M.S. Ramaiah University of Applied Sciences

New BEL Road, MSR Nagar, Bangalore – 560054

RAMAIAH UNIVERSITY OF APPLIED SCIENCES

PO, PSO, PEO & CO

Programme: B.Tech.in Electrical and Electronics Engineering

Programme Code: 003

Programme Outcome (PO)
Programme Specific Outcome (PSO)
Program Educational Objectives (PEO)
Course Outcomes (CO)

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Bangalore-560054

Registrar
M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054

Approved in 23rd ACM (Resolution 23.05) held on 15th July 2021

Faculty of Engineering and Technology (FET)

Programme Name: B.Tech. (Electrical and Electronics Engineering)

Programme Outcomes (POs)

B.Tech. graduates will be able to:

PO-1. Apply the knowledge of mathematics, science, basic engineering fundamentals, and engineering specialization to the solution of complex engineering problems

PO-2. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

PO-3. Design solutions for complex engineering problems and design system components or processes thatmeet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

PO-4. 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. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

PO-6. 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. 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. Apply ethical principles and commit to professional ethics and responsibilities and norms of theengineering practice

PO-9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

PO-10. 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. Demonstrate knowledge and understanding of the engineering and management principles and applythese to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO-12. Recognize the need for and have the preparation and ability to engage in independent and life-longlearning in the broadest context of technological change

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Programme Specific Outcomes (PSOs)

At the end of the B. Tech. (Electrical and Electronics Engineering) program, the graduate will be able to:

PSO-1. Apply the knowledge of fundamentals in electrical engineering, power system, electronics engineering, embedded systems, power electronics and drives, to obtain solutions for complex problems in electrical domain and allied areas

PSO-2. Design and develop embedded control systems using the principles and concepts of Electromechanical, Electronics and Computer Engineering through experimentation and usage of modern tools to address industry and societal requirements

PSO-3. Demonstrate ethics, leadership qualities, communication, entrepreneurial skills and involvement in lifelong learning for the betterment of organization, environment and society

Program Educational Objectives (PEOs)

The objectives of the B.Tech. (Electrical and Electronics Engineering) programme are to:

PEO-1. To provide students with knowledge in mathematics, science and core engineering area to enable them to deliver efficient solutions for complex engineering problems using analytical and cognitive skills

PEO-2. To enable students to design and develop sustainable innovative solutions for industry and societal requirements by conducting engineering investigations through experimentation and usage of moderntools

PEO-3. To inculcate ethics, communication, leadership, soft, managerial and entrepreneurial skills for a successful career in industries and to engage in lifelong learning

Course Outcomes (COs)

Course Title & Code: Engineering Mathematics - 1 (MTB101A)

After the successful completion of this course, the student will be able to:

CO-1. State and discuss basic concepts related to single, two variable calculus and matrix algebra

CO-2. Perform basic operations of matrix algebra and apply them to solve systems of linear equations

CO-3. Solve simple mathematical problems associated with linear algebra, single and two variable calculus

CO-4. Demonstrate competence with the basic ideas of linear systems, independence, basesand dimension, linear transformations, eigenvalues, eigenvectors and diagonalization

CO-5. Solve complex real-world problems associated with linear algebra, single and two variable calculus

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Course Outcomes (COs)

Course Title & Code: Engineering Physics and Laboratory (PYB102A)

After the successful completion of this course, the student will be able to:

- **CO-1.** State, explain the concepts of mechanics, electrical conductivity, quantum mechanics, crystal structure and material science, laser and fiber optics
- **CO-2.** Derive standard relationships in mechanics, electrical conductivity, quantum mechanics, crystal structure and material science, laser & fiber optics, and interpret them
- **CO-3.** Discuss the applications of mechanics, electrical conductivity, quantum mechanics, crystal structure and material science, laser and fiber optics
- **CO-4.** Solve problems in mechanics, electrical conductivity, quantum mechanics, crystal structure, material science, laser and fiber optics
- **CO-5.** Plan the experimental set-up, conduct experiments, calculate and plot the graphs to obtain the results and write a laboratory report as per the prescribed format.

Course Outcomes (COs)

Course Title & Code: Engineering Mechanics (CEF101A)

After the successful completion of this course, the student will be able to:

- **CO-1.** State and describe the laws of Statics, Friction and Dynamics and their contexts of application.
- **CO-2.** Interpret standard mathematical relationships and apply for solving simple static and dynamic problems in engineering mechanics
- **CO-3.** Calculate moment of inertia, determine centroid, centre of gravity for the structural members
- **CO-4.** Apply the laws of statics and dynamics for the equilibrium analysis of rigid bodies withand without friction
- **CO-5.** Apply energy methods in analyzing of static and dynamic aspects of engineeringstructures made of rigid bodies

Course Outcomes (COs)

Course Title & Code: Elements of Electronics Engineering and Laboratory (ECF102A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain working principles of PN junction diode, Zener diode, transistors, amplifier configurations, Op-Amps, power supply, logic gates and electronic displays
- **CO-2.** Derive mathematical relationships for electronic devices and circuits
- **CO-3.** Solve simple numerical and design problems related to analog / digital circuits as well as devices
- **CO-4.** Design and analyse operation of standard analog / digital circuits for a givenapplication
- **CO-5.** Conduct experiments as per the standard procedures and tabulate/calculate/plotthe measured values
- **CO-6.** Interpret and compare with standard results, and draw conclusions and Write reportas per the prescribed format

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Course Outcomes (COs)

Course Title & Code: Engineering Drawing (MEF103A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Describe the conventions used in projections of geometric entities and interpret thesame
- **CO-2.** Draw orthographic projections for the geometric entities in specified positions
- **CO-3.** Develop lateral surfaces of un-sectioned and sectioned regular solids
- **CO-4.** Develop orthographic projections for given applications
- **CO-5.** Draw isometric projections for the solids and their combinations
- **CO-6.** Demonstrate competency in using CAD tool for drawing projections of geometric entities

Course Outcomes (COs)

Course Title & Code: Constitution, Human Rights and Law (LAN101A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain the key principles of the Indian Constitution
- **CO-2.** Explain Indian legal system and judicial structure that govern the citizens
- **CO-3.** Discuss UN Declaration of Human Rights
- **CO-4.** Discuss the scope and application of Human Rights Principles and Law
- **CO-5.** Suggest strategies for protection of human rights and resolving legal issues in compliancewith applicable laws

Course Outcomes (COs)

Course Title & Code: Engineering Mathematics – 2 (MTB102A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Describe the fundamentals of ordinary differential equations and Laplace transform
- **CO-2.** Solve standard forms of ordinary differential equations
- **CO-3.** Solve simple problems in ordinary differential equations and Laplace transform
- **CO-4.** Model real world problems using ordinary differential equations and solve complexproblems associated with ordinary differential equations using Laplace transform
- **CO-5.** Apply Laplace transform in solving complex real world engineering problems

Course Outcomes (COs)

Course Title & Code: Engineering Chemistry and Laboratory (CYB104A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain the basic concepts of electrochemistry, conversion of chemical energy into electrical energy, theory of corrosion and principles of metal finishing

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CO-2. Differentiate renewable - nonrenewable fuels, primary - secondary electrodes & primary - secondary batteries, batteries - fuel cells, electroplating – electroless plating, thermosetting – thermoplastic polymers and dry corrosion - wet corrosion

CO-3. Discuss the reaction chemistry and stoichiometry of combustion of fuels, remedial measures to control oxides of nitrogen, sulphur and carbon, polymerization – methods, mechanism, preparation, properties and applications of some polymers, concepts of nano science and nanotechnology

CO-4. Identify the types of corrosion and methods to prevent corrosion, suitable polymers and nanocomposite materials for engineering applications

CO-5. Derive kinetic rate equations for various chemical systems and equation for electromotive force

CO-6. Analyze the suitability of polymers & composites for various applications and solve problems related to storage devices, chemical kinetics, electro chemistry, corrosion and metal finishing

CO-7. Plan the experimental set up, conduct experiments, calculate and plot the graphs to obtain results, and write a laboratory report as per the prescribed format

Course Outcomes (COs)

Course Title & Code: Elements of Mechanical Engineering and Workshop Practice (MEF104A)

After the successful completion of this course, the student will be able to:

CO-1. Demonstrate the understanding on Classification of energy sources, energy conversion systems, mechanical power transmission systems, machine tools and processes

CO-2. Describe various energy conversion systems, mechanical power transmission systemsand machine tools

CO-3. Explain the working principle of refrigeration systems, biomass conversiontechnologies and machining operations

CO-4. Solve numerical problems on IC engines and mechanical power transmission systems

CO-5. Apply principles of energy conversion systems, power transmission systems, machining processes and mechanical joints to practical applications

Course Outcomes (COs)

Course Title & Code: Elements of Electrical Engineering and Laboratory (EEF105A)

After the successful completion of this course, the student will be able to:

CO-1. State and explain various laws of electric circuits, magnetic circuits and theirsignificance, phasor diagrams for electrical elements

CO-2. Explain construction, principle of operation, working and characteristics of DCmachines, transformers, AC rotating machines and their applications

CO-3. Derive equations for electrical circuits, magnetic circuits and performance of various AC and DC machines

CO-4. Solve problems on electric circuits, magnetic circuits, DC machines, transformersandAC rotating machines

CO-5. Conduct experiments as per the standard procedures and tabulate/calculate/plotthe measured values

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CO-6. Interpret and compare with standard results, and draw conclusions and writereport as per the prescribed format

Course Outcomes (COs)

Course Title & Code: Elements of Computer Science and Engineering and Laboratory (CSF106A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Describe the elements and methodology of Computer Science and Engineering
- **CO-2.** Explain the basic principles and techniques of algorithms and programming
- **CO-3.** Select appropriate approach to solve a computational problem
- **CO-4.** Design an algorithmic solution and draw a flow chart of the solution
- **CO-5.** Develop computer programs for moderately complex problems
- **CO-6.** Test and validate developed computer programs

Course Outcomes (COs)

Course Title & Code: Professional Communication (TSN101A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Apply the concepts of grammar for communication
- **CO-2.** Compose precise paragraphs
- **CO-3.** Demonstrate professional etiquette
- **CO-4.** Demonstrate appropriate verbal and non-verbal communication in the given context
- **CO-5.** Develop professional written document

Course Outcomes (COs)

Course Title & Code: Engineering Mathematics - 3 (MTF201A)

After the successful completion of this course, the student will be able to:

- **CO-1.** State and explain the important theorems in Fourier series, transforms and vector integral calculus
- **CO-2.** Solve simple problems in Fourier series, transforms and vector calculus
- **CO-3.** Apply Fourier series, transforms and vector calculus in solving complex real world engineering problems
- **CO-4.** Implement the programs to solve system of linear equations and non-linear equationsof singlevariable using MATLAB
- **CO-5.** Apply interpolation and numerical integration method in analyzing some real world problems

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Course Outcomes (COs)

Course Title & Code: Signals and Systems (21EEC201A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Describe the signals and systems, their classification and perform the basic operations on signals
- **CO-2.** Evaluate the time response of continuous-time and discrete-time systems LTI systemsfor specified inputs and impulse response
- **CO-3.** Compute the Fourier series of periodic signals, Fourier transform of aperiodic signalsand z-transform of discrete-time signals
- **CO-4.** Solve problems on signal generation, signal manipulation, classification of signals and systems
- **CO-5.** Analyse signals and systems in both time and transformed domains
- **CO-6.** Use standard software tools to analyse and perform time and frequency domainanalysis of signals and systems

Course Outcomes (COs)

Course Title & Code: Electronic Circuits (EEC202A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain the principles of biasing the transistors, small and large signal amplifier configurations
- **CO-2.** Describe working principles of feedback amplifiers, power amplifiers andoscillators
- **CO-3.** Solve problems on stability factors, gain, impedance, efficiency, distortion ofamplifiers, resonance frequency of oscillators and performance parameters of feedback amplifiers
- **CO-4.** Design transistor biasing circuits and small signal amplifier circuits
- **CO-5.** Analyse the stability aspects of amplifiers, performance of feedback amplifiers
- **CO-6.** Simulate and analyse the designs using standard circuit simulation too

Course Outcomes (COs)

Course Title & Code: Network Analysis (EEC203A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain fundamentals of electric networks, source and circuit transformation techniques
- **CO-2.** Simplify complex electrical circuits using various circuit theorems
- **CO-3.** Analyze general networks, ladder networks, transient behavior and resonance in electrical circuits
- **CO-4.** Develop relation between various two port network parameters
- **CO-5.** Solve simple network problems
- **CO-6.** Solve complex network problems

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Course Outcomes (COs)

Course Title & Code: Digital Logic Design (21EEC204A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain basic concepts of digital electronics such as Boolean algebra, logic functions
- **CO-2.** Describe and Classify different types of digital circuit implementations
- **CO-3.** Solve problems on logic design and logic minimization, and also incorporate them in software tools
- **CO-4.** Analyze a practical problem and develop a logic design to solve the problem
- **CO-5.** Apply digital design concepts for complex digital circuits

Course Outcomes (COs)

Course Title & Code: Electrical Machines - 1 (EEC205A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain working principle, construction, operation of DC machines and transformers using appropriate governing laws
- **CO-2.** Describe testing and characteristics of DC machines and transformers
- **CO-3.** Discuss starters, speed control techniques of DC motors and parallel operation of generators
- **CO-4.** Derive equations to determine performance parameters of DC machines and Transformers
- **CO-5.** Solve simple and complex problems on DC machines and transformers
- **CO-6.** Recommend suitable DC machines and transformers with specifications and selection criteria for a given application

Course Outcomes (COs)

Course Title & Code: Digital Logic Design Laboratory (EEL206A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Simulate digital logic circuits using standard software
- **CO-2.** Plan an experimental setup to test and verify the truth tables of logic gates
- **CO-3.** Construct digital circuits such as latches, multiplexers and counters to verify their functionalities
- **CO-4.** Design and construct various code converters
- **CO-5.** Write a laboratory report in a prescribed format

Course Outcomes (COs)

Course Title & Code: Electrical Machines Laboratory- 1 (EEL207A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Determine performance characteristics of a DC Machine as per the standardprocedures

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CO-2. Conduct suitable tests on Transformer as per the standard procedures
CO-3. Draw the desired performance characteristics of DC Machines and Transformers
CO-4. Write laboratory report as per the prescribed format

Course Outcomes (COs)

Course Title & Code: Environmental Studies (BTN101A)

After the successful completion of this course, the student will be able to:

CO-1. Define the multidisciplinary nature of environmental studies and recognize theneed for public awareness
CO-2. Classify and explain the various natural resources and their associated problems, ecosystemand environmental pollution
CO-3. Describe biodiversity at local, national and global levels
CO-4. Discuss various social issues pertaining to environment including sustainabledevelopment and energy issues
CO-5. Assess the impact of human population on the environment

Course Outcomes (COs)

Course Title & Code: Additional Mathematics - 1 (MTB103A)

After the successful completion of this course, the student will be able to:

CO-1. State and explain the important theorems and solve simple mathematical problems in one variable calculus and vector algebra
CO-2. State theorems and solve simple problems in two variable calculus
CO-3. Solve complex real world problems associated with one and two real analysis
CO-4. Illustrate fundamentals of MATLAB programming and write simple programs
CO-5. Solve complex mathematical problems associated with linear algebra and comparethe results with that of solutions obtained using MATLAB

Course Outcomes (COs)

Course Title & Code: Engineering Mathematics - 4 (MTF202A)

After the successful completion of this course, the student will be able to:

CO-1. Define and explain the concepts of correlation, regression, random variables,probability distribution, partial differential equations and complex analysis
CO-2. State theorems and solve simple problems in partial differential equations, complex analysis, probability, probability distributions
CO-3. Apply numerical methods to solve ordinary and partial differential equations using MATLAB
CO-4. Solve complex engineering problems associated with numerical methods using MATLAB
CO-5. Analyze real world problems associated with probability, probabilitydistributions, partial differential equations and complex analysis
CO-6. Construct the Bar chart, pie chart, Histogram, Box-plot and fitting of curves byusing MATLAB

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Course Outcomes (COs)

Course Title & Code: Linear Integrated Circuits (EEC211A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain Integrated Circuit fabrication processes, op-amp fundamentals and characteristics
- **CO-2.** Discuss the various linear and non-linear applications of op-amps
- **CO-3.** Design, compute and analyse op-amp based circuits
- **CO-4.** Analyse the functionalities of linear and nonlinear ICs for various applications
- **CO-5.** Design, model and analyse active filters, waveform generators, A/D and D/A converters

Course Outcomes (COs)

Course Title & Code: Electromagnetic Theory (EEC212A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain the concept of vector, co-ordinate system, electrostatics and magnetostatics
- **CO-2.** Derive gauss divergence theorem, Stokes' theorem and continuity equation
- **CO-3.** Solve simple and complex problems on capacitance, potential field, electric field and electric force
- **CO-4.** Analyze the concepts of divergence and curl, Faraday's laws of magnetic induction
- **CO-5.** Use standard software tools to solve and analyze specific parameters of electrostatics, magnetostatics

Course Outcomes (COs)

Course Title & Code: Microprocessors and Microcontrollers (EEC213A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain architectures of microprocessors, microcontrollers and their applications inembedded systems
- **CO-2.** Describe concepts of peripheral interfacing and programming of microprocessors and microcontrollers
- **CO-3.** Program and verify functionality of given application using microprocessor or microcontroller
- **CO-4.** Perform external peripheral interfacing using microprocessor or microcontroller for agiven application
- **CO-5.** Design applications using microprocessors, microcontrollers and embedded board with external peripherals

Course Outcomes (COs)

Course Title & Code: Measurements and Instrumentation (EEC214A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Describe measurement standards, measurement units and measurement systems
- **CO-2.** Explain the principles and applications of signal and function generators
- **CO-3.** Describe different sensors and their usage in various applications.
- **CO-4.** Analyse the models of measurement systems and analyze their static and dynamic

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characteristics

CO-5. Design appropriate signal conditioning circuits and choose recording / display devices

CO-6. Design of instrumentation for a system and measure resistance, capacitance, inductance, current, voltage and power

Course Outcomes (COs)

Course Title & Code: Electrical Machines-2 (EEC215A)

After the successful completion of this course, the student will be able to:

CO-1. Describe the construction, principle of operation, working, characteristics and types of AC andspecial machines

CO-2. Explain phasor diagrams, equivalent circuit, starting methods and speed control techniques forAC machines

CO-3. Derive equations for performance analysis of AC machines

CO-4. Discuss two reaction theory, slip test, parallel operation, regulation of alternators, power flowdiagram, crawling and cogging

CO-5. Solve simple and complex problems on AC machines

CO-6. Analyze performance characteristics of AC machines and special purpose machines for variousapplications

Course Outcomes (COs)

Course Title & Code: Electrical Circuits and Measurements Laboratory (EEL216A)

After the successful completion of this course, the student will be able to:

CO-1. Plan the experimental setup to achieve the stated aim

CO-2. Identify the type and range of the instruments required based on the type of test tobe conducted

CO-3. Conduct experiments as per the standard procedures and tabulate the measuredvalues

CO-4. Model, Simulate and test electric circuits using standard software tool

CO-5. Interpret the results by comparing with the simulation results and draw conclusions

CO-6. Write laboratory report as per the prescribed format

Course Outcomes (COs)

Course Title & Code: Microprocessors and Microcontrollers Laboratory (EEL217A)

After the successful completion of this course, the student will be able to:

CO-1. Develop the assembly level program on a Microprocessor / Microcontroller for a given application

CO-2. Design circuits for performing given tasks using Arduino board

CO-3. Interface external peripherals with Arduino board for given applications

CO-4. Demonstrate the developed designs for different applications

CO-5. Write the report as per the prescribed format

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Course Outcomes (COs)

Course Title & Code: Innovation and Entrepreneurship (BAU201A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain the concepts and process of Innovation as well as entrepreneurship
- **CO-2.** Construct and apply the idea generation techniques
- **CO-3.** Discuss the opportunities for launching of new venture and various entry strategies
- **CO-4.** Examine innovative ideas for the creation and management of entrepreneurship
- **CO-5.** Formulate and present a viable business plan to the investor's appraisal

Course Outcomes (COs)

Course Title & Code: Additional Mathematics - 2 (MTB104A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Describe the fundamentals of ordinary differential equations State theorems and solve simpleproblems in two variable calculus
- **CO-2.** Solve standard forms of ordinary differential equations Illustrate fundamentals of Linearalgebra
- **CO-3.** Model real world problems using ordinary differential equations and solve complex problemsassociated with ordinary differential equations
- **CO-4.** Apply numerical methods to solve nonlinear equations in one variable, system of linearequations, interpolation and numerical quadrature, and implement the same using MATLAB
- **CO-5.** Solve complex problems associated with nonlinear equations and linear systems, interpolation and numerical integration using MATLAB

Course Outcomes (COs)

Course Title & Code: Transmission and Distribution (EEC301A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain components of power transmission systems, distribution systems
- **CO-2.** Describe different modes of bulk power transmission, HVAC and HVDC systems, types of insulatorsand UG cables, testing of cables and insulators
- **CO-3.** Derive expressions for sag, corona, line parameters, performance parameters of undergroundcables, string efficiency of insulator
- **CO-4.** Discuss performance parameters of power transmission lines, sag, corona and distribution system
- **CO-5.** Solve simple and complex numerical problems on sag, corona, insulator and line parameters
- **CO-6.** Solve simple and complex numerical problems on performance of transmission lines, undergroundcables, uniform and concentrated loads on distribution system

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Course Outcomes (COs)

Course Title & Code: Digital Signal Processing (ECC302A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Describe types of signals, transforms, filters, algorithms and its properties.
- **CO-2.** Explain the filter design techniques, types of transformations, and multirate principles in signal processing.
- **CO-3.** Determine Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT),
- **CO-4.** Determine convolution using DFT and filter structures for discrete time sequences
- **CO-5.** Design digital filters using IIR and FIR using structures
- **CO-6.** Apply principles of Fourier transforms for spectral analysis of digital signals and systems.

Course Outcomes (COs)

Course Title & Code: Control Systems (EEC303A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Demonstrate the understanding of control systems
- **CO-2.** Obtain mathematical models of various physical systems
- **CO-3.** Design controllers and compensators for given specifications
- **CO-4.** Analyze practical problems and develop controllers to solve the problems
- **CO-5.** Apply control system concepts for real world applications

Course Outcomes (COs)

Course Title & Code: Electrical Machine Design (EEC304A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain design parameters, specific electric and magnetic loading of static and rotating electrical machines
- **CO-2.** Discuss mmf calculation, thermal rating of static and rotating electrical machines
- **CO-3.** Design armature and field system for DC machines
- **CO-4.** Design core, yoke, windings and cooling systems for transformers
- **CO-5.** Design stator, rotor for asynchronous and synchronous machines
- **CO-6.** Analyze the performance prediction for designed values of static and rotating

Course Outcomes (COs)

Course Title & Code: High Voltage Engineering and laboratory (EEC305A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain causes and effects of over voltages, protection and high voltage surges in electrical powersystems
- **CO-2.** Describe generation and measurement techniques of high DC, AC, impulse voltages and currents, testingof various high voltage apparatus

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CO-3. Discuss breakdown mechanisms in gaseous, liquid, solid and composite dielectrics, applications,insulation coordination and partial discharges
CO-4. Solve simple and complex problems on breakdown strength, dielectrics and impulse voltages
CO-5. Analyze the behavior of travelling waves in transmission lines under various conditions
CO-6. Design a suitable high voltage/current generator, measurement scheme and recommend appropriateinsulation medium/material for a given application

Course Outcomes (COs)

Course Title & Code: Engineering Economics (EEH301A)

After the successful completion of this course, the student will be able to:

CO-1. Explain the concepts related to engineering decision making, time value of money, cash- flow analysis, financial accounting, budget, and project management
CO-2. Describe the factors related to microeconomics and macroeconomics
CO-3. Solve simple problems related to engineering decision making, time value of money, cash-flow analysis, financial accounting, budget, microeconomics, macroeconomics and project management
CO-4. Analyse a financial budget and interpret from economics point of view
CO-5. Develop a project management report related to an electrical product/system consideringthe financial and economic aspects

Course Outcomes (COs)

Course Title & Code: Electrical Machines Laboratory-2 (EEL306A)

After the successful completion of this course, the student will be able to:

CO-1. Determine performance characteristics of an AC Machine as per the standard
CO-2. Write laboratory report as per the prescribed format
CO-3. Determine performance characteristics of an AC Machine as per the standard
CO-4. Write laboratory report as per the prescribed format

Course Outcomes (COs)

Course Title & Code: Control Systems Laboratory (EEL307A)

After the successful completion of this course, the student will be able to:

CO-1. Perform stability analysis in time and frequency domain for linear control systems
CO-2. Design, model and analyze controllers and compensators for a specific application
CO-3. Obtain time and frequency response, interpret, infer, comment and draw conclusions
CO-4. Write laboratory report as per the prescribed format

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Course Outcomes (COs)

Course Title & Code: Design and Computer Aided Drawing of Electrical Machine (EEC311A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Develop DC and AC winding diagrams for rotating electrical machines
- **CO-2.** Design and draw armature and field systems of AC and DC rotating machines
- **CO-3.** Design and draw cross sectional view of core, yoke and windings of static and rotating electricalmachines
- **CO-4.** Develop assembly drawing of static and rotating electrical machines
- **CO-5.** Create 3D models of the designed electrical machines

Course Outcomes (COs)

Course Title & Code: Switchgear and Protection (EEC312A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain arc interruption theories, significance, transients, AC and DC circuit breaking and protectiverelaying
- **CO-2.** Describe the construction, principle of operation, working, characteristics of various types of fuses,switches, protective relays, Circuit Breakers (CB) and applications
- **CO-3.** Discuss the operating mechanism of various types of relays, protection schemes for various types of faults in electrical machines, grounding systems, testing of CB, static and microprocessor based relays
- **CO-4.** Solve simple problems on fuses, CBs, protective relaying, protection of electrical machines, groundingsystems
- **CO-5.** Solve complex problems on fuses, CBs, protective relaying, protection of electrical machines, groundingsystems
- **CO-6.** Select switchgears and protecting devices and suitable scheme for a given application

Course Outcomes (COs)

Course Title & Code: Power Electronics and Drives (EEC313A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Describe the working of various power semiconductor devices, characteristics and power converter
- **CO-2.** Explain the formation of PN junction and behavior, model, characteristics, protection, operation,firing and commutation of power electronic devices
- **CO-3.** Discuss AC voltage controllers, controlled rectifiers, DC choppers , inverters, DC and AC drives
- **CO-4.** Solve simple, complex problems on devices, commutation techniques and power converters
- **CO-5.** Analyze the performance of AC voltage controllers, controlled rectifiers, DC choppers and inverters
- **CO-6.** Design and analyze power electronic converters for a given application using standard softwaretool

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Course Outcomes (COs)

Course Title & Code: Power System Analysis (EEC314A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain various power system components, single line diagram, and various faults
- **CO-2.** Describe per unit system, sequence impedances and sequence networks of a power system
- **CO-3.** Discuss various numerical methods for solving power flow equations
- **CO-4.** Solve simple numerical problems on per unit system, power flow methods, faults and stability in apower system
- **CO-5.** Solve complex numerical problems on per unit system, power flow methods, faults and stability inpower system
- **CO-6.** Analyze load flow studies, steady state stability and transient stability of a power system

Course Outcomes (COs)

Course Title & Code: Seminar (EEP317A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Prepare and deliver seminar on a given topic.
- **CO-2.** Write a report on the seminar topic.

Course Outcomes (COs)

Course Title & Code: Project Work -1/Internship (EEP401A/EEI401A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Recognize the need for developing a new or improving an existing engineering product/system through an organised survey of literature
- **CO-2.** Define engineering design specifications
- **CO-3.** Design, model, solve, analyse the product/system to meet the design specifications
- **CO-4.** Evaluate the performance of the modelled system and justify its performance
- **CO-5.** Demonstrate the system working in a virtual environment and make a presentation
- **CO-6.** Write a technical report alternatively,
- **CO-7.** Write a report on experiences during internship
- **CO-8.** Make a presentation to a panel of examiners

Course Outcomes (COs)

Course Title & Code: Electronic Devices and Appliances (OEE411A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain concepts of electronics and its subfields
- **CO-2.** Apply principles of electronics to construct and analyze electronic circuits and devices

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CO-3. Identify components and circuits of an electronic device/appliance at sub-circuitry level andrealize its functionality

CO-4. Test electronic device/appliance functionality using appropriate tools and procedure

CO-5. Solve identified problem of an electronic device/appliance by applying standard diagnosticand troubleshooting procedure

Course Outcomes (COs)

Course Title & Code: Project Work -2 (EEP411A)

After the successful completion of this course, the student will be able to:

CO-1. Recognize the need for developing a new or improving an existing engineering product/system through an organized survey of literature

CO-2. Define engineering design specifications

CO-3. Design, model, solve, analyse the product/system to meet the design specifications

CO-4. Evaluate the performance of the modelled system and justify its performance

CO-5. Demonstrate the system working in a virtual environment and make a presentation

CO-6. Write a project report

Course Outcomes (COs)

Course Title & Code: Power Converter Control Techniques (EEE311A)

After the successful completion of this course, the student will be able to:

CO-1. Describe various approaches for mathematical modelling of power converters and controllers

CO-2. Explain different control techniques, compensators and observers

CO-3. Obtain expressions for circuit parameters to meet the design specifications

CO-4. Model and analyze various converter circuits in frequency domain

CO-5. Solve simple and complex problems on equivalent circuit of switch, converter, response of second order system, graphical construction of various impedance networks

CO-6. Design and analyze the performance of controllers and regulators for various converter applications

Course Outcomes (COs)

Course Title & Code: Electrical Power Generation (EEE312A)

After the successful completion of this course, the student will be able to:

CO-1. Describe various conventional and non- conventional power plants, energy storagesystems

CO-2. Explain the layout, components, working of various conventional plants

CO-3. Discuss the economic loading of power plants, environmental impact of conventionalpower plants

CO-4. Solve simple problems related to load duration curve and energy load curve

CO-5. Solve complex problems related to load duration curve and energy load curve

CO-6. Arrive at the specifications of an appropriate power plant for a given generationcapacity

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Course Outcomes (COs)

Course Title & Code: Advanced Control Systems (EEE313A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Describe the impact of nonlinearities and stability on controller design
- **CO-2.** Discuss the principles of state space analysis describing function, singular points and chaos in non-linear control system
- **CO-3.** Model, simulate and analyze various nonlinearities of a plant Design controllers and compensators for given specifications
- **CO-4.** Design controller for non-linear system using describing function and phaseplane approaches and perform stability studies
- **CO-5.** Model and simulate nonlinear controller for a given application and analyzetime response, steady state error and stability of the system

Course Outcomes (COs)

Course Title & Code: Industrial Drives and Applications (EEE411A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Describe block diagram, dynamics, speed torque characteristics of electric drives
- **CO-2.** Explain the transient behavior of electric drives, loss reduction techniques and induction motor drive configurations
- **CO-3.** Discuss and analyze the speed control of various AC and DC drive topologies
- **CO-4.** Solve simple and complex problems on AC and DC drives
- **CO-5.** Select suitable rating of motor used in an electric drive for a given application

Course Outcomes (COs)

Course Title & Code: Power System Operation and Control (EEE412A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain basic concepts in power system operation and control, unit commitment, economic dispatch, smart grid
- **CO-2.** Describe various mechanisms of real and reactive power control
- **CO-3.** Discuss various FACTS devices and their applications, conventional and smart grid
- **CO-4.** Solve simple problems on economic dispatch, unit commitment real, power-frequency control, reactive power voltage control
- **CO-5.** Solve complex numerical problems on unit commitment, economic dispatch, real power-frequency control, reactive power voltage control, FACTS devices
- **CO-6.** Model and analyze FACTS devices for a given application using standard software tool

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Course Outcomes (COs)

Course Title & Code: Soft Computing (EEE413A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Understand Soft Computing concepts, technologies, and applications
- **CO-2.** Explain the concepts of Fuzzy logic, neural networks, Genetic Algorithm and their importance in non-linear and adaptive control systems
- **CO-3.** Model, simulate and analyze membership functions of Fuzzy logic controllers and learning schemes of neural network for their implementation
- **CO-4.** Identify, evaluate and select an appropriate control law for a given application and develop a schematic diagram for its implementation
- **CO-5.** Model, design, simulate and analyze the control laws using Fuzzy logic and neural controllers
- **CO-6.** Apply different soft computing techniques for real world applications

Course Outcomes (COs)

Course Title & Code: Modelling and Control of Power Electronics System (EEE421A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain various methods of modelling and control of power converters
- **CO-2.** Discuss linear control techniques for power electronic converters. Describe various methods to improve power quality
- **CO-3.** Obtain mathematical model for various configurations of DC – DC converters
- **CO-4.** Develop a control strategy for a given power electronic converter model
- **CO-5.** Solve simple and complex numerical problems on modelling and control ofpower electronic converters
- **CO-6.** Model, simulate and analyze power converters for various applications usingstandard software tool

Course Outcomes (COs)

Course Title & Code: Testing and Commissioning of Electrical Equipment (EEE422A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Describe the theoretical workings of various electrical equipments
- **CO-2.** Discuss different testing methods adopted in power systems
- **CO-3.** Discuss how to commission high voltage equipments in distribution processes
- **CO-4.** Perform efficiency and regulation tests and determine mechanical stress under normaland abnormal conditions
- **CO-5.** Model a system as per BIS standards used in testing and commissioning
- **CO-6.** Formulate a real-world testing and commissioning of approach to meet Standards, types, specification, installation, commissioning tests, maintenance schedule, type& routine tests

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Course Outcomes (COs)

Course Title & Code: PLC and SCADA (EEE423A)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain the need for automation, SCADA systems, PLC and programming languages, IoT, DCS, MMI
- **CO-2.** Describe PLC architecture and logic implementation
- **CO-3.** Discuss SCADA system and various real time applications
- **CO-4.** Discuss DCS architecture and various distributed control applications
- **CO-5.** Develop control logic for industrial automation using PLC program language and SCADA
- **CO-6.** Automate a given manual process and experimentally validate the developed control logic

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