Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Embedded Software development process and tools, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

Text Books:
1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications,2013.
2. Embedded Systems-By Shibu. K.V-Tata McGraw Hill Education Private Limited,2013.

References:
1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications,2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications,2013.

Course Outcomes:
At the end of this course the student can able to:
- Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specificfunction.
- The hardware components required for an embedded system and the design approach of an embeddedhardware.
- The various embedded firmware design approaches on embeddedenvironment.
- Understand how to integrate hardware and firmware of an embedded system using real time operatingsystem.