R K COLLEGE OF ENGINEERING

(Approved by AICTE, New Delhi & Affiliated to JNTUK, Kakinada & SBTET, Amaravati)
(An ISO 9001:2015 Certified Institution)
Kethanakonda (V), Ibrahimpatnam (M), Vijayawada, AMARAVATI - AP - 521456

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE OUTCOMES (COs)

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

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

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				FET in different configurations.
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

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				CO4: Draw locus diagrams
				CO5: Draw Waveforms and pharos diagrams for 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-II	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

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				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 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.
				CO1: Explain the operation and performance of three phase induction motor.

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14	II-II	PCC	Induction And Synchronous Machines	**CO2:** Analyze the torque-speed relation, performance of induction motor and induction generator.
				CO3: Implement the starting of single phase induction motors.
				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.

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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
				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.
18	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.
19	III-I		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.
20	III-I		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

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				control and harmonic mitigation. Analyze the operation of AC-AC regulators.
21	III-I		Linear IC Applications	**CO1:** Design circuits using operational amplifiers for various applications.
				CO2: Analyze and design amplifiers and active filters using Op-amp.
				CO3: Diagnose and trouble-shoot linear electronic circuits.
				CO4: Understand the gain-bandwidth concept and frequency response of the amplifier configurations.
				CO5: Understand thoroughly the operational amplifiers with linear integrated circuits.
22	III-I		Digital Signal Processing	**CO1:** Understand the concepts of signal processing& transforms.
				CO2: Appraise the Fat Fourier algorithm.
				CO3: Design FIR and IIR filters.
				CO4: Appreciate the concepts of MultiMate signal processing.
23	III-I		Microprocessors And Microcontrollers	**CO1:** Understand the Microprocessor capability in general and explore the evaluation of microprocessors.
				CO2: Understand the addressing modes of Microprocessors
				CO3: Understand the Microcontroller capability.
				CO4: Program Microprocessors and Microcontrollers.
				CO5: Interface Microprocessors and Microcontrollers with other electronic devices. Develop cyber physical systems
24	III-I		Electrical Machines – Ii Laboratory	**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.
25	III-I		Control Systems Laboratory	**CO1:** Analyze the performance and working Magnetic amplifier, D.C and A.C. servo motors and synchros.

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				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.
26	III-I		Electrical Measurements & Instrumentation Laboratory	**CO1:** Measure the electrical parameters voltage, current, power, energy and electrical characteristics of resistance, inductance and capacitance.
				CO2: Known the characteristics of transducers.
				CO 3: Measure the strains, frequency and phase difference.
27	III-I		Socially Relevant Projects	**CO1:** The student(s) are be able to provide a solutions the technological problems of society
				CO2: The student(s) is able suggest technological changes which suits current needs of society
				CO3: The student(s) are able to explain new technologies available for problems of the society.
29	III-II		Electric Drives	**CO1:** Explain the fundamentals of electric drive and different electric braking methods.
				CO2: Analyze the operation of three phase converter fed dc motors and four quadrant operations of dc motors using dual converters.
				CO3: Describe the converter control of dc motors in various quadrants of operation
				CO4: Know the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters.
				CO5: Differentiate the stator side control and rotor side control of three phase induction motor; explain the speed control mechanism of synchronous motors.
30	III-II		Power System Analysis	**CO1:** Draw impedance diagram for a power system network and to understand per unit quantities.
				CO2: Form a Ybus and Zbus for a power system networks.
				CO3: Understand the load flow solution of a power

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				system using different methods.
				CO4: Find the fault currents for all types faults to provide data for the design of protective devices.
				CO5: Find the sequence components of currents for unbalanced power system network.
				CO6: Analyze the steady state, transient and dynamic stability concepts of a power system.
31	III-II		Data Structures	**CO1:** Data structures concepts with arrays, stacks, queues.
				CO2: Linked lists for stacks, queues and for other applications.
				CO3: Traversal methods in the Trees.
				CO4: Various algorithms available for the graphs.
				CO5: Sorting and searching in the data ret retrival applications.
32	III-II		Digital Control Systems	**CO1:** Learn the advantages of discrete time control systems and the "know how" of various associated accessories.
				CO2: Understand z–transformations and their role in the mathematical analysis of different systems (like Laplace transforms in analog systems).
				CO3: learn the stability criterion for digital systems and
				CO4: Methods adopted for testing the same are explained.
				CO5: Understand the conventional and state space methods of design are also introduced.
33	III-II		Digital IC Applications	**CO1:** Understand the structure of commercially available digital integrated circuit families.
				CO2: Learn the IEEE Standard 1076 Hardware Description Language (VHDL).
				CO3: Model complex digital systems at several levels of abstractions, behavioral, structural, simulation, synthesis and rapid system prototyping.
				CO4: Analyze basic digital circuits with combinatorial and sequential logic circuits using VHDL.
				CO5: Design basic digital circuits with combinatorial and sequential logic circuits using VHDL.
				CO1: Know the various fundamentals, architectures and technologies of Internet of Things.

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34	III-II		Internet Of Things Applications To Electrical Engineering	**CO2:** Understand various communication technologies used in the Internet of Things.
				CO3: Understand the various device connectivity methods using web and internet in the IoT environment.
				CO4: Understand various data acquisition methods, data handling using cloud for IoT applications.
				CO5: know the implementation of IoT from the case studies like Smart Home, Smart city, etc.
35	III-II		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.
				CO5: Understand the working of single–phase square wave inverter and PWM inverter
36	III-II		Micro Processors And Micro Controllers Lab	**CO1:** Write assembly language program using 8086 micro based on arithmetic, logical, and shift operations.
				CO2: Interface 8086 with I/O and other devices..
				CO 3: Do parallel and serial communication using 8051 & PIC 18 micro controllers
37	IV-I		Utilization Of Electrical Energy	**CO1:** Able to identify a suitable motor for electric drives and industrial applications.
				CO2: Able to identify most appropriate heating or welding techniques for suitable applications.
				CO3: Able to understand various level of luminosity produced by different illuminating sources.
				CO4: Able to estimate the illumination levels produced by various sources and recommend the most efficient illuminating sources and should be able to design different lighting systems by taking inputs and constraints in view.
				CO5: Able to determine the speed/time characteristics of different types of traction motors.
				CO6: Able to estimate energy consumption levels at various modes of operation.

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38	IV-I		Linear Ic Applications	**CO1:** Design circuits using operational amplifiers for various applications.
				CO2: Analyze and design amplifiers and active filters using Op-amp.
				CO3: Diagnose and trouble-shoot linear electronic circuits.
				CO4: Understand the gain-bandwidth concept of the amplifier configurations.
				CO5: Understand the frequency response of the amplifier configurations.
				CO6: Understand thoroughly the operational amplifiers with linear integrated circuits.
39	IV-I		Power System Operation And Control	**CO1:** Able to compute optimal scheduling of Generators.
				CO2: Able to understand hydrothermal scheduling.
				CO3: Understand the unit commitment problem.
				CO4: Able to understand importance of the frequency.
				CO5: Understand importance of PID controllers in single area and two area systems.
				CO6: Will understand reactive power control and compensation for transmission line.
40	IV-I		Switchgear And Protection	**CO1:** Able to understand the principles of arc interruption for application to high voltage circuit breakers of air, oil, vacuum, SF6 gas type.
				CO2: Ability to understand the working principle and operation of different types of electromagnetic protective relays.
				CO3: Students acquire knowledge of faults and protective schemes for high power generator and transformers.
				CO4: Improves the ability to understand various types of protective schemes used for feeders and bus bar protection.
				CO5: Able to understand different types of static relays and their applications.
				CO6: Able to understand different types of over voltages and protective schemes required for insulation co–ordination.
				CO1: Able to represent various types of signals.

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41	IV-I		Instrumentation (Elective – I)	**CO2:** Acquire proper knowledge to use various types of Transducers
				CO3: Able to monitor and measure various parameters such as strain, velocity, temperature, pressure etc.
				CO4: Acquire proper knowledge and working principle of various types of digital voltmeters.
				CO5: Able to measure various parameter like phase and frequency of a signal with the help of CRO.
				CO6: Acquire proper knowledge and able to handle various types of signal analyzers.
42	IV-I		Special Electrical Machines (Elective – Ii)	**CO1:** Able to represent various types of signals.
				CO2: Acquire proper knowledge to use various types of Transducers
				CO3: Able to monitor and measure various parameters such as strain, velocity, temperature, pressure etc.
				CO4: Acquire proper knowledge and working principle of various types of digital voltmeters.
				CO5: Able to measure various parameter like phase and frequency of a signal with the help of CRO.
				CO6: Acquire proper knowledge and able to handle various types of signal analyzers.
43	IV-I		Electrical Simulation Lab	**CO1:** Able to simulate integrator circuit, differentiator circuit, and PWM inverter.
				CO2: Able to simulate Boost converter and PWM inverter.
				CO3: Able to simulate Buck converter, full convertor and PWM inverter.
				CO4: Able to simulate integrator full convertor and PWM inverter.
				CO5: Able to simulate transmission line by incorporating line, load and transformer models
				CO6: Able to perform transient analysis of RLC circuit and single machine connected to infinite bus(SMIB).
44	IV-I		Power Systems Lab	**CO1:** The student is able to determine the parameters of various power system components which are frequently occur in power system studies.
				CO 2: Execute energy management systems functions at load dispatch center.

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45	IV-II		Digital Control Systems	**CO1:** The students learn the advantages of discrete time control systems and the "know how" of various associated accessories.
				CO2: The learner understand z–transformations.
				CO3: The learner understand z–transformations role in the mathematical analysis of different systems (like Laplace transforms in analog systems).
				CO4: The stability criterion for digital systems are explained.
				CO5: The methods adopted for testing digital systems are explained.
				CO6: Finally, the conventional and state space methods of design are also introduced.
46	IV-II		H.V.D.C. Transmission	**CO1:** Learn different types of HVDC levels and basic concepts
				CO2: Know the operation of converters
				CO3: Acquire control concept of reactive power control and AC/DC load flow.
				CO4: Understand converter faults, protection and harmonic effects
				CO5: Design low pass filters
				CO6: Design high pass filters
47	IV-II		Electrical Distribution Systems	**CO1:** Able to understand various factors of distribution system.
				CO2: Able to design the substation and feeders.
				CO3: Able to determine the voltage drop and power loss
				CO4: Able to understand the protection and its coordination.
				CO5: Able to understand the effect of compensation for p.f improvement.
				CO6: Able to understand the effect of voltage control
48	IV-II		Flexible Alternating Current Transmission Systems	**CO1:** Understand power flow control in transmission lines using FACTS controllers.
				CO2: Explain operation and control of voltage source converter.
				CO3: Analyze compensation methods to improve stability and reduce power oscillations in the transmission lines.

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				CO4: Explain the method of shunt compensation using static VAR compensators.
				CO5: Understand the methods of compensations using series compensators.
				CO6: Explain operation of Unified Power Flow Controller (UPFC).
49	IV-II		Seminar	**CO1:** Present information on new problems, identify and define the appropriate requirements for its solutions.
				CO2: Present the impact of engineering solutions.
				CO3: Present how to complete a common goal
50	IV-II		Project	**CO1:** Analyze new problems, identify and define the appropriate requirements for its solutions.
				CO2: Understand of the impact of engineering solutions.
				CO3: Understand team work to complete a common goal

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