Electrical and Electronics Engineering

SEM	COURSE	COURSE OUTCOMES	BLOOMS TAXONOMY LEVEL
SEM I	**HS3152: Professional English - I**	CO1: To use appropriate words in a professional context	K3
		CO2: To gain understanding of basic grammatic structures and use them in right context.	K2
		CO3: To read and infer the denotative and connotative meanings of technical texts	K2
		CO4: To write definitions, descriptions, narrations and essays on various topics	K6
	MA3151: Matrices and Calculus	CO1: Use the matrix algebra methods for solving practical problems.	K3
		CO2: Apply differential calculus tools in solving various application problems.	K3
		CO3: Able to use differential calculus ideas on several variable functions.	K3
		CO4: Apply different methods of integration in solving practical problems.	K3
		CO5: Apply multiple integral ideas in solving areas, volumes and other practical problems.	K3
	PH3151: Engineering Physics	CO1: Understand the importance of mechanics.	K2
		CO2: Express their knowledge in electromagnetic waves.	K1
		CO3: Demonstrate a strong foundational knowledge in oscillations, optics and lasers.	K1
		CO4: Understand the importance of quantum physics.	K2
		CO5: Comprehend and apply quantum mechanical principles towards the formation of energy bands.	K3
	CY3151: Engineering Chemistry	CO1: To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.	K2
		CO2: To identify and apply basic concepts of nanoscience and nanotechnology in designing thesynthesis of nanomaterials for engineering and technology applications.	K3
		CO3: To recommend suitable fuels for engineering processes and applications.	K6
		CO4: To recognize different forms of energy resources and apply them for suitable applications in energy sectors.	K1
		CO5: To apply the knowledge of phase rule and composites for material selection requirements.	K3

	GE3151: Problem Solving and Python Programming	CO1: Develop algorithmic solutions to simple computational problems.	K6
		CO2: Develop and execute simple Python programs.	K6
		CO3: Write simple Python programs using conditionals and loops for solving problems.	K6
		CO4: Decompose a Python program into functions.	K6
		CO5: Represent compound data using Python lists, tuples, dictionaries etc.	K6
	GE3171: Problem Solving and Python Programming Laboratory	CO1: Develop algorithmic solutions to simple computational problems	K6
		CO2: Develop and execute simple Python programs.	K6
		CO3: Implement programs in Python using conditionals and loops for solving problems.	K6
		CO4: Deploy functions to decompose a Python program.	K6
		CO5: Process compound data using Python data structures.	
	BS3171: Physics and Chemistry Laboratory	CO1: Understand the functioning of various physics laboratory equipment.	K2
		CO2: Use graphical models to analyze laboratory data.	K3
		CO3: Use mathematical models as a medium for quantitative reasoning and describing physical reality.	K3
		CO4: Access, process and analyze scientific information.	K4
	GE3172: English Laboratory	CO1: To listen to and comprehend general as well as complex academic information	K5
		CO2: To listen to and understand different points of view in a discussion	K2
		CO3: To speak fluently and accurately in formal and informal communicative contexts	K3
		CO4: To describe products and processes and explain their uses and purposes clearly and accurately	K3
		CO5: To express their opinions effectively in both formal and informal discussions	K1
SEM II	**HS3252 : Professional English - II**	CO1: To compare and contrast products and ideas in technical texts.	K3
		CO2: To identify and report cause and effects in events, industrial processes through technical texts	K1

		CO3: To analyse problems in order to arrive at feasible solutions and communicate them in the written format.	K4
		CO4: To present their ideas and opinions in a planned and logical manner	K5
		CO5: To draft effective resumes in the context of job search.	K3
	MA3251 : Statistics and Numerical Methods	CO1: Apply the concept of testing of hypothesis for small and large samples in real life problems.	K3
		CO2: Apply the basic concepts of classifications of design of experiments in the field of agriculture.	K6
		CO3: Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.	K3
		CO4: Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.	K2
		CO5: Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.	K3
	PH3202 PHYSICS FOR ELECTRICAL ENGINEERING	CO1: know basics of dielectric materials and insulation.	K3
		CO2: gain knowledge on the electrical and magnetic properties of materials and their applications	K1
		CO3: understand clearly of semiconductor physics and functioning of semiconductor devices	K2
		CO4: understand the optical properties of materials and working principles of various optical devices	K2
		CO5: appreciate the importance of nanotechnology and nanodevices	K5
	BE3255 BASIC CIVIL AND MECHANICAL ENGINEERING	CO1: Understanding profession of Civil and Mechanical engineering.	K2
		CO2: Summarise the planning of building, infrastructure and working of Machineries.	K6
		CO3: Apply the knowledge gained in respective discipline	K1
		CO4: Illustrate the ideas of Civil and Mechanical Engineering applications.	K4
		CO5: Appraise the material, Structures, machines and energy	K6
	GE3251 : Engineering Graphics	CO1: Use BIS conventions and specifications for engineering drawing.	K3
		CO2: Construct the conic curves, involutes and cycloid.	K6
		CO3: Solve practical problems involving projection of lines.	K2
		CO4: Draw the orthographic, isometric and perspective projections of simple solids.	K6

	EE3251 ELECTRIC CIRCUIT ANALYSIS	CO1: Explain circuit behavior using circuit laws.	K1
		CO2: Apply mesh analysis, nodal analysis, and network theorems to determine the behavior of DC and AC circuits.	K3
		CO3: Compute the transient response of first-order and second-order systems to step and sinusoidal input.	K5
		CO4: Compute power, line/phase voltages, and currents in three-phase circuits.	K3
		CO5: Explain the frequency response of series and parallel RLC circuits.	K1
		CO6: Explain the behavior of magnetically coupled circuits.	K1
	GE3271 : Engineering Practices Laboratory	**CO1:** Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.	K6
		CO2: Wire various electrical joints in common household electrical wire work.	K6
		CO3: Weld various joints in steel plates using arc welding work; Machine various simple processes	K6
		CO4: Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.	K6
	GE3272 : Communication Laboratory / Foreign Language	CO1: Speak effectively in group discussions held in formal/semi formal contexts.	K6
		CO2: Discuss, analyse and present concepts and problems from various perspectives to arrive at SUITABLE SOLUTIONS	K4
		CO3: Write emails, letters and effective job applications.	K6
		CO4: Write critical reports to convey data and information with clarity and precision	K6
		CO5: Give appropriate instructions and recommendations for safe execution of task	K3
SEM III	**MA3303 PROBABILITY AND COMPLEX FUNCTIONS**	CO1: Understand the fundamental concepts of probability and the knowledge of standard distributions that describe real-life phenomena.	K1
		CO2: Understand the basic concepts of one- and two-dimensional random variables and apply them in engineering applications.	K2
		CO3: Develop an understanding of the standard techniques of complex variable theory, particularly analytic functions and their mapping properties.	K6
		CO4: Familiarize with complex integration techniques and contour integration techniques for use in evaluating real integrals.	K3

		CO5: Acquaint with differential equations significantly used in engineering problems.	K3
	EE3301 ELECTROMAGNETIC FIELDS	CO1: Visualize and explain Gradient, Divergence, and Curl operations on electromagnetic vector fields, and identify electromagnetic sources and their effects.	K1
		CO2: Compute and analyze electrostatic fields, electric potential, energy density, along with their applications.	K4
		CO3: Compute and analyze magnetostatic fields, magnetic flux density, vector potential, along with their applications.	K4
		CO4: Explain different methods of EMF generation and Maxwell's equations.	K1
		CO5: Explain the concept of electromagnetic waves and characterizing parameters.	K1
	EE3302 DIGITAL LOGIC CIRCUITS	CO1: Explain various number systems and characteristics of digital logic families.	K1
		CO2: Apply K-maps and Quine McCluskey methods to simplify given Boolean expressions.	K3
		CO3: Explain the implementation of combinational circuits such as multiplexers, demultiplexers, code converters, adders, subtractors, encoders, and decoders.	K1
		CO4: Design various synchronous and asynchronous circuits using flip-flops.	K6
		CO5: Explain asynchronous sequential circuits and programmable logic devices.	K1
		CO6: Use VHDL for simulating and testing RTL, combinational, and sequential circuits.	K3
	EC3301 ELECTRONIC DEVICES AND CIRCUITS	CO1: Explain the structure and operation of PN junction devices (diode, Zener diode, LED, and laser diode).	K1
		CO2: Design clipper, clamper, half-wave and full-wave rectifier, and regulator circuits using PN junction diodes.	K6
		CO3: Analyze the structure and characteristics of BJT, FET, MOSFET, UJT,Thyristor, and IGBT.	K4
		CO4: Analyze the performance of various configurations of BJT- and MOSFET-based amplifiers.	K4
		CO5: Explain the characteristics of MOS-based cascade and differential amplifiers.	K1
		CO6: Explain the operation of various feedback amplifiers and oscillators.	K1
	EE3303 ELECTRICAL MACHINES - I	CO1: Apply the laws governing electromechanical energy conversion for singly and multiple excited systems.	K3
		CO2: Explain the construction and working principle of DC machines.	K1

		CO3: Interpret various characteristics of DC machines.	K2
		CO4: Compute various performance parameters of machines by conducting suitable tests.	K1
		CO5: Draw the equivalent circuit of a transformer and predetermine its efficiency and regulation.	K3
		CO6: Describe the working principle of autotransformers and three-phase transformers with different types of connections.	K1
	CS3353 C PROGRAMMING AND DATA STRUCTURES	CO1: Develop C programs for any real- world or technical application.	K6
		CO2: Apply advanced features of C in solving problems.	K3
		CO3: Write functions to implement linear and non-linear data structure operations.	K6
		CO4: Suggest and use appropriate linear or non-linear data structure operations for solving a given problem.	K3
		CO5: Appropriately use sort and search algorithms for a given application.	K3
		CO6: Apply appropriate hash functions that result in a collision-free scenario for data storage and retrieval.	K3
	EC3311 ELECTRONIC DEVICES AND CIRCUITS LABORATORY	CO1: Analyze the characteristics of PN, Zener diode, and BJT in CE, CC, CB configurations experimentally.	K4
		CO2: Analyze the characteristics of JFET and UJT experimentally.	K4
		CO3: Analyze the frequency response characteristics of a common emitter amplifier experimentally.	K4
		CO4: Analyze the characteristics of RC phase shift and LC oscillators experimentally.	K4
		CO5: Analyze the characteristics of half- wave and full-wave rectifiers with and without filters experimentally.	K4
		CO6: Analyze the characteristics of a FET-based differential amplifier experimentally.	K4
		CO7: Calculate the frequency and phase angle using CRO experimentally.	
		CO8: Analyze the frequency response characteristics of passive filters experimentally.	K4
	CS3362 C PROGRAMMING AND DATA STRUCTURES LABORATORY	CO1: Use different constructs of C and develop applications.	K3
		CO2: Write functions to implement linear and non-linear data structure operations.	K6
		CO3: Suggest and use appropriate linear or non-linear data structure operations for a given problem.	K3
		CO4: Apply appropriate hash functions that result in a collision-free scenario for data storage and retrieval.	K3

		CO5: Implement sorting and searching algorithms for a given application.	K3
	GE3361 PROFESSIONAL DEVELOPMENT	CO1: Use MS Word to create quality documents by structuring and organizing content for day-to-day technical and academic requirements.	K3
		CO2: Use MS Excel to perform data operations and analytics, record and retrieve data as per requirements, and visualize data for ease of understanding.	K3
		CO3: Use MS PowerPoint to create high- quality academic presentations by including tables, charts, graphs, interlinking elements, and using media objects.	K3
SEM IV	**GE3451 ENVIRONMENTAL SCIENCES AND SUSTAINABILITY**	CO1: Recognize and understand the functions of the environment, ecosystems, biodiversity, and their conservation.	K1
		CO2: Identify the causes and effects of environmental pollution and natural disasters, and contribute to preventive measures in society.	K1
		CO3: Identify and apply the understanding of renewable and non-renewable resources and contribute to sustainable measures to preserve them for future generations.	K1
		CO4: Recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.	K1
		CO5: Demonstrate knowledge of sustainability practices and identify green materials, energy cycles, and the role of sustainable urbanization.	K1
	EE3401 TRANSMISSION AND DISTRIBUTION	CO1: Understand the structure of the power system and computation of transmission line parameters for different configurations.	K2
		CO2: Model the transmission lines to determine line performance and understand the impact of the Ferranti effect and corona on line performance.	K2
		CO3: Perform mechanical design of transmission lines, grounding, and understand the role of insulators in the transmission system.	K6
		CO4: Design underground cables and understand the performance analysis of underground cables.	K6
		CO5: Understand the modeling, performance analysis, and modern trends in the distribution system.	K2
	EE3402 LINEAR INTEGRATED CIRCUITS	CO1: Explain monolithic IC fabrication process	K1
		CO2: Explain the fabrication of diodes, capacitance, resistance, FETs and PV Cell.	K1

		CO3: Analyze the characteristics and basic applications (inverting/non-inverting amplifier, summer, differentiator, integrator, V/I and I/V converter) of Op-Amp	K4
		CO4: Explain circuit and applications of op- amp based instrumentation amplifier, log/antilog amplifier, analog multiplier /divider, active filters, comparators, waveform generators, A/D and D/A converters	K1
		CO5: Explain Functional blocks, characteristics and applications of Timer, PLL, analog multiplier ICs.	K1
		CO6 :Explain the applications of ICs in Instrumentation amplifier, fixed and variable voltage regulator, SMPS and function generator	K1
	EE3403 MEASUREMENTS AND INSTRUMENTATION	CO1: Ability to understand the fundamental art of measurement in engineering.	K2
		CO2: Ability to understand the structural elements of various instruments.	K2
		CO3: Ability to understand the importance of bridge circuits.	K2
		CO4: Ability to understand about various transducers and their characteristics by experiments.	K2
		CO5: Ability to understand the concept of digital instrumentation and virtual instrumentation	K2
	EE3404 MICROPROCESSOR AND MICROCONTROLLER	CO1: Ability to write assembly language program for microprocessor and microcontroller	K6
		CO2: Ability to design and implement interfacing of peripheral with microprocessor and microcontroller	K6
		CO3: Ability to analyze, comprehend, design and simulate microprocessor based systems used for control and monitoring	K4
		CO4: Ability to analyze, comprehend, design and simulate microcontroller based systems used for control and monitoring	K4
		CO5: Ability to understand and appreciate advanced architecture evolving microprocessor field	K2
	EE3405 ELECTRICAL MACHINES - II	CO1: Ability to understand the construction and working principle of Synchronous generator	K2
		CO2: Ability to understand the construction and working principle of Synchronous Motor	K2

		CO3: Ability to understand the construction and working principle of Three Phase Induction Motor	K2
		CO4: Acquire knowledge about the starting and speed control of induction motors	K1
		CO5: To gain knowledge about the basic principles and working of Single phase induction motors and Special Electrical Machine	K1
	EE3412 LINEAR AND DIGITAL CIRCUITS LABORATORY	CO1: Ability to understand and implement Boolean Functions	K2
		CO2: Ability to understand the importance of code conversion	K2
		CO3: Ability to design and implement circuits with digital ICs like decoders, multiplexers, registers	K6
		CO4: Ability to acquire knowledge on Application of Op-Amp	K1
		CO5: Ability to design and implement counters using analog ICs like timers, VCOs and digital ICs like Flip-flops and counters	K6
	EE3413 MICROPROCESSOR AND MICROCONTROLLER LABORATORY	CO1: Ability to write assembly language program for microprocessor	K6
		CO2: Ability to write assembly language program for microcontroller	K6
		CO3: Ability to design and implement interfacing of peripheral with microprocessor and microcontroller	K6
		CO4: Ability to analyze, comprehend, design and simulate microprocessor based systems used for control and monitoring	K4
		CO5: Ability to analyze, comprehend, design and simulate microcontroller based systems used for control and monitoring	K4
	EE3501: POWER SYSTEM ANALYSIS	**CO1:** Ability to model the power system under steady state operating condition.	K6
		CO2: Ability to carry out power flow analysis.	K6
SEM V		**CO3:**Ability to infer the significance of short circuit studies in designing circuit breakers.	K6
		CO4: Ability to analyze the state of the power system for various unsymmetrical faults.	K4
		CO5: Ability to analyze the stability of power system using different methods.	K4

	EE3591: POWER ELECTRONICS	**CO1:** Understand the operation of semiconductor devices and their dynamic characteristics, and design & analyze low power SMPS.	K4
		CO2: Analyze various uncontrolled rectifiers and design suitable filter circuits.	K4
		CO3: Analyze the operation of n-pulse converters and evaluate their performance parameters.	K4
		CO4: Understand various PWM techniques and apply voltage control and harmonic elimination methods to inverter circuits.	K2
		CO5: Understand the operation of AC voltage controllers and their applications.	K2
	EE3503: CONTROL SYSTEMS	**CO1** Represent simple systems in transfer function and state variable forms.	K3
		CO2 Analyze simple systems in time domain.	K4
		CO3 Analyze simple systems in frequency domain.	K4
		CO4 Infer the stability of systems in time and frequency domain.	K2
		CO5 Interpret characteristics of the system and find out solutions for simple control problems.	K2
	EE3511: POWER ELECTRONICS LABORATORY	**CO1** Determine the characteristics of SCR, IGBT, TRIAC, MOSFET, and IGBT.	K6
		CO2 Find the transfer characteristics of full converter, semi converter, step-up, and step-down choppers through simulation experimentation.	K6
		CO3 Analyze the voltage waveforms for PWM inverters using various modulation techniques.	K4
		CO4 Design and experimentally verify the performance of basic DC/DC converter topologies used for SMPS.	K6
		CO5 Understand the performance of AC voltage controllers through simulation and experimentation.	K2

	EE3512: CONTROL AND INSTRUMENTATION LABORATORY	**CO1:** To model and analyze simple physical systems and simulate the performance in analog and digital platform.	K4
		CO2: To design and implement simple controllers in standard forms.	K6
		CO3: To design compensators based on time and frequency domain specifications.	K6
		CO4: To design a complete closed control loop and evaluate its performance for simple physical systems.	K5
		CO5: To analyze the stability of a physical system in both continuous and discrete domains.	K4
	EE3001: UTILIZATION AND CONSERVATION OF ELECTRICAL ENERGY	**CO1:** Ability to choose suitable electric drives for different applications.	K1
		CO2: Ability to design the illumination systems for energy saving.	K6
		CO3: Ability to demonstrate the utilization of electrical energy for heating and welding purposes.	K1
		CO4: Ability to know the effective usage of solar and wind energies for electrical applications.	K6
		CO5: Ability to do electric connection for any domestic appliance like refrigerator, battery charging circuit for a specific household application.	K3
		CO6: To illustrate the need for energy conservation and to simulate three phase power control.	K1
	EE3004: HVDC AND FACTS	**CO1:** To identify and understand the problems in AC transmission systems and understand the need for Flexible AC transmission systems and HVDC Transmission.	K1
		CO2: To understand the operation and control of SVC and TCSC and its applications to enhance the stability and damping.	K2

		CO3: To analyze basic operation and control of voltage source converter based FACTS controllers.	K4
		CO4: To demonstrate basic operation and control of Line Commutated HVDC Transmission.	K1
		CO5: To explain the d-q control based operation of VSC based HVDC Transmission.	K1
SEM VI	**EE3006: POWER QUALITY**	**CO1:** Use various definitions of power quality for power quality issues.	K3
		CO2: Describe the concepts related with single phase / three phase, linear / nonlinear loads and single phase / three phase sinusoidal, non-sinusoidal source.	K2
		CO3: Solve problems related with mitigation of Power System Harmonics.	K3
		CO4: Use DSTATCOM for load compensation.	K3
		CO5: Demonstrate the role of DVR, SAFs, and UPQC in power distribution systems.	K1
	EE3601: PROTECTION AND SWITCHGEAR	**CO1:** Understand and select proper protective scheme and type of earthing.	K2
		CO2: Explain the operating principles of various relays.	K1
		CO3: Suggest suitable protective scheme for the protection of various power system apparatus.	K1
		CO4: Analyze the importance of static relays and numerical relays in power system protection.	K4
		CO5: Summarize the merits and demerits and application areas of various circuit breakers.	K2
	EE3602: POWER SYSTEM OPERATION AND CONTROL	**CO1:** Understand the day-to-day operation of power system.	K2
		CO2: Model and analyse the control actions that are implemented to meet the minute-to-minute variation of system real power demand.	K4
		CO3: Model and analyze the compensators for reactive power control and various devices used for voltage control.	K4

		CO4: Prepare day-ahead and real-time economic generation scheduling.	K6
		CO5: Understand the necessity of computer control of power systems.	K2
	EE3611: POWER SYSTEM LABORATORY	**CO1:** Model and analyze the performance of the transmission lines.	K4
		CO2: Perform power flow, short circuit, and stability analysis for any power system network.	K3
		CO3: Understand, design, and analyze the load frequency control mechanism.	K4
		CO4: Perform optimal scheduling of generators and compute the state of the power system.	K3
		CO5: Understand, analyze, and apply the relays for power system protection.	K4
	EE3007: SMART GRID	**CO1:** To be able to understand the importance and objectives of Power grid	K2
		CO2: To be able to know and understand the concept of a smart grid.	K2
		CO3: To identify and discuss smart metering devices and associated technologies.	K1
		CO4: To be able to get an overview of Microgrid and Electric Vehicle Technology.	K6
		CO5: To be able to have an up-to-date knowledge on the various computing technologies; to understand the role of Big Data and IoT for effective and efficient operation of Smart Grid.	K2
	EE3033: HYBRID ENERGY TECHNOLOGY	**CO1:** Analyze the impacts of hybrid energy technologies on the environment and demonstrate their application to harness electrical power.	K4
		CO2: Select a suitable electrical machine for Wind Energy Conversion Systems and simulate the wind energy conversion system.	K5
		CO3: Design power converters such as AC- DC, DC-DC, and AC-AC converters for SPV systems.	K6
		CO4: Analyze power converters such as AC-DC, DC-DC, and AC-AC converters for hybrid energy systems.	K4
		CO5: Interpret the functioning and integration of hybrid renewable energy systems.	K2

	EE3003: SUBSTATION ENGINEERING AND AUTOMATION	**CO1:** Understand the key deciding factors involved in substation design and operation.	K2
		CO2: Know about the sizing and selection of equipment which forms part of a substation.	K2
		CO3: Know about composite layout design aspects of the substation with different services and the challenges including statutory clearances.	K6
		CO4: Understand the interdisciplinary aspects involved in substation design.	K2
		CO5: Understand different protection and control schemes involved in substation design.	K2
		CO6: Know about substation automation systems and different communication protocols involved for efficient operation of a substation.	K2
	OCS351: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FUNDAMENTALS	**CO1:** Understand the foundations of AI and the structure of intelligent agents.	K2
		CO2: Use appropriate search algorithms for any AI problem.	K3
		CO3: Study various learning methods.	K1
		CO4: Solve problems using supervised learning.	K3
		CO5: Solve problems using unsupervised learning.	K3
SEM VII	**EE3701: HIGH VOLTAGE ENGINEERING**	**CO1:** Explain various overvoltages and their effects on power systems.	K1
		CO2: Understand the breakdown phenomena in different media under uniform and non-uniform fields.	K2
		CO3: Explain the methods of generating and measuring high DC, AC, and impulse voltages and currents.	K1
		CO4: Suggest and conduct suitable high- voltage testing of electrical power apparatus as per standards.	K6
		CO5: Explain the industrial applications of electrostatic fields.	K1
	GE3791: HUMAN VALUES AND ETHICS	**CO1:** Identify the importance of democratic, secular, and scientific values in the harmonious functioning of social life.	K1
		CO2: Practice democratic and scientific values in both personal and professional life.	K6
		CO3: Find rational solutions to social problems.	K1

		CO4: Behave in an ethical manner in society.	K4
		CO5: Practice critical thinking and the pursuit of truth.	K5
	EE3005: ENERGY MANAGEMENT AND AUDITING	**CO1:** Acquire knowledge in the field of energy management and auditing process.	K1
		CO2: Understand the basic concepts of economic analysis and load management.	K2
		CO3: Design effective thermal utility systems.	K6
		CO4: Improve the efficiency of compressed air systems.	K6
		CO5: Apply design concepts in the field of lighting systems, light sources, and various forms of cogeneration.	K6
	OCS352: IoT CONCEPTS AND APPLICATIONS	**CO1:** Explain the concept of IoT.	K1
		CO2: Understand the communication models and various protocols for IoT.	K2
		CO3: Design portable IoT systems using Arduino, Raspberry Pi, or open platforms.	K6
		CO4: Apply data analytics and utilize cloud offerings related to IoT.	K3
		CO5: Analyze applications of IoT in real- time scenarios.	K4
	OEI353: INTRODUCTION TO PLC PROGRAMMMING	**CO1:** Know the basic requirements of PLC input/output devices and architecture. *(L1)*	K2
		CO2: Apply basic instruction sets used for Ladder Logic and Function Block programming. *(L2)*	K3
		CO3: Design PLC programs using timers, counters, arithmetic, and logic instructions for Ladder Logic and Function Blocks. *(L3)*	K6
		CO4: Develop PLC logic for specific real- world applications. *(L5)*	K6
		CO5: Understand the concepts of communication used in PLC/SCADA systems. *(L1)*	K2
	OMR353: SENSORS	**CO1:** Understand various sensor effects, sensor characteristics, signal types, calibration methods, and obtain transfer functions and empirical relations of sensors; analyze sensor response.	K4

		CO2: Analyze and select suitable sensors for displacement, proximity, and range measurements.	K4
		CO3: Analyze and select suitable sensors for force, magnetic field, speed, position, and direction measurements.	K4
		CO4: Analyze and select suitable sensors for light detection, pressure, and temperature measurements; gain familiarity with miniaturized smart sensors.	K4
		CO5: Select and design suitable signal conditioning circuits with proper compensation and linearizing elements based on sensor outputs.	K6
SEM VIII	**EE3811: PROJECT WORK / INTERNSHIP**	**CO1:** Ability to identify, formulate, design, interpret, analyze, and provide solutions to complex engineering and societal issues by applying knowledge of basic science and engineering.	K4
		CO2: Ability to choose, conduct, and demonstrate sound technical knowledge of selected project topics in power components, protection, high voltage, electronics, process automation, power electronics, drives, instrumentation, and control by exploring suitable engineering and IT tools.	K1
		CO3: Ability to understand, formulate, and propose new learning algorithms to solve engineering and societal problems of moderate complexity through multidisciplinary projects, with an understanding of and commitment to sustainable development.	K2
		CO4: Ability to demonstrate teamwork, prepare reports, communicate effectively, and function as a member or leader while adhering to ethical responsibilities.	K1
		CO5: Ability to acknowledge the value of lifelong learning and stay updated with technological advancements.	K1