2.6.1 Programme Outcomes (POs) and Course Outcomes (COs) for all Programmes offered by the Institution are stated and displayed on website and attainment of POs and COs are evaluated.

PO.1.Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO.2.Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO.3.Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO.4.Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO.5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO.6.The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO.7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO.8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO.9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO.10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO.11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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PO.12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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NAAC "B++" Accredited Institute
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Electrical & Electronics Engineering I & II SEM Course Outcomes For the A.Y 2022-23

S.no	Year/Sem	Course Name	Course Outcomes
1	II-I	Engineering Mechanics	CO1: Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces.
			CO2: Solve problem of bodies subjected to friction
			CO3: Find the location of centroid and calculate moment of inertia of a given section
			CO4: Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.
			CO5:Solve problems using work energy equations for translation, fixed axis rotation and plane
			CO6:motion and solve problems of vibration.
2	II-I	Electrical Circuit Analysis	CO1: Apply network theorems for the analysis of electrical circuits
			CO2; Obtain the transient and steady-state response of electrical circuits.
			CO3: Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
			CO4: Analyze two port circuit behavior
3	II-I	Analog Electronics	CO1: Know the characteristics, utilization of various components
			CO2: Understand the biasing techniques Design and analyze various rectifiers, small signal amplifier circuits
			CO3: Design sinusoidal and non-sinusoidal oscillators
			CO4:A thorough understanding, functioning of OP-AMP, design OP-AMP based circuits with linear integrated circuits
4	II-I	Electrical Machines-I	CO1: Identify different parts of a DC machine & understand its operation Carry out different testing methods to predetermine the efficiency of DC machines
			CO2:Understand different excitation and starting methods of DC machines
			CO3:Control the voltage and speed of a DC machines
			CO4:Analyze single phase and three phase transformers circuits

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5	II-I	Electro Magnetic Field	**CO1**: Understand the basic laws of electromagnetism
			CO2: Obtain the electric and magnetic fields for simple configurations under static conditions
			CO3: Analyze time varying electric and magnetic fields
			CO4: Understand Maxwell's equation in different forms and different media
			CO5: Understand the propagation of EM waves
6	II-I	ELECTRICAL MACHINES LAB	CO1:to Start and control the Different DC Machines
			CO2;Assess the performance of different machines using different testing methods
			CO3:Identify different conditions required to be satisfied for self - excitation of DC Generators
			CO4:Separate iron losses of DC machines into different components
7	II-I	ANALOG ELECTRONICS LAB	CO1: Know the characteristics, utilization of various components
			CO2 :Understand the biasing techniques
			CO3:Design and analyze various rectifiers, small signal amplifier circuits
			CO4:Design sinusoidal and non-sinusoidal oscillators
			CO5:A thorough understanding, functioning of OP-AMP, design OP-AMP based circuits with linear integrated circuits
8	II-I	ELECTRICAL CIRCUITS LAB	CO1:Analyze complex DC and AC linear circuits
			CO2:Apply concepts of electrical circuits across engineering
			CO3:Evaluate response in a given network by using theorems
9	II-II	LAPLACE TRANSFORMS, NUMERICAL METHODS AND COMPLEX VARIABLES	CO1:Use the Laplace transforms techniques for solving ODE's
			CO2:Find the root of a given equation.
			CO3:Estimate the value for the given data using interpolation
			CO4:Find the numerical solutions for a given ODE's
			CO5:Analyze the complex function with reference to their analyticity, integration using Cauchy's
			CO6:integral and residue theorems Taylor's and Laurent's series expansions of complex function

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10	II-II	ELECTRICAL MACHINES – II:	CO1: Understand the concepts of rotating magnetic fields
			CO2:Understand the operation of ac machines.
			CO3:Analyze performance characteristics of ac machines
11	II-II	DIGITAL ELECTRONICS	CO1:Understand working of logic families and logic gates
			CO2:Design and implement Combinational and Sequential logic circuits
			CO3:Understand the process of Analog to Digital conversion and Digital to Analog conversion
			CO4:Be able to use PLDs to implement the given logical problem.
12	II-II	CONTROL SYSTEMS	CO1:Understand the modeling of linear-time-invariant systems using transfer function and statespace representations
			CO2:Understand the concept of stability and its assessment for linear-time invariant systems
			CO3:Design simple feedback controllers.
13	II-II	POWER SYSTEM - I	CO1:Understand the concepts of power systems
			CO2:Understand the operation of conventional generating stations and renewable sources of electrical power.
			CO3:Evaluate the power tariff method
			CO4:Determine the electrical circuit parameters of transmission lines
			CO5:Understand the layout of substation and underground cables and corona
14	II-II	DIGITAL ELECTRONICS LAB	CO1:Understand working of logic families and logic gates
			CO2:Design and implement Combinational and Sequential logic circuits
			CO3:Understand the process of Analog to Digital conversion and Digital to Analog conversion
			CO4:Be able to use PLDs to implement the given logical problem.

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15	II-II	ELECTRICAL MACHINES LAB – II	CO1: Assess the performance of different machines using different testing methods
			CO2: Convert the Phase from three phase to two phase and vice versa
			CO3: Compensate the changes in terminal voltages of synchronous generator after estimating
			CO4:the change by different methods Control the active and reactive power flows in synchronous machines
			CO5:Start different machines and control the speed and power factor
16	II-II	CONTROL SYSTEMS LAB	CO1:How to improve the system performance by selecting a suitable controller and/or a compensator for a specific application
			CO2:Apply various time domain and frequency domain techniques to assess the system
			CO3:performance Apply various control strategies to different applications (example: Power systems, electrical drives etc)
			CO4:Test system controllability and observability using state space representation and applications of state space representation to various systems
17	III-I	POWER ELECTRONICS	CO1:Understand the differences between signal level and power level devices
			CO2:Analyze controlled rectifier circuits
			CO3:Analyze the operation of DC-DC choppers
			CO4:Analyze the operation of voltage source inverters
18	III-I	POWER SYSTEM – II	CO1: Analyze transmission line performance
			CO2:Apply load compensation techniques to control reactive power
			CO3:Understand the application of per unit quantities
			CO4:Design over voltage protection and insulation coordination
			CO5:Determine the fault currents for symmetrical and unbalanced fault
19	III-I	EASUREMENTS AND INSTRUMENTATI	CO1:Understand different types of measuring instruments, their construction, operation
			CO2:characteristics Identify the instruments suitable for typical measurements
			CO3:Apply the knowledge about transducers and instrument transformers to use them effectively
			CO4:Apply the knowledge of smart and digital metering for industrial applications

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20	III-I	COMPUTER ARCHITECTURE(Professional Elective - I)	CO1:Understand the concepts of microprocessors, their principles and practices
			CO2:Write efficient programs in assembly language of the 8086 family of microprocessors
			CO3: Organize a modern computer system and be able to relate it to real examples
			CO4: Develop the programs in assembly language for 80286, 80386 and MIPS processors in real
			CO5: and protected modes. Implement embedded applications using ATOM processor.
21	III-I	HIGH VOLTAGE ENGINEERING Professional Elective - I)	CO1:the basic physics related to various breakdown processes in solid, liquid
			CO2:gaseous insulating materials. Knowledge of generation and measurement of C., A.C
			CO3:Impulse voltages. Knowledge of tests on H. V. equipment and on insulating materials, as per the standards
			CO4: Knowledge of how over-voltages arise in a power system, and protection against these overvoltages
22	III-I	ELECTRICAL MACHINE DESIGN Professional Elective - I)	CO1: Understand the construction and performance characteristics of electrical machines
			CO2:Understand the various factors which influence the design: electrical, magnetic and thermal
			CO3: loading of electrical machines Understand the principles of electrical machine design and carry out a basic design of an acmachine
			CO4:Use software tools to do design calculations.
23	III-I	BUSINESS ECONOMICS AND FINANCIAL ANALYSIS	CO1:The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost Market Structure , Pricing
24	III-I	)WER SYSTEM SIMULATION L	CO1:Perform various transmission line calculations
			CO2:Understand Different circuits time constants
			CO3:Analyze the experimental data and draw the conclusions.

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25	III-I	POWER ELECTRONICS LAB	CO1:operating principles of various power electronic converters
			CO2:Use power electronic simulation packages
			CO3:hardware to develop the power converters
			CO4:Analyze and choose the appropriate converters for various applications
26	III-I	MEASUREMENTS AND INSTRUMENTATION LAB	CO1 :Describe measuring instruments.
			CO2:Understand and explain working of waveform generators, waveform analyzers, and transducers.
			CO3: To operate various measuring instruments.
			CO4:To analyze performance of waveform generators, waveform analyzers, transducers.
27	III-I	ADVANCED COMMUNICATION SKILLS LAB	CO1:To improve the students' fluency in English, through a well-developed vocabulary and enable
			CO2:them to listen to English spoken at normal conversational speed by educated English
			CO3:speakers and respond appropriately in different socio-cultural and professional contexts
			CO4;Further, they would be required to communicate their ideas relevantly and coherently in writing
			CO5:To prepare all the students for their placements
28	III-II	OPTIMIZATION TECHNIQUES Professional Elective - III	CO1:need of optimization of engineering systems
			CO2:understand optimization of electrical and electronics engineering problems
			CO3:apply classical optimization techniques, linear programming, simplex algorithm, transportation
			CO4;problem apply unconstrained optimization and constrained non-linear programming and dynamic
			CO5:programming Formulate optimization problems

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29	III-II	POWER SEMICONDUCTOR DRIVES	CO1:Identify the drawbacks of speed control of motor by conventional methods
			CO2:Differentiate Phase controlled and chopper-controlled DC drives speed- torque characteristics
			CO3: merits and demerits Understand Ac motor drive speed–torque characteristics using different control strategies its
			CO4: merits and demerits Describe Slip power recovery schemes
30	III-II	WIND AND SOLAR ENERGY SYSTEMS Professional Elective - II	CO1:Understand the energy scenario and the consequent growths of the power generate renewable energy sources
			CO2:Understand the basic physics of wind and solar power generation
			CO3:Understand the power electronic interfaces for wind and solar generation
			CO4:Understand the issues related to the grid-integration of solar and wind energy Systems
31	III-II	SIGNALS AND SYSTEMS	CO1: to Differentiate various signal functions
			CO2:Represent any arbitrary signal in time and frequency domain
			CO3:Understand the characteristics of linear time invariant systems
			CO4:Analyze the signals with different transform technique
32	III-II	MICROPROCESSORS & MICROCONTROLLERS	CO1:Understands the internal architecture, organization and assembly language programming of 8086 processors
			CO2:Understands the internal architecture, organization and assembly language programming of 8051/controllers
			CO3:Understands the interfacing techniques to 8086 and 8051 based systems
			CO4:Understands the internal architecture of ARM processors and basic concepts of advanced ARM processors
33	III-II	POWER SYSTEM PROTECTION	CO1:Compare and contrast electromagnetic, static and microprocessor-based relays
			CO2:Apply technology to protect power system components
			CO3:Select relay settings of over current and distance relays
			CO4:Analyze quenching mechanisms used in air, oil and vacuum circuit breakers

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34	III-II	POWER SYSTEM OPERATION AND CONTROL	CO1:Understand operation and control of power systems
			CO2:Analyze various functions of Energy Management System (EMS) functions
			CO3:Analyze whether the machine is in stable or unstable position
			CO4:Understand power system deregulation and restructuring
35	III-II	POWER SYSTEM LAB	CO1: Perform various load flow techniques
			CO2:Understand Different protection methods
			CO3:Analyze the experimental data and draw the conclusions
36	III-II	SIGNALS AND SYSTEMS LAB	CO1:Understand the concepts of continuous time and discrete time systems
			CO2:Analyse systems in complex frequency domain
			CO3:Understand sampling theorem and its implications
37	III-II	DIGITAL CONTROL SYSTEMS (Professional Elective - II)	CO1: the ability to Obtain discrete representation of LTI systems
			CO2:Analyze stability of open loop and closed loop discrete-time systems
			CO3:Design and analyze digital controllers
			CO4;Design state feedback and output feedback controllers
38	IV-I	ELECTRICAL AND HYBRID VEHICLES	CO1:demonstrate the ability to Understand the models to describe hybrid vehicles and their performance
			CO2:Understand the different possible ways of energy storage
			CO3:Understand the different strategies related to energy storage systems
39	IV-I	HVDC TRANSMISSION	CO1:to Compare EHV AC and HVDC system and to describe various types of DC links
			CO2:Analyze Graetz circuit for rectifier and inverter mode of operation
			CO3;Describe various methods for the control of HVDC systems and to perform power flow analysis
			CO4:in AC/DC systems Describe various protection methods for HVDC systems and classify Harmonics and design different types of filters

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40	IV-I	POWER SYSTEM RELIABILITY	CO1: able to Estimate loss of load and energy indices for generation systems model
			CO2:Describe merging generation and load models
			CO3:Apply various indices for distribution systems
			CO4:Evaluate reliability of interconnected systems
41	IV-I	FUNDAMENTALS OF MANAGEMENT FOR ENGINEERS	CO1: The students understand the significance of Management in their Profession.
			CO2: Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area
42	IV-I	ELECTRICAL & ELECTRONICS DESIGN LAB	CO1:Get practical knowledge related to electrical
			CO2:Fabricate basic electrical circuit elements/networks
			CO3:Trouble shoot the electrical circuits Design filter circuit for application
			CO4:Get hardware skills such as soldering, winding etc
43	IV-II	POWER QUALITY AND FACTS	CO1:Know the severity of power quality problems in distribution system
			CO2:Understand the concept of voltage sag transformation from up-stream (higher voltages
			CO3:devices Choose proper controller for the specific application based on system requirements
			CO4:Understand various systems thoroughly and their requirements
			CO5:Understand the control circuits of Shunt Controllers SVC& STATCOM for various functions viz
			CO6:Transient stability Enhancement, voltage instability prevention and power oscillation

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44	IV-II	SMART GRID TECHNOLOGIES	CO1:Understand the features of small grid in the context of Indian grid
			CO2:Understand the role of automation in transmission and distribution
			CO3:Apply evolutionary algorithms for smart grid
			CO4:Understand operation and maintenance of PMUs, PDCs, WAMs, and voltage and frequency control in micro grid
45	IV-II	ELECTRICAL DISTRIBUTION SYSTEMS	CO1:to distinguish between transmission, and distribution line and design the feeders
			CO2:compute power loss and voltage drop of the feeders
			CO3:design protection of distribution systems
			CO4:understand the importance of voltage control and power factor improvement
46	IV-II	NON-CONVENTIONAL SOURCES OF ENERGY	CO1: Understand the basic concepts and operation of renewable energy systems
			CO2 : Remember the ideas and statistics of current RES availability and usage.
			CO3 :Analyze the problems in RES installation in real time
			CO4:Identify the other NCES and available sources improvement
			C05 :Apply the renewable energy systems in real time applications.

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