



PES's
MODERN COLLEGE OF ENGINEERING
Shivaji Nagar
DEPARTMENT OF ELECTRICAL ENGINEERING

**Statements of Program Outcomes (POs) and Program Specific Outcomes
(PSOS):**

PROGRAM OUTCOMES (POs)

- PO1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2. Problem analysis:** Identify, formulate, research literature, and analyses complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3. 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.
- PO4. Conduct investigations of complex problems:** The problems that cannot be solved by straight forward application of knowledge, theories and technique applicable to the engineering discipline that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions that require consideration of appropriate constraints/requirements not explicitly given in the problem statement. (Like: cost, power requirement, durability, product life, etc.).Which need to be defined (modeled) within appropriate mathematical framework that often requires use of modern computational concepts and tools.
- PO5. 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.
- PO6. 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.
- PO7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and



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need for sustainable development.

- PO8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10. 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.
- PO11. 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.
- PO12. 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.

PROGRAM SPECIFIC OUTCOMES (PSOs):

- PSO1:** Students will have skill set in Energy Audit, Design of Solar System, Automation in PLC and SCADA Applications, Microcontroller and analysis for power quality in Power System.
- PSO2:** Students will be capable of dealing with techno-commercial aspect in Electrical Engineering.



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CO Statements of S.E. (2012 Pattern)		
Course Code No.	Course Name	Course Outcomes
C201.1	Power Generation Technologies	Students will be able to define and explain the fundamental concepts of thermodynamic cycles.
C201.2		Students will be able to outline the Thermal, Hydro, Nuclear, Diesel & Gas power plant.
C201.3		Students will be able to explain basic concepts of non-conventional energy systems.
C201.4		Students will be able to compare energy conversion techniques
C201.5		Students will be able to classify various new technologies with non-conventional energy system.
C201.6		Students will be able to identify energy conversion related to social aspects
C202.1	Engineering Mathematics-III	Students be able to solve higher order linear Differential equations and model L-C-R electrical circuits
C202.2		Students will be able to evaluate Laplace transform, inverse Laplace transform and its application to solve Linear differential equation
C202.3		Students will be able to evaluate Fourier Transform, Inverse Fourier Transform, Z-transform, Inverse Z-transform and solution of difference equation by Z-transform
C202.4		Students will be able to apply vector differential operators Gradient, Divergence, Curl to deal with Directional Derivatives, Vector Identities, Scalar Potential, Solenoidal, Irrational and Conservative Fields
C202.5		Students will be able to apply Greens, Gauss divergence, Stokes theorem to evaluate Line integral, Surface integral, volume integrals and solve problems in Electromagnetic fields
C202.6		Students will be able to check analytic functions using Cauchy Riemann Theorem, evaluate bilinear transformation and apply Cauchy's integral theorem, residue theorem to evaluate line integrals in the complex plane
C203.1	Material Science	Students will able to classify dielectric properties of insulating materials.
C203.2		Students will able to explain the difference in performance of dielectrics & insulating materials (solid/liquid/gaseous) & their breakdown process. They can apply their knowledge for selecting proper material as per application.
C203.3		Students will able to illustrate types & properties of magnetic materials & apply the knowledge to different electrical applications.
C203.4		Students will able to relate conducting materials & their applications.
C203.5		Students will be able to identify latest technologies like Nano technology & its applications.
C203.6		Students will be able to experiment with different materials for their properties.
C205.1	Electrical Measurements And Instrumentation	Student will be able to study and analyze electrical measuring instrument.
C205.2		Student will be able to explain and analyze Power Measurements.
C205.3		Student will be able to describe and explain Electrical Energy Measurement.
C205.4		Students will be able to Identify and select transducers for particular application.
C205.5		Students will be able to explain different methods for nonelectrical quantity measurement
C205.6		Students will be able to implement fundamental concepts in measurement and instrumentation areas.
C207.1	Power System I	Students will be able to interpret and calculate inductance and capacitance for different configurations of transmission lines in power systems.
C207.2		Students will be able to relate the theoretical knowledge of power system with the real time power networks.
C207.3		Students will be able to distinguish consumers, apply different tariff structures and compute the electricity bills.
C207.4		Students will be able to define different factors associated with generating station and can demonstrate its application in problem solving.
C207.5		Students will be able to design mechanical structure of overhead transmission lines and evaluate the efficiency of different components.
C207.6		Students will be able to analyze the performance of transmission lines & estimate the performance parameters.
C204.1	Analog And Digital Electronics	Students will be able to understand conversion of numbering system , perform binary arithmetic and reduce Boolean expression by K-map
C204.2		Students will be able to design various combinational and sequential circuits
C204.3		Students will be able to understand basics of linear integrated circuits.
C204.4		Students will be able to apply basic knowledge of linear integrated circuits in various applications.



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C204.5		Students will be able to acquire knowledge of BJT and it's applications.
C204.6		Students will be able to understand basics of uncontrolled rectifier.
C209.1	Network Analysis	Students will be able to characterize types of networks and network equations along with the applications of loop and nodal analysis.
C209.2		Students will be able to define and implement network theorems to solve various circuits.
C209.3		Students will be able to analyze transient response of basic circuits by classical method.
C209.4		Students will be able to analyze transient response of basic circuits by Laplace transform method.
C209.5		Students will be able to define and synthesize two-port network and Basics of Low pass and High Pass Filter
C209.6		Students will be able to recognize network functions and analyze stability of active networks.
C210.1		Numerical Methods and Computer Programming
C210.2	Students will be able to understand and apply concept of roots and errors for finding the solution of numerical methods.	
C210.3	Students will be able to demonstrate and evaluate polynomial and transcendental equations and its applications in electrical engineering and verify the solution by C language programming.	
C210.4	Students will be able to classify the problems related to interpolation and numerical differential equations.	
C210.5	Students will be able to classify and evaluate simultaneous equations and its applications in electrical engineering.	
C210.6	Students will be able to assess ordinary differential and numerical integration problems..	
C211.1	Fundamentals of Microprocessor & Microcontroller	
C211.2		Students will be able to explain programming of microprocessor 8085.
C211.3		Students will be able to make use of data communication/interfacing of peripheral devices with microprocessor 8085.
C211.4		Students will be able to illustrate microcontroller 8051.
C211.5		Students will be able to explain programming of microcontroller 8051 and make use of data communication/interfacing of peripheral devices with microcontroller 8051
C211.6		Students will be able to examine physical parameters using microcontroller and microprocessor.
C208.1		Electrical Machines I
C208.2	Students will be able to explain working and applications of single and three phase transformers under different operating conditions.	
C208.3	Students will be able to analyze construction, working of d c machines and evaluate its performance parameters.	
C208.4	Students will be able to evaluate speed control techniques and applications of DC machines under different operating conditions	
C208.5	Students will be able to analyze construction and working of three phase Induction motor.	
C208.6	Students will be able to understand working and applications of three phase Induction motor under different operating conditions , plot and evaluate its performance parameters	
C206.1	Soft Skills	
C206.2		Students will be able to develop their communication skills.
C206.3		Students will be able to apply and implement etiquettes in workplace and society.
C206.4		Students will be able to develop their interpersonal relationships.
C206.5		Students will be able to define leadership qualities and develop skills required for it.
C206.6		Students will be able to make use of skillsets like stress management, time management



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CO Statement of T.E. (2012 Pattern)		
Course Code No.	Course Name	Course Outcomes
C305.1	Electrical Installation, Maintenance and Testing	Students will be able to recognize condition monitoring, maintenance and international standards of maintenance of various electrical equipments.
C305.2		Students will be able to analyze trouble shooting and maintenance of transformers.
C305.3		Students will be able to analyze trouble shooting and maintenance of Induction Motor.
C305.4		Students will be able to recognize testing methods various electrical equipment's buildings.
C305.5		Students will be able to categorize, analyze and compare Distribution Power System and economics behind it.
C305.6		Students will be able to evaluate and analyze various earthing schemes, Estimation and costing of residential and commercial buildings.
C307.1	Power System II	Students will be able to analyze power flow in transmission line its performance and its compensation technique.
C307.2		Students will be able to explain HVDC transmission systems and its control.
C307.3		Student will be able to solve problems involving modelling, design and performance evaluation of EHVAC power transmission lines
C307.4		Students will be able to apply load flow solutions to various power system network in per unit system by computational technique & software tools.
C307.5		Student will be able to examine power system network under symmetrical fault with protection perspective.
C307.6		Student will be able to analyze power system network under unsymmetrical fault with protection perspective.
C309.1	Utilization of Electrical Energy	Students will be able to interpret different types of electric heating and welding methods.
C309.2		Students will be able to explain refrigeration, air conditioning and interpret control devices, electrochemical processes in practical world.
C309.3		Students will be able to design illumination schemes.
C309.4		Students will be able to explain types of track electrification and traction systems
C309.5		Students will be able to analyze the mechanics of train movement.
C309.6		Students will be able to apply knowledge for selecting motors for traction purpose & will understand process of electrical braking & railway signaling.
C311.1	Energy Audit and Management	Analyze and understand energy consumption patterns and environmental impacts and its mitigation method.
C311.2		Students will be able to define energy management strategies and analyze the energy utility management system
C311.3		Students will be able to list out various energy conservation measures for Demand side management.
C311.4		Students will be able to implement preliminary audits.
C311.5		Students will be able to recognize energy conservation application.
C311.6		Students will be able to analyze and work out economic feasibility of energy conservation options.
C312.1	Electrical Workshop	Students will be able to demonstrate practical knowledge related to electrical engineering subjects.
C312.2		Students will be able to develop hardware of different electronic circuit.
C312.3		Students will be able to evaluate operation by testing of circuits.
C312.4		Students will be able to develop ability to do troubleshooting of circuits.
C312.5		Students will be able to assemble different electrical circuits.
C312.6		Students will be able to create small residential wiring circuits
C302.1	Advance Microcontroller and its Applications	Students will be able to explain the architecture of PIC microcontroller.
C302.2		Students will be able to develop assembly and embedded C language programming for PIC 18F458.
C302.3		Students will be able to define timers/counters, interrupts, SPI protocol for PIC18F458.
C302.4		Students will be able to develop programming for serial communication using PIC18F458.
C302.5		Students will be able to build interrupt programming using PIC 18F458.
C302.6		Students will be able to do experiment with interfacing using PIC 18F458.
C308.1	Control System-I	Students will be able to demonstrate and determine control system parameters and model the physical systems.



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C308.2		Students will be able to analyze and evaluate the behavior of control system by time domain specifications and validate it by modern tool.
C308.3		Student will be able to implement the stability analysis in time domain.
C308.4		Student will be able to implement the stability analysis by using Polar and Nyquist plot in frequency domain.
C308.5		Student will be able to implement the stability analysis by using Bode plot in frequency domain.
C308.6		Student will be able to construct, design and validate feedback controller to achieve desired performance specifications.
C303.1	Electrical Machines II	Students will be able to recognize and describe construction and working of alternators.
C303.2		Students will be able to demonstrate and control three phase alternator under different operating conditions.
C303.3		Students will be able to evaluate performance parameters and explain working and applications of synchronous motor.
C303.4		Students will be able to illustrate construction, working and applications of Induction generators, Induction regulators and special purpose machines.
C303.5		Students will be able to analyze construction, working and applications under different operating conditions of AC series motor, plot and evaluate its performance parameters
C303.6		Students will be able to analyze construction, working and applications under different operating conditions of single phase Induction motor, plot and evaluate its performance parameters.
C304.1	Power Electronics	Students will be able to demonstrate fundamental working principle, characteristics and applications of power electronics devices.
C304.2		Students will be able to analyze performance of single phase and three phase AC-DC converters.
C304.3		Students will be able to analyze performance of single phase and three phase AC-AC converters.
C304.4		Students will be able to analyze performance of DC-DC converters.
C304.5		Students will be able to analyze performance of single phase and three phase DC-AC converters.
C304.6		Students will be able to solve problems of switching regulators according to specifications.
C310.1	Design of Electrical Machines	Students will be able to explain construction of Transformer and modes of heat dissipations.
C310.2		Students will be able to evaluate design parameters of transformer.
C310.3		Students will be able to determine the performance parameter of transformer.
C310.4		Students will be able to develop AC winding using modern tools and define different terminology of Three phase induction motor.
C310.5		Students will be able to design three phase induction motor.
C310.6		Students will be able to interpret various performance parameters of Three phase induction motor.
C301.1	Industrial and Technology Management	Students will be able to classify different types of business organization, economics and management.
C301.2		Students will be able to explain technology management and industrial management.
C301.3		Students will be able to illustrate quality management.
C301.4		Students will be able to analyze marketing management and financial management.
C301.5		Students will be able to analyze importance of motivation, group dynamics, team work, leadership skill and entrepreneurship.
C301.6		Students will be able to analyze the importance of IPR and fundamentals of patent document.
C306.1	Seminar and Technical Communication	Students will be able to recognize needs of today's world regarding in electrical engineering.
C306.2		Students will be able to demonstrate presentation and documentation skills.
C306.3		Students will be able to implement theoretical knowledge to actual industrial applications and research activity.
C306.4		Students will be able to contribute in analysis, planning, management and operations in electrical engineering field.
C306.5		Students will be able to communicate effectively.
C306.6		Students will be able to correlate the facts with current technology and innovations in electrical engineering.



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CO Statement of B.E. (2012 Pattern)		
Course Code No	Course Name	Course Outcome
C401.1	Power System Operation and Control	Students will be able to identify and analyze the dynamics of power system stability.
C401.2		Students will be able to categorize the reactive power control methodology.
C401.3		Students will be able to classify and explain various FACTS devices for reactive power management.
C401.4		Students will be able to analyze the generation-load balance in real time operation and its effect on frequency and develop automatic control strategies with mathematical relations.
C401.5		Students will be able to formulate objective functions for optimization tasks such as unit commitment and economic load dispatch and get solution using computational techniques.
C401.6		Students will be able to explain real time energy control strategies and concept of reliability.
C403.E1B.1	Power Quality	Students will be able to demonstrate the knowledge to characterize power quality events.
C403.E1B.2		Students will be able to reproduce causes of voltage sag and estimate magnitude of voltage sag.
C403.E1B.3		Students will be able to carry out harmonic analysis and calculate total harmonic distortion.
C403.E1B.4		Students will be able to design filters for harmonic reduction.
C403.E1B.5		Students will be able to identify different mitigation techniques for different power quality events.
C403.E1B.6		Students will be able to explain power quality monitoring needs and able to use different PQ instruments.
C403.E1C.1	Renewable Energy Systems	Students will be able to describe various renewable energy sources such as Solar Photovoltaic, Biomass, Wind, Fuel cell and Solar thermal.
C403.E1C.2		Students will be able to explain different renewable energy sources as an alternate for conventional power sources in any application.
C403.E1C.3		Students will be able to identify and locate the use of renewable energy sources as per the requirement of the location.
C403.E1C.4		Students will be able to analyze, assess and design renewable energy sources such as solar and wind sources.
C403.E1C.5		Students will be able to compare the various storage sources for electrical energy.
C403.E1C.6		Students will be able to recognize the standards of renewable energy sources along with economic analysis and apply for evaluation of economic analysis.
C404.E2A.1	Restructuring & Deregulation	Students will be able to identify the Role of Power Sector Regulation and evolution of various regulatory commissions in India.
C404.E2A.2		Students will be able to list and explain the methods power sector economics and tariff setting.
C404.E2A.3		Student will be able to define Power Sector Restructuring and Market Reforms in India.
C404.E2A.4		Students will be able to illustrate the international experience with electricity reform and real challenges in power sector restructuring.
C404.E2A.5		Students will be able to explain the role and concepts of privatization in India.
C404.E2A.6		Students will be able to analyze various cost components in Generation, transmission and distribution sector.
C407.1	Switchgear and Protection	Students will be able to describe the need of protective Relaying and operating principles of different types of relays.
C407.2		Students will be able to analyze arc interruption phenomenon and implement protection based on it.
C407.3		Students will be able to elaborate construction and working principle of different types of HVCBs.
C407.4		Students will be able to explain protection against over voltages due to lightning as well as implementation of static and digital relaying.
C407.5		Students will be able to analyze different types of faults in transformer, alternator, 3phase induction motor and various protective schemes related to them
C407.6		Students will be able to design the various protection schemes for bus bars, overhead transmission lines and explain wide area management.
C409.E3A.1	High Voltage Engineering	Students will be able to utilize various concept of breakdown phenomenon of gaseous dielectric materials.
C409.E3A.2		Students will be able to identify various concept of breakdown phenomenon in liquid & solid dielectric materials.
C409.E3A.3		Students will be able to apply concepts of various causes of overvoltage & select protective devices for the same.
C409.E3A.4		Student will be able to list and categorize various methods of generation of High AC, DC and Impulse voltage.



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C409.E3A.5		Students will be able to distinguish various methods of measurement of High AC, DC and Impulse voltage.
C409.E3A.6		Students will be able to build high voltage laboratory and demonstrate various test on high voltage equipments.
C409.E3B.1	HVDC & FACTS	Students will be able to extend the general back ground of HVDC System.
C409.E3B.2		Students will be able to discover modern trends in HVDC Transmission Technology.
C409.E3B.3		Students will be able to identify in-depth understanding of HVDC Light.
C409.E3B.4		Students will be able to discover the applications of power electronics in the control of power transmission.
C409.E3B.5		Students will be able to identify Series and Shunt Compensation in terms of FACTS Devices.
C409.E3B.6		Students will be able to identify in-depth understanding of Unified Power Flow Controller.
C410.E4A.1	Smart Grid	Students will be able to explain and compare Conventional and Smart Grid.
C410.E4A.2		Students will be able to identify the need of Smart Grid, Micro Grid, smart metering and storage.
C410.E4A.3		Students will be able to outline new technologies of Automation and communication in Smart grid.
C410.E4A.4		Students will be able to choose the recent trends for various electric grids
C410.E4A.5		Students will be able to assess current professional issues in electric Grid and evaluate the emerging technologies
C410.E4A.6		Students will be able to define and formulate the necessity of global smart communication system.
C410.E4C.1	Illumination Engineering	Students will be able to describe relation between human optical system and illumination fundamental concepts.
C410.E4C.2		Students will be able to define and reproduce various terms in illumination.
C410.E4C.3		Students will be able to identify various parameters for illumination system.
C410.E4C.4		Students will be able to implement design techniques in indoor lighting systems.
C410.E4C.5		Students will be able to implement design techniques in outdoor lighting systems.
C410.E4C.6		Students will be able to enlist state of the art illumination systems.
C405.1	Control System-II	Students will be able to design, categorize and implement compensator for physical system.
C405.2		Students will be able to demonstrate and model physical system using modern control technique.
C405.3		Students will be able to analyze and design of observer for control system using state space technique.
C405.4		Students will be able to distinguish and analyze various nonlinearities in physical system.
C405.5		Students will be able to categorize and evaluate basics of digital control system and Z-transform.
C405.6		Students will be able to analyze and design digital control system.
C402.1	PLC and SCADA Applications	Students will be able to define, describe and explain the architecture of PLC and evolution of PLC.
C402.2		Students will be able to demonstrate, execute various ladder programs using timer and counters etc.
C402.3		Students will be able to Identify analog and digital input and output devices which can be interfaced with PLC.
C402.4		Students will be able to develop ladder logic for various industrial processes.
C402.5		Students will be able to define, describe SCADA architecture along with various protocols.
C402.6		Students will be able to evaluate new technology by implementing PLC and SCADA.
C408.1	Power Electronics Controlled Drives	Students will be able to understand dynamics of Electrical drives.
C408.2		Students will be able to acquire and practice the knowledge of braking used in dc drives and Induction motor drives
C408.3		Students will be able to analyze operation of converter fed and chopper fed dc drives
C408.4		Students will be able to analyze operation of classical and modern induction motor drives.
C408.5		Students will be able to describe current and speed controller for solid state controlled PMSM and BLDC drives.
C408.6		Students will be able to select the drive for any particular industrial application.
C404.E3D.1		Students will be able to demonstrate alternative modes for electric transportation system.



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C404.E3D.2	Introduction to Electrical Transportation Systems	Students will be able to classify the different application of electric mobility.
C404.E3D.3		Students will be able to recognize and select storage battery for electrified transportation.
C404.E3D.4		Students will be able to compare and analyze various power and energy converters in transportation system
C404.E3D.5		Students will be able to explain control systems used in electric transportation.
C404.E3D.6		Students will be able to demonstrate the knowledge of road safety, traffic control and monitoring
C416.1		Project
C416.2	Students will be able to demonstrate moral and ethical values while completing their project.	
C416.3	Students will be able to Communicate their findings effectively in verbal and written forms.	
C416.4	Students will be able to work in team and ensure satisfactory completion of project in all respect.	
C416.5	Students will be able to acquire specified knowledge in area of their interest and apply various Tools to complete their project	
C416.6	Students will be able to take part in sponsored projects and industrial issues through their project.	