R K COLLEGE OF ENGINEERING

(Accredited by NAAC with 'A' Grade)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE OUTCOMES (COs)

Course Outcomes (COs) describe what students can able to do after completion of the course.

Program :	Academic Year :	Semester :
B.Tech- Electrical & Electronics Engineering	2023-24	I & II

S.No	Year-Sem	Course Code	Course Name	Course Outcomes After completion of the course student can able to
1	II-I	BSC	Mathematics-IV (Complex Variables And Statistical Methods)	CO1: apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic (L3)
				CO2: find the differentiation and integration of complex functions used in engineering problems (L5)
				CO3: make use of the Cauchy residue theorem to evaluate certain integrals (L3)
				CO4: apply discrete and continuous probability distributions (L3)
				CO5: design the components of a classical hypothesis test (L6)
				CO6: infer the statistical inferential methods based on small and large sampling tests (L4)
2	II-I	PCC	Electronic Devices And Circuits	CO1: Understand the basic concepts of semiconductor physics.
				CO2: 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.
				CO3: Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
				CO4: Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.
				CO5: Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.
				CO6: Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.

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3	II-I	PCC	Electrical Circuit Analysis - II	CO1: Understand the concepts of balanced and unbalanced three-phase circuits.
				CO2: Know the transient behavior of electrical networks with DC excitations.
				CO3: Learn the transient behavior of electrical networks with AC excitations.
				CO4: Estimate various parameters of a two port network.
				CO5: Understand the significance of filters in electrical networks
4	II-I	PCC	DC Machines And Transformers	CO1: Assimilate the concepts of electromechanical energy conversion.
				CO2: Mitigate the ill-effects of armature reaction and improve commutation in dc machines.
				CO3: Understand the torque production mechanism and control the speed of dc motors.
				CO4: Analyze the performance of single phase transformers.
				CO5: Predetermine regulation, losses and efficiency of single phase transformers.
				CO6: Parallel transformers, control voltages with tap changing methods and achieve three-phase to two-phase transformation.
5	II-I	PCC	Electro Magnetic Fields	CO1: Compute electric fields and potentials using Gauss law or solve Laplace's or Poisson's equations for various electric charge distributions.
				CO2: Calculate the capacitance and energy stored in dielectrics.
				CO3: Calculate the magnetic field intensity due to current carrying conductor and understanding the application of Ampere's law, Maxwell's second and third law.
				CO4: Estimate self and mutual inductances and the energy stored in the magnetic field.
				CO5: Understand the concepts of displacement current and Pointing theorem and Pointing vector
6	II-I	PCC	Electrical Circuits Lab	CO1: Apply various theorems
				CO2: Determination of self and mutual inductances
				CO3: Two port parameters of a given electric circuits
				CO4: Draw locus diagrams
				CO5: Draw Waveforms and pharos diagrams for

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				lagging and leading networks
7	II-I	PCC	DC Machines And Transformers Lab	CO1: Determine and predetermine the performance of DC machines and Transformers.
				CO2: Control the speed of DC motor.
				CO3: Obtain three phase to two phase transformation.
8	II-I	PCC	Electronic Devices And Circuits Lab	CO1: Analyze the characteristics of diodes, transistors and other devices
				CO2: Design and implement the rectifier circuits, SCR and UJT in the hardware circuits.
				CO3: Design the biasing and amplifiers of BJT and FET amplifiers
				CO4: Measure electrical quantities using CRO in the experimentation.
9	II-I	SC	Design Of Electrical Circuits Using Engineering Software Tools	CO1: Write the MATLAB programs to simulate the electrical circuit problems
				CO2: Simulate various circuits for electrical parameters
				CO3: Simulate various wave form for determination of wave form parameters
				CO4: Simulate RLC series and parallel resonance circuits for resonant parameters
				CO5: Simulate magnetic circuits for determination of self and mutual inductances
10	II-I	MC	Professional Ethics & Human Values	CO1: Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
				CO2: Identify the multiple ethical interests at stake in a real-world situation or practice.
				CO3: Articulate what makes a particular course of action ethically defensible
				CO4: Assess their own ethical values and the social context of problems
				CO5: 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
				CO6: Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work
				CO7: Integrate, synthesize, and apply knowledge of

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				ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research
11	II-II	ESC	Python Programming	CO1: Develop essential programming skills in computer programming concepts like data types, containers
				CO2: Apply the basics of programming in the Python language
				CO3: Solve coding tasks related conditional execution, loops
				CO4: Solve coding tasks related to the fundamental notions in object- oriented programming
				CO5: Solve coding tasks related to the techniques used in object- oriented programming
12	II-II	PCC	Digital Electronics	CO1: Classify different number systems and apply to generate various codes.
				CO2: Use the concept of Boolean algebra in minimization of switching functions
				CO3: Design different types of combinational logic circuits.
				CO4: Apply knowledge of flip-flops in designing of Registers and counters
				CO5: The operation and design methodology for synchronous sequential circuits and algorithmic state machines.
13	II-II	PCC	Power Systems - I	CO1: Identify the different components of thermal power plants.
				CO2: Identify the different components of nuclear Power plants.
				CO3: Identify the different components of air and gas insulated substations.
				CO4: Identify single core and three core cables with different insulating materials.
				CO5: Analyze the different economic factors of power generation and tariffs.
14	II-II	PCC	Induction And Synchronous	CO1: Explain the operation and performance of three phase induction motor.
				CO2: Analyze the torque-speed relation, performance of induction motor and induction generator.
				CO3: Implement the starting of single phase induction motors.

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			Machines	CO4: Develop winding design and predetermine the regulation of synchronous generators.
				CO5: Explain hunting phenomenon, implement methods of staring and correction of power factor with synchronous motor.
15	II-II	HSMC	Managerial Economics & Financial Analysis	CO1: The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product.
				CO2: The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
				CO3: 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.
				CO4: The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.
				CO5: The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.
16	II-II	ESC	Python Programming Lab	CO1: Write, Test and Debug Python Programs
				CO2: Use Conditionals and Loops for Python Programs
				CO3: Use functions and represent Compound data using Lists, Tuples and Dictionaries
				CO4: Use various applications using python
17	II-II	PCC	Induction And Synchronous Machines Lab	CO1: Assess the performance of single phase and three phase induction motors.
				CO2: Control the speed of three phase induction motor.
				CO3: Predetermine the regulation of three–phase alternator by various methods.
				CO4: Find the Xd/Xq ratio of alternator and asses the performance of three–phase synchronous motor.
				CO5: Determine the performance of single phase AC series motor.
18	II-II	PCC	Digital Electronics Lab	CO1: Learn the basics of gates, filp-flops and counters.
				CO2: Construct basic combinational circuits and verify their functionalities

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				CO3: Apply the design procedures to design basic sequential circuits
				CO4: To understand the basic digital circuits and to verify their operation
				CO5: Apply Boolean laws to simplify the digital circuits.
19	II-II	PCC	Skill Oriented Course IOT Applications Of Electrical Engineering	CO1: Apply various technologies of Internet of Things to real time applications.
				CO2: Apply various communication technologies used in the Internet of Things.
				CO3: Connect the devices using web and internet in the IoT environment.
				CO4: Implement IoT to study Smart Home, Smart city, etc.
20	III-I	PCC	Power Systems-II	CO1: Understand parameters of various types of transmission lines during different operating conditions.
				CO2: Understand the performance of short and medium transmission lines.
				CO3: Understand travelling waves on transmission lines.
				CO4: Understand various factors related to charged transmission lines.
				CO5: Understand sag/tension of transmission lines and performance of line insulators.
21	III-I	PCC	Power Electronics	CO1: Explain the characteristics of various power semiconductor devices and analyze the static and dynamic characteristics of SCR's.
				CO2: Design firing circuits for SCR.
				CO3: Explain the operation of single phase full–wave converters and analyze harmonics in the input current.
				CO4: Explain the operation of three phase full–wave converters.
				CO5: Analyze the operation of different types of DC-DC converters. Explain the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation. Analyze the operation of AC-AC regulators.
22	III-I	PCC	CONTROL SYSTEMS	CO1: Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.

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				CO2: Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
				CO3:Analyze the stability of LTI systems using frequency response methods.
				CO4:Analyze the stability of LTI systems using frequency response methods.
				CO5: Represent physical systems as state models and determine the response. Understand the concepts of controllability and observability.
23	III-I	OEC	Open elective-1 SUSTAINABLE ENERGY TECHNOLOGIES	CO1: Explain the importance of solar energy collection and storage. CO2: CO3: CO4:
				CO2: Apply the principles of wind energy and biomass energy.
				CO3: Analyze knowledge on geothermal and ocean energy.
				CO4: Justify the knowledge about energy efficient systems.
				CO5: Discuss the concepts of green manufacturing systems.
24	III-I	PEC	UTILIZATION OF ELECTRICAL ENERGY (Professional Elective-I)	CO1: Identify various illumination methods produced by different illuminating sources.
				CO2: Identify a suitable motor for electric drives and industrial applications
				CO3: Identify most appropriate heating and welding techniques for suitable applications.
				CO4: Distinguish various traction system and determine the tractive effort and specific energy consumption.
				CO5: Validate the necessity and usage of different energy storage schemes for different applications and comparisons.
25	III-I	PCC	Power Electronics Laboratory	CO1: Study the characteristics of various power electronic devices.
				CO2: Analyze the performance of single–phase and three–phase full–wave bridge converters with both resistive and inductive loads.
				CO3: Understand the operation of single phase AC voltage regulator with resistive and inductive loads.
				CO4: Understand the working of Buck converter, Boost converter.

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				CO5: Understand the working of single–phase square wave inverter and PWM inverter
26	III-I	PCC	Control Systems Laboratory	CO1: Analyze the performance and working Magnetic amplifier, D.C and A.C. servo motors and synchros.
				CO2: Design P,PI,PD and PID controllers
				CO3: Design lag, lead and lag–lead compensators
				CO4: Control the temperature using PID controller
				CO5: Determine the transfer function of D.C Motor
				CO6: Control the performance of D.C and A.C Servo Motor.
				CO7: Test the controllability and observability.
				CO8: Judge the stability in time and frequency domain.
27	III-I	SC	SOFT SKILL COURSE EMPLOYABILITY SKILLS	CO1: Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems
				CO2: Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.
				CO3: Analyze, summarize and present information in quantitative forms including table, graphs and formulas
				CO4: Understand the core competencies to succeed in professional and personal life
				CO5: Learn and demonstrate a set of practical skills such as time management, self-management, handling conflicts, team leadership, etc.
28	III-I	MC	ENVIRONMENTAL SCIENCE	CO1: Overall understanding of the natural resources.
				CO2: Basic understanding of the ecosystem and its diversity.
				CO3: Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
				CO4: An understanding of the environmental impact of developmental activities.
				CO5: Awareness on the social issues, environmental legislation and global treaties.

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29	III-II	PCC	Microprocessors And Microcontrollers	CO1: Understand the Microprocessor capability in general and explore the evaluation of microprocessors.
				CO2: Analyse the instruction sets - addressing modes - minimum and maximum modes operations of 8086 Microprocessors
				CO3: Analyse the Microcontroller and interfacing capability
				CO4: Describe the architecture and interfacing of 8051 controller
				CO5: Know the concepts of PIC micro controller and its programming.
30	III-II	PCC	ELECTRICAL MEASUREMENTS AND INSTRUMENTATIO N	CO1: Know the construction and working of various types of analog instruments.
				CO2: Describe the construction and working of wattmeter and power factor meters.
				CO3: Know the construction and working various bridges for the measurement resistance - inductance and capacitance.
				CO4: Know the operational concepts of various transducers.
				CO5: Know the construction and operation digital meters.
31	III-II	PCC	POWER SYSTEM ANALYSIS	CO1: Draw impedance diagram for a power system network and calculate per unit quantities.
				CO2: Apply the load flow solution to a power system using different methods.
				CO3: Form Zbus for a power system networks and analyse the effect of symmetrical faults.
				CO4: Find the sequence components for power system Components and analyse its effects of unsymmetrical faults.
				CO5: Analyse the stability concepts of a power system.
32	III-II	PEC	SWITCHGEAR AND PROTECTION	CO1: Illustrate the principles of arc interruption for application to high voltage circuit breakers of air - oil - vacuum - SF6 gas type.
				CO2: Analyse the working principle and operation of different types of electromagnetic protective relays.

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				CO3: Acquire knowledge of protective schemes for generator and transformers for different fault conditions.
				CO4: Classify various types of protective schemes used for feeders and bus bar protection and Types of static relays.
				CO5: Analyse the operation of different types of over voltages protective schemes required for insulation co–ordination and types of neutral grounding.
33	III-II	OEC	Open elective-II IOT AND APPLICATIONS	CO1: Understand internet of Things and its hardware and software components.
				CO2: Interface I/O devices, sensors & communication modules.
				CO3: Remotely monitor data and control devices.
				CO4: Design real time IoT based applications
34	III-II	PCC	ELECTRICAL MEASUREMENTS AND INSRUMENTATION LABORATORY	CO1: Know about the phantom loading.
				CO2: Learn the calibration process.
				CO3: Measure the electrical parameters voltage - current - power - energy and electrical characteristics of resistance - inductance and capacitance.
				CO4: Gain the skill knowledge of various brides and their applications.
				CO5: Learn the usage of CT's - PT's for measurement purpose.
				CO6: Know the characteristics of transducers.
				CO7: Measure the strains - frequency and phase difference.
35	III-II	PCC	POWER SYSTEMS AND SIMULATION LAB	CO1: Estimate the sequence impedances of 3-phase Transformer and Alternators
				CO2: Evaluate the performance of transmission lines
				CO3: Analyse and simulate power flow methods in power systems
				CO4: Analyse and simulate the performance of PI controller for load frequency control.
				CO5: Analyse and simulate stability studies of power systems
36	III-II	PCC	MICRO PROCESSORS AND MICRO CONTROLLERS LAB	CO1: Write assembly language program using 8086 microprocessor based on arithmetic - logical - number systems and shift operations.
				CO2: Write assembly language programs for numeric operations and array handling problems.

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				CO3: Write a assembly program on string operations.
				CO4: Interface 8086 with I/O and other devices.
				CO5: Do parallel and serial communication using 8051 & PIC 18 micro controllers.
				CO6: Program microprocessors and microcontrollers for real world applications.
37	III-II	MC	RESEARCH METHODOLOGY	CO1: Understand objectives and characteristics of a research problem
				CO2: Analyze research related information and to follow research ethics.
				CO3: Understand the types of intellectual property rights.
				CO4: Learn about the scope of IPR.
				CO5: Understand the new developments in IPR.
38	III-II	SC	SKILL ADVANCED COURSE MACHINE LEARNING WITH PYTHON	CO1: Illustrate and comprehend the basics of Machine Learning with Python
				CO2: Demonstrate the algorithms of Supervised Learning and be able to differentiate linear and logistic regressions
				CO3: Demonstrate the algorithms of Unsupervised Learning and be able to understand the clustering algorithms
				CO4: Evaluate the concepts of binning, pipeline Interfaces with examples
				CO5: Apply the sentiment analysis for various case studies
39	IV-I	PEC	FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS	CO1: Know the concepts of facts controller and power flow control in transmission line.
				CO2: Demonstrate operation and control of voltage source converter and know the concepts current source converter.
				CO3: Analyse compensation by using different compensators to improve stability and reduce power oscillations in the transmission lines.
				CO4: Know the concepts methods of compensations using series compensators.
				CO5: Analyse operation of Unified Power Flow Controller (UPFC) and Interline power flow controller (IPFC).
				CO6: Able to estimate energy consumption levels at

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				various modes of operation.
40	IV-I	PEC	HYBRID ELECTRIC VEHICLES	CO1: Know the concept of electric vehicles and hybrid electric vehicles.
				CO2: Familiar with different configuration of hybrid electric vehicles.
				CO3: Choose an effective motor for EV and HEV application
				CO4: Understand the power converters used in hybrid electric vehicles
				CO5: Know different batteries and other energy storage systems.
41	IV-I	PEC	SWITCHED MODE POWER CONVERSION	CO1:Design and analyse the operation of non-isolated switch mode converters.
				CO2: Analyze the operation of isolated switch mode converters.
				CO3: Illustrate the operation of resonant converters.
				CO4: Analyse the control schemes of converters and design transformer and inductor.
				CO5: Model the converters and design controller for closed loop operation.
42	IV-I	OEC	Open Elective-III ADDITIVE MANUFACTURING	CO1: Understand the principles of prototyping, classification of RP processes and liquid-based RP systems. CO2: CO3: CO4: CO5:
				CO2: Understand and apply different types of solid-based RP systems.
				CO3: Apply powder-based RP systems
				CO4: Analyze and apply various rapid tooling techniques.
				CO5: Understand different types of data formats and explore the applications of AM processes in various fields.
43	IV-I	OEC	Open Elective-IV BIO MEDICAL INSTRUMENTATION	CO1: Apply principles and concepts of electronics to analyze input and output signals in medical electronics.
				CO2: Apply principles and concepts of electronics to design filters for de-noising of medical measurements
				CO3: Recognize different types of transducers, ongoing progress in improving their design, and their application in medical measurements
				CO4: Apply principles and concepts of engineering to quantify and model measurements of biopotentials

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				CO5: Apply principles and concepts of sensing and engineering to (i) design diagnostic devices for detection of markers in biofluids, and (ii) be able to evaluate quality of diagnostic devices
				CO6: Apply engineering tools to evaluate parameters needed for point-of-care health screening and mobile-health, and design of appropriate point-of-care diagnostic devices
44	IV-I	HSMC	UNIVERSAL HUMAN VALUES-2: UNDERSTANDING HARMONY	CO1: Students will be able to discuss a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
				CO2: to explain (or developing clarity) of the harmony in the human being, family, society and nature/existence.
				CO3: to strengthen self-reflection and to judge the commitment and courage to act.
45	IV-I	SC	SKILL ADVANCED COURSE MACHINE LEARNING WITH PYTHON LAB	CO1: Implement procedures for the machine learning algorithms
				CO2: Design and Develop Python programs for various Learning algorithms
				CO3: Apply appropriate data sets to the Machine Learning algorithms
				CO4: Develop Machine Learning algorithms to solve real world problems

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