



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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S.E. (2015 Pattern) w.e.f. AY 2016-17

Course Outcome	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 will be able to solve higher order linear Differential equations and model L-C-R electrical circuits
C202.2		Students will be able to explain and apply Laplace transform to solve Linear differential equation
C202.3		Students will be able to explain and apply Fourier Transform and Z-transform to various engineering problems
C202.4		Students will be able to apply vector differential operators and integration.
C202.5		Students will be able to apply Vector integration to solve problems in electromagnetic field.
C202.6		Students will be able to analyze conformal mapping, transformations and perform contour integration of complex functions
C203.1	Material Science	Students will able to classify dielectric properties of insulating materials & optical properties of 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.
C208.1	Power System I	Students will be able to interpret and calculate inductance and capacitance for different configurations of transmission lines in power systems.
C208.2		Students will be able to relate the theoretical knowledge of power system with the real time power networks.
C208.3		Students will be able to distinguish consumers, apply different tariff structures and compute the electricity bills.
C208.4		Students will be able to define different factors associated with generating station and can demonstrate its application in problem solving.
C208.5		Students will be able to design mechanical structure of overhead transmission lines and evaluate the efficiency of different components.
C208.6		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 demonstrate basic of various types of Flip flops, design registers and counters.
C204.3		Students will be able to define basics of Op-amp and its parameters



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C204.4		Students will be able to apply basic knowledge of linear integrated circuits in various applications.
C204.5		Students will be able to make use of BJT as amplifier with various configurations
C204.6		Students will be able to understand basics of uncontrolled rectifier.
C210.1	Network Analysis	Students will be able to classify types of networks and formulate network equations for loop and nodal analysis.
C210.2		Students will be able to define and implement network theorems to solve various circuits.
C210.3		Students will be able to analyze transient response of basic circuits using classical method.
C210.4		Students will be able to analyze transient response of basic circuits using Laplace transform method.
C210.5		Students will be able to describe and synthesize two-port network, network functions and identify stability of networks.
C210.6		Students will be able to define, recognize and design passive filters.
C212.1	Fundamentals of Microcontroller and its Applications	Students will be able to explain microcontroller 8051.
C212.2		Students will be able to develop programming using 8051, addressing modes and instruction set.
C212.3		Students will be able to illustrate the capability of stack, program counter and timers.
C212.4		Student will be able to interface micro-controller with external device like switches, keypads, displays, A/D and D/A converters.
C212.5		Student will be able to develop serial communication programming.
C212.6		Students will be able to explain and develop programs for various interrupt in 8051.
C211.1	Numerical Methods and Computer Programming	Students will be able to construct C language program to find the solution of various numerical methods.
C211.2		Students will be able to understand and apply concept of roots and errors for finding the solution of numerical methods.
C211.3		Students will be able to demonstrate and evaluate polynomial and transcendental equations and its applications in electrical engineering and verify the solution by C
C211.4		Students will be able to classify the problems related to interpolation and numerical differential equations.
C211.5		Students will be able to assess ordinary differential and numerical integration problems..
C211.6		Students will be able to classify and evaluate simultaneous equations and its applications in electrical engineering.
C209.1	Electrical Machines I	Students will be able to recognize and describe construction and working of single phase transformers
C209.2		Students will be able to explain working and applications of single and three phase transformers under different operating conditions.
C209.3		Students will be able to analyze construction, working of d c machines and evaluate its performance parameters.
C209.4		Students will be able to evaluate speed control techniques and applications of D.C. machines under different operating conditions
C209.5		Students will be able to analyze construction and working of three phase Induction motor.
C209.6		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	Students will be able to analyze SWOT analysis.
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
C207.1	Audit Course I: German Language	Students Will able to understand and use familiar and everyday expressions and very simple sentences
C207.2		Students Will able to introduce him/herself and others as well as ask others about themselves



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C207.3		Students Will able to get basic idea of reading, writing and listening skills in German Language
C207.4		Students Will able to write and identify alphabets, numbers, months, days of the week and time of the day months, days of the week and time of the day
C213.1	Audit Course II : Installation & Maintenance of Electrical appliances	Student will be able to apply the knowledge of safety in working environment.
C213.2		Students will be able to identify the Indian Standard applicable to earthing system
C213.3		Students will be able to identify the main parts of Fluorescent lamp

T.E. (2015 Pattern) w.e.f. AY: 2017-18

Course Outcome	Course Name	Course Outcomes
C315.1	Electrical Installation, Maintenance and Testing	Student will be able to interpret the basic concepts, design and estimation of distribution systems & substation
C315.2		Students will be able to able to analyze earthing system for industrial and residential premises
C315.3		Students are able to demonstrate practical aspects of condition monitoring and maintenance of various electrical equipment used in substation
C315.4		Students will be able to recognize testing methods and its implementation for various electrical equipment.
C315.5		Student will be able to evaluate and analyze Estimation and costing of residential and commercial buildings
C315.6		Students are able to recognize the basic aspects of Electrical Safety.
C308.1	Power System II	Students will be able to analyze power flow in transmission line its performance and its compensation technique.
C308.2		Student will be able to solve problems involving modeling, design and performance evaluation of EHVAC power transmission lines
C308.3		Students will be able to apply load flow solutions to various power system networks in per unit system by computational technique & software tools.
C308.4		Student will be able to examine power system network under symmetrical fault with protection perspective.
C308.5		Student will be able to analyze power system network under unsymmetrical fault with protection perspective..
C308.6		Students will be able to explain HVDC transmission systems and its control.
C310.1	Utilization of Electrical Energy	Students will be able to interpret different types of electric heating and welding methods.
C310.2		Students will be able to explain refrigeration and air conditioning and interpret electrochemical processes in practical world.
C310.3		Students will be able to design illumination schemes.
C310.4		Students will be able to explain types of track electrification and traction systems
C310.5		Students will be able to analyse the mechanics of train movement.
C310.6		Students will be able to apply knowledge for selecting motors for traction purpose & will understand process of electrical braking & railway signaling.
C312.1	Energy Audit and Management	Analyze and understand energy consumption patterns and environmental impacts and its mitigation method.
C312.2		Students will be able to define energy management strategies and analyze the energy utility management system
C312.3		Students will be able to list out various energy conservation measures for Demand side management.
C312.4		Students will be able to implement preliminary audits.
C312.5		Students will be able to recognize energy conservation application.
C312.6		Students will be able to analyze and work out economic feasibility of energy conservation options.
C313.1	Electrical Workshop	Students will be to demonstrate practical knowledge related to electrical engineering subjects.
C313.2		Students will be to develop hardware of different electronic circuit.
C313.3		Students will be to evaluate operation by testing of circuits.



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C313.4		Students will be to develop ability to do troubleshooting of circuits.
C313.5		Students will be to assemble different electrical circuits.
C313.6		Students will be 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.
C309.1	Control System-I	Students will be able to demonstrate and determine control system parameters and model the physical systems.
C309.2		Students will be able to analyse and evaluate the behavior of control system by time domain specifications and validate it by modern tool.
C309.3		Student will be able to implement the stability analysis in time domain.
C309.4		Student will be able to implement the stability analysis by using Polar and Nyquist plot in frequency domain.
C309.5		Student will be able to implement the stability analysis by using Bode plot in frequency domain.
C309.6		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 analyze construction, working and applications under different operating conditions of a.c. series motor, plot and evaluate its performance parameters
C303.6		Students will be able to analyses construction, working and applications under different operating conditions of single phase Induction motor, plot and evaluate its performance
C304.1	Power Electronics	Students will be able to explain the working principle and characteristics of power semiconductor devices
C304.2		Students will be able to demonstrate different switching(firing) circuits of power semiconductor devices (SCR and MOSFET/IGBT)
C304.3		Students will be able to analyze AC-DC and AC-AC power converters according to specifications
C304.4		Students will be able to analyze DC-DC and DC-AC power converters according to specifications
C304.5		Students will be able to apply and analyze computer-aided techniques for the design of power converter circuits
C304.6		Students will be able to identify applications of power electronics circuits in ac and dc drives, energy conservation, renewable energy, transportation etc.
C311.1	Design of Electrical Machines	Students will be able to explain construction of Transformer and modes of heat dissipations.
C311.2		Students will be able to evaluate design parameters of transformer.
C311.3		Students will be able to determine the performance parameter of transformer.
C311.4		Students will be able to develop AC winding using modern tools and define different terminology of Three phase induction motor.
C311.5		Students will be able to design three phase induction motor.
C311.6		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.



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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.
C313.1	Audit Course IV: Biomass Energy	Students will be able to illustrate renewable and non-renewable resources.
C313.2		Students will be able to explain the main source of biomass energy and their primary applications.
C313.3		Students will be able to classify bioenergy generation by latest biological and molecular techniques.

B.E. (2015 Pattern) w.e.f. 2018-19

Course Code	Course Name	Course Outcomes
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 are able to explain real time energy control strategies and concept of reliability.
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 indentify and find suitable analog and digital input and output devices which can be interfaced with PLC.
C402.3		Students will be able to demonstrate, execute various ladder programs for various industrial applications.
C402.4		Students will be able to implement various controllers for industrial processes.
C402.5		Students will be able to define, describe SCADA architecture along with various protocols.
C402.6		Student will be able to evaluate new technology by implementing PLC and SCADA in critical infrastructure.
C403.E1B.1	Power Quality	Students will be able to understand/Identify importance of various power quality issues.
C403.E1B.2		Students will be able to describe the causes and effects of power quality problems and categorize the various electrical power quality issues in power systems. (Understand)
C403.E1B.3		Students will be able to analyze the various PQ problems. (Analyze)
C403.E1B.4		Students will be able to explain the conventional mitigation methods for PQ issues. (Understand)
C403.E1B.5		Students will be able to use IEEE 519-2014 power quality standard for harmonic compliance. (Apply)
C403.E1B.6		Students will be able to carry out power quality monitoring.(Apply)
C403.E1C.1	Renewable Energy Systems	Student will be able to describe various renewable energy sources such as Solar Photovoltaic, Biomass, Wind, Fuel cell and Solar thermal.



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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.
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 finding 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 choose and solve societal and industrial issues through their project.	
C405.1	Control System-II	Students will be able to understand digital control system.
C405.2		Students will be able to categorize, define and evaluate basics of digital control system and Z- transform.
C405.3		Students will be able to analyze the stability of Digital Control System.
C405.4		Students will be able to understand state space technique.
C405.5		Students will be able to analyze, design and implement the system using state space technique.
C405.6		Students will be able to understand digital control system.
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.
C404.E2D.1	Electric and Hybrid Vehicles	Students will be able to describe history, Social and environmental importance of Hybrid and Electric vehicles.
C404.E2D.2		Students will be able analyze the performance and selection of energy storage systems required for hybrid electrical vehicle
C404.E2D.3		Students will be able to explain battery management and charging system
C404.E2D.4		Students will be able to distinguish between the performance and architecture of various drive trains.
C404.E2D.5		Students will be able to illustrate the different Instrumentation and Control used for electric vehicles.
C404.E2D.6		Students will be able to classify Vehicle to Home, Vehicle to Vehicle and Vehicle to Grid energy systems concepts.
C407.1	Switchgear and Protection	Students will be able to explain 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 summarize construction and working principle of different types of High Voltage Circuit Breakers.
C407.4		Students will be able to explain protection for three phase Induction motor as well as implementation of static and digital relaying.
C407.5		Students will be able to categorize different types of faults in transformer and Alternator and various protective schemes related to them.
C407.6		Students will be able to demonstrate various protection schemes for transmission lines and illustrate PLCC,WAM system.



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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 reproduce the layout of HVDC system with various components including protective devices.
C409.E3B.3		Students will be able to differentiate VSC HVDC and conventional HVDC system.
C409.E3B.4		Students will be able to differentiate various types of Power Electronic Controllers.
C409.E3B.5		Students will be able to analyse 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.
C408.1	Power Electronics Controlled Drives	Students will be able to understand motor load dynamics and multi quadrant operation of drives
C408.2		Students will be able to describe braking methods DC drives and analyse operation of converter and chopper fed DC drives
C408.3		Students will be able to describe braking methods of three phase induction motor drives and inverter fed induction motor drive.
C408.4		Students will be able to explain vector control of induction motor drives and identify classes and duty cycle of motors.
C408.5		Students will be able to differentiate synchronous motor and Brushless DC motor drives
C408.6		Students will be able to identify requirement and choice of drive for applications of drives in industries.
C410.E4C.1	Illumination Engineering	Students will be able to understand/Identify importance of various power quality issues.
C410.E4C.2		Students will be able to describe the causes and effects of power quality problems and categorize the various electrical power quality issues in power systems.
C410.E4C.3		Students will be able to analyze the various PQ problems.
C410.E4C.4		Students will be able to explain the different mitigation methods for PQ issues.
C410.E4C.5		Students will be able to use IEEE 519-2014 power quality standard for harmonic compliance.
C410.E4C.6		Students will be able to understand different instruments used for power quality monitoring and know objectives of PQ monitoring.
C404.E2A.1	Restructuring & Deregulation	Students will able to enlist the functions of various key entities in India and explain the implications of various policies and acts on restructuring and deregulation.
C404.E2A.2		Students will able to describe the regulatory process in India along with various methods of regulations.
C404.E2A.3		Student will able to list the components involved in tariff determination.
C404.E2A.4		Students will able to explain different power sector restructuring models.
C404.E2A.5		Students will able to explain different types of electricity markets.
C404.E2A.6		Students will able to explain different transmission pricing methods and discuss congestion 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.
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 equipment's.