Course Outcomes (COs)

Department of

Electrical and Electronics Engineering

Programme Name": B.E.-Electrical & Electronics Engineering

CONTENTS

2022 Scheme(UG)

Course Outcomes of Second -Year Courses

Course Name	MATHEMATICS-III FOR EE ENGINEERING
Course Code	BMATE 301
Course outcomes (COs): At the end of the course the student will be able to:	
BMATE301.1	Illustrate the concepts of– ODE of higher order, Statistical methods, Fourier series, Fourier & Z-transforms and Probability distributions.
BMATE301.2	Apply the above acquired knowledge to solve the problems in Electrical & Electronics engineering.
BMATE301.3	Analyze the solutions of the real _world problems using above techniques.
BMATE301.4	Interpret _ the overall knowledge gained to demonstrate the problems arising in practical situations.

Course Name	ELECTRIC CIRCUIT ANALYSIS
Course Code	BEE302
Course outcomes (COs): At the end of the course the student will be able to:	
BEE302.1	Understand the basic concepts, basic laws and methods of analysis of DC and AC networks and reduce the complexity of network using source shifting, source transformation and network reduction using transformations.
BEE302.2	Solve complex electric circuits using network theorems & Discuss resonance in series and parallel circuits and also the importance of initial conditions and their evaluation.
BEE302.3	Synthesize typical waveforms using Laplace transformation.
BEE302.4	Solve unbalanced three phase systems and also evaluate the performance of two port networks.

Course Name	ANALOG ELECTRONIC CIRCUITS
Course Code	BEE303
Course outcomes (COs): At the end of the course the student will be able to:	
BEE303.1	Utilize the characteristics of transistor for different applications.
BEE303.2	Design and analyze biasing circuits for transistor.
BEE303.3	Design, analyze and test transistor circuitry as amplifiers
BEE303.4	Design, analyze and test transistor circuitry as an oscillators

Course Name	TRANSFORMERS AND GENERATORS
Course Code	BEE304
Course outcomes (COs): At the end of the course the student will be able to:	
BEE304.1	Explain the construction, working and various tests of single phase Transformer.
BEE304.2	Explain the construction, working and parallel operation of three phase Transformer.
BEE304.3	Explain the construction, working and analysis of Synchronous Generator.
BEE304.4	Explain the construction, working of solar and wind power generators.

Course Name	TRANSFORMERS AND GENERATORS LAB
Course Code	BEEL305
Course outcomes (COs): At the end of the course the student will be able to:	
BEEL305.1	Conduct various tests on transformers and synchronous machines and evaluate their performance.
BEEL305.2	Perform the parallel operation on two single phase transformers.
BEEL305.3	Verify the performance of synchronous generator.
BEEL305.4	Calculate the voltage regulation of an alternator using different methods for comparison.

Course Name	DIGITAL LOGIC CIRCUITS
Course Code	BEE 306A
Course outcomes (COs): At the end of the course the student will be able to:	
BEE 306A.1	Explain and analyze the concept and design of combinational and sequential logic circuits
BEE 306A.2	Design the sequential circuits using SR, JK, D and T flip-flops and Melay and Moore applications
BEE 306A.3	Design applications of combinational and sequential circuits
BEE 306A.4	Employ the digital circuits for different applications

Course Name	SOCIAL CONNECT & RESPONSIBILITY
Course Code	BSCK307
Course outcomes (COs): At the end of the course the student will be able to:	
BSCK307.1	Communicate, connect to the surrounding & create a responsible connection with the society.
BSCK307.2	Involve in the community in general in which they work & notice the needs and problems of the community and involve them in problem –solving.
BSCK307.3	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
BSCK307.4	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

Course Name	555 IC LABORATORY
Course Code	BEEL358B
Course outcomes (COs): At the end of the course the student will be able to:	
BEEL358B.1	Design the circuit in an intelligent way
BEEL358B.2	Analyze the circuit in a proper method
BEEL358B.3	Implement the circuit for basic applications
BEEL358B.4	Test the performance of the circuits in practical applications.

2021 Scheme(UG)

Course Outcomes of Second-Year Courses

Course Name	TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES
Course Code	21MAT31
Course outcomes (COs): At the end of the course the student will be able to:	
21MAT31.1	Illustrate the concepts of– Laplace, Fourier & Z transformation, Fourier series , Numerical solutions of PDE & ODE and Calculus of variation .
21MAT31.2	Apply the above acquired knowledge to solve the problems in engineering.
21MAT31.3	Analyze the solutions of the real world problems using above techniques.
21MAT31.4	Interpret the overall knowledge gained to demonstrate the problems arising in practical situations.

Course Name	ANALOG ELECTRONIC CKT AND OPAMPS
Course Code	21EE32
Course outcomes (COs): At the end of the course the student will be able to:	
21EE32.1	Obtain the output characteristics of electronic circuits in passive and Active mode
21EE32.2	Design and compare biasing circuits for amplifiers &. Explain the concept of feedback, its types and design of feedback circuits
21EE32.3	Design and analyze the operation of oscillators for different frequencies and Design and analysis of BJT, FET and MOSFET amplifiers
21EE32.4	Design and Demonstrate the application of BJT,MOSFT, FET and OpAmps

Course Name	ELECTRIC CIRCUIT ANALYSIS
Course Code	21EE33
Course outcomes (COs): At the end of the course the student will be able to:	
21EE33.1	Apply the knowledge of basic circuital laws and simplify the dc and ac networks using reduction techniques.
21EE33.2	Solve complex electric circuits using network theorems.
21EE33.3	Apply the knowledge of basic circuital laws to determine the response of the system using Laplace transformation.
21EE33.4	Apply the knowledge of basic circuital laws to evaluate the performance of two port networks

Course Name	TRANSFORMERS AND GENERATORS
Course Code	21EE34
Course outcomes (COs): At the end of the course the student will be able to:	
21EE34.1	Understand the construction and operation of 1-phase, 3-Phase transformers, and Autotransformer.
21EE34.2	Analyze the performance of transformers by polarity test, Sumpner's Test, phase conversion, 3-phase connection, and parallel operation.
21EE34.3	Understand the construction and working of AC and DC Generators.
21EE34.4	Analyze the performance of the AC Generators on infinite bus and parallel operation. Determine the regulation of AC Generator by Slip test, EMF, MMF, and ZPF Methods

Course Name	ELECTRICAL MACHINES LABORATORY I
Course Code	21EEL35
Course outcomes (COs): At the end of the course the student will be able to:	
21EE35.1	Evaluate the performance of transformers from the test data obtained.
21EE35.2	Connect and operate two single phase transformers of different KVA rating in parallel.
21EE35.3	Connect single phase transformers for three phase operation and phase conversion.
21EE35.4	Compute the voltage regulation of synchronous generator using the test data obtained in the laboratory. Evaluate the performance of synchronous generators from the test data and assess the performance of synchronous generator connected to infinite bus.

Course Name	SOCIAL CONNECT AND RESPONSIBILITY
Course Code	21SCR36
Course outcomes (COs): At the end of the course the student will be able to:	
21SCR36.1	Understand social responsibility
21SCR36.2	Practice sustainability and creativity
21SCR36.3	Showcase planning and organizational skills
21SCR36.4	To create a responsible connection with society

Course Name	555 IC Laboratory
Course Code	21EEL383
Course outcomes (COs): At the end of the course the student will be able to:	
21EEL383.1	Design simple multi-vibrator circuits
21EEL383.2	Construct the circuits for real-time-applications.
21EEL383.3	test the circuits regarding their applicability.
21EEL383.4	Construct the circuits for industrial applications.

Course Name	COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS
Course Code	21MAT41
Course outcomes (COs): At the end of the course the student will be able to:	
21MAT41.1	Illustrate the concepts of– Complex Analysis, Special functions, Probability distributions and Statistical methods.
21MAT41.2	Apply the above acquired knowledge to solve the problems in Electrical & Electronics engineering.
21MAT41.3	Analyze the solutions of the real world problems using above techniques.
21MAT41.4	Interpret the overall knowledge gained to demonstrate the problems arising in practical situations.

Course Name	DIGITAL SYSTEM DESIGN
Course Code	21EE42
Course outcomes (COs): At the end of the course the student will be able to:	
21EE42.1	Simplify the given bolean expression using K-map
21EE42.2	Design of combinational digital circuits(Mux,Dmux,Decoder,Encoder and Comparators)
21EE42.3	Design of arithmatic circuits(Adders and subtrators)
21EE42.4	Design of sequential circuits

Course Name	MICROCONTROLLER
Course Code	21EE43
Course outcomes (COs): At the end of the course the student will be able to:	
21EE43.1	Understand the architecture, organization and addressing modes of 8051.
21EE43.2	Develop programs in assembly level language using the instruction set.
21EE43.3	Write 8051 C programs for various applications.
21EE43.4	Develop 8051 programs for interfacing the external devices.

Course Name	ELECTRIC MOTORS
Course Code	21EE44
Course outcomes (COs): At the end of the course the student will be able to:	
21EE44.1	Explain the construction, operation and classification of DC Motor, AC motor and special purpose motors.
21EE44.2	Describe the performance characteristics and applications of Electric motors.
21EE44.3	Demonstrate and explain the methods of testing of DC machines and determine losses and efficiency.
21EE44.4	Control the speed of DC motor and induction motor. Explain the starting methods, equivalent circuit and phasor diagrams, torque angle, effect of change in excitation and change in load, hunting and damping of synchronous motors.

Course Name	BIOLOGY FOR ENGINEERS
Course Code	21BE45
Course outcomes (COs): At the end of the course the student will be able to:	
21BE45.1	Elucidate the basic biological concepts via relevant industrial applications and case studies.
21BE45.2	Evaluate the principles of design and development, for exploring novel bioengineering projects.
21BE45.3	Corroborate the concepts of biomimetics for specific requirements.
21BE45.4	Think critically towards exploring innovative biobased solutions for socially relevant problems

Course Name	ELECTRICAL MACHINES LABORATORY – II
Course Code	21EEL46
Course outcomes (COs): At the end of the course the student will be able to:	
21EEL46.1	Test DC machines to determine their characteristics and also to control the speed of DC motor.
21EEL46.2	Pre-determine the performance characteristics of DC machines by conducting suitable tests.
21EEL46.3	Perform load test on single phase and three phase induction motor to assess its performance.
21EEL46.4	Conduct test on induction motor to pre-determine the performance characteristics. Conduct test on synchronous motor to draw the performance curves

Course Name	UNIVERSAL HUMAN VALUES
Course Code	21UH49
Course outcomes (COs): At the end of the course the student will be able to:	
21UH49.1	Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
21UH49.2	They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
21UH49.3	Holistic vision of life, Socially responsible behaviour, Environmentally responsible work, Ethical human conduct
21UH49.4	Having Competence and Capabilities for Maintaining Health and Hygiene,Appreciation and aspiration for excellence (merit) and gratitude for all

Course Outcomes of Third -Year Courses

Course Name	TRANSMISSION AND DISTRIBUTION
Course Code	21EE51
Course outcomes (COs): At the end of the course the student will be able to:	
21EE51.1	Explain transmission and distribution scheme, identify the importance of different transmission systems and types of insulators.
21EE51.2	Analyze and compute the parameters of the transmission line for different configurations.
21EE51.3	Assess the performance of overhead lines. Interpret corona and explain the use of underground cables.
21EE51.4	Classify different types of distribution systems; examine its quality & reliability.

Course Name	CONTROL SYSTEMS
Course Code	21EE52
Course outcomes (COs): At the end of the course the student will be able to:	
21EE52.1	Analyze and model electrical and mechanical system using analogous and Formulate transfer functions using block diagram and signal flow graphs.
21EE52.2	Analyze the stability of control system, ability to determine transient and steady state time response. and Illustrate the performance of a given system in time and frequency domains, stability analysis using Root locus and Bode plots.
21EE52.3	Discuss stability analysis using Nyquist plots, Design controller and compensator for a given specification. and also Utilize software package and discrete components in assessing the time and frequency domain response of a given second order system,Design, analyze and simulate Lead, Lag and Lag – Lead compensators for given specifications.
21EE52.4	Determine the performance characteristics of ac and DC servomotors and synchro-transmitter receiver pair used in control systems. also Simulate the DC position and feedback control system to study the effect of P, PI, PD and PID controller and Lead compensator on the step response of the system.and Develop a script files to plot Root locus, Bode plot and Nyquist plot to study the stability of a system using software package

Course Name	Power System Analysis – 1
Course Code	21EE53
Course outcomes (COs): At the end of the course the student will be able to:	
21EE53.1	Model the power system components & construct per unit impedance diagram of power system.
21EE53.2	Analyze three phase symmetrical & unsymmetrical faults on power system.
21EE53.3	Compute unbalanced phasors in terms of sequence components and vice versa, also develop sequence networks.
21EE53.4	Examine dynamics of synchronous machine and determine the power system stability.

Course Name	POWER ELECTRONICS
Course Code	21EE54
Course outcomes (COs): At the end of the course the student will be able to:	
21EE54.1	Give an overview of applications power electronics, different types of power semiconductor devices, their switching characteristics, power diode characteristics, types, their operation and the effects of power diodes on RL circuits.
21EE54.2	Explain the techniques for design and analysis of single phase diode rectifier circuits. power transistors, their steady state and switching characteristics and limitations.
21EE54.3	Explain different types of Thyristors, their gate characteristics and gate control requirements.
21EE53.4	Explain the design, analysis techniques, performance parameters and characteristics of controlled rectifiers, DC- DC, DC -AC converters and Voltage controllers.

Course Name	POWER ELECTRONICS LABORATORY
Course Code	21EEL55
Course outcomes (COs): At the end of the course the student will be able to:	
21EEL55.1	Obtain static characteristics of semiconductor devices to discuss their performance. &Trigger the SCR by different methods
21EEL55.2	Verify the performance of single phase controlled full wave rectifier and AC voltage controller with R and RL loads.
21EEL55.3	Control the speed of a DC motor, universal motor and stepper motors.
21EEL55.4	Verify the performance of single phase full bridge inverter connected to resistive load.

Course Name	RENEWABLE ENERGY PROJECTS
Course Code	21EEP584
Course outcomes (COs): At the end of the course the student will be able to:	
21EEP584.1	Design the circuit in an intelligent way
21EEP584.2	Analyze the circuit in a proper method
21EEP584.3	Implement the circuit for basic applications
21EEP584.4	Test the performance of the circuits in practical applications.

Course Name	MANAGEMENT AND ENTREPRENEURSHIP
Course Code	21EE61
Course outcomes (COs): At the end of the course the student will be able to:	
21EE61.1	Explain the field of management, task of the manager, planning and steps in decision making.
21EE61.2	Discuss the structure of organization, importance of staffing, leadership styles, modes of communication, techniques of coordination and importance of managerial control in business.
21EE61.3	Explain the concepts of entrepreneurship and a businessman's social responsibilities towards different groups and Show an understanding of role of SSI's in the development of country and state/central level institutions/ agencies supporting business enterprises.
21EE61.4	Discuss the concepts of project management, capital budgeting, project feasibility studies, need for project report and new control techniques.

Course Name	POWER SYSTEM ANALYSIS – 2
Course Code	21EE62
Course outcomes (COs): At the end of the course the student will be able to:	
21EE62.1	Formulate network matrices and models for solving load flow problems.and Perform steady state power flow analysis of power systems using numerical iterative techniques.
21EE62.2	Solve issues of economic load dispatch and unit commitment problems. and analyze short circuit faults in power system networks using bus impedance matrix.
21EE62.3	Apply Point by Point method and Runge Kutta Method to solve Swing Equation.and develop a program in suitable package to assess the performance of medium and long transmission lines.
21EE62.4	Develop a program in suitable package to obtain the power angle characteristics of salient and non-salient pole alternator. and in suitable package to assess the transient stability under three phase fault at different locations in a of radial power systems.

Course Name	SIGNALS AND DIGITAL SIGNAL PROCESSING
Course Code	21EE63
Course outcomes (COs): At the end of the course the student will be able to:	
21EE63.1	Discuss classification and basic operations that can be performed on both continuous and discrete time signals.
21EE63.2	Evaluate Discrete Fourier Transform of a sequence and the convolution of two sequences to determine the output sequence.
21EE63.3	Evaluate Discrete Fourier Transform of a sequence by using fast methods.
21EE63.4	Design Butterworth and Chebyshev IIR digital filters and FIR filters using different techniques and develop different structures for IIR and FIR filters.

Course Name	ELECTRICAL ENGINEERING MATERIALS
Course Code	21EE644
Course outcomes (COs): At the end of the course the student will be able to:	
21EE644.1	Discuss electrical and electronics materials, their importance, classification and operational requirement
21EE644.2	Discuss conducting, dielectric, insulating and magnetic materials used in engineering, their properties and classification.
21EE644.3	Explain the phenomenon superconductivity, super conducting materials and their application in engineering.
21EE644.4	Explain the plastic and its properties and applications.

Course Name	DIGITAL SIGNAL PROCESSING LABORATORY
Course Code	21EEL66
Course outcomes (COs): At the end of the course the student will be able to:	
21EEL66.1	(1)Conduct sampling of signals in time and frequency domains and evaluate the impulse response of a system.
21EEL66.2	Obtain convolution of given sequences to evaluate the response of a system.
21EEL66.3	Compute DFT and IDFT of a given sequence using the basic definition and/or fast methods.
21EEL66.4	(5)Provide a solution for a given difference equation. and Design and IIR and FIR filters.

Course Outcomes of Fourth -Year Courses

Course Name	HIGH VOLTAGE AND POWER SYSTEM PROTECTION
Course Code	21EE71
Course outcomes (COs): At the end of the course the student will be able to:	
21EEL71.1	Apply the knowledge of dielectric property for insulation, it's performances as per Standards and High voltage application in power system Equipment's. and analyze the circuits of high voltages, high currents in Generation and Measurements.
21EEL71.2	Apply relays to the power system protection and discuss the construction, operating principles and performances of circuit breaker.
21EEL72.3	Discuss protection of generators, motors, Transformer and Bus Zone Protection and describe the causes of over voltages and their remedial measures.
21EEL73.4	Analyze the spark over characteristics using High voltages for checking the breakdown phenomenon and dielectric strength of dielectric materials. and experimentally verify the characteristics of over current, over voltage, under voltage using electromagnetic, static, distance and impedance relays.

Course Name	POWER SYSTEM OPERATION AND CONTROL
Course Code	21EE72
Course outcomes (COs): At the end of the course the student will be able to:	
21EEL71.1	Describe various levels of controls in power systems, architecture and configuration of SCADA.
21EEL71.2	Develop and analyze mathematical models of Automatic Load Frequency Control.
21EEL72.3	Develop mathematical model of Automatic Generation Control in Interconnected Power system.
21EEL73.4	Discuss the Control of Voltage, Reactive Power and Voltage collapse.and explain security, contingency analysis, and state estimation of power systems.

Course Name	POWER SYSTEM PLANNING
Course Code	21EE721
Course outcomes (COs): At the end of the course the student will be able to:	
21EE721.1	Discuss primary components of power system planning, planning methodology for optimum power system expansion and load forecasting. and understand economic appraisal to allocate the resources efficiently and appreciate the investment decisions
21EE721.2	Discuss expansion of power generation and planning for system energy in the country, evaluation of operating states of transmission system, their associated contingencies and the stability of the system.
21EE721.3	Discuss principles of distribution planning, supply rules, network development and the system studies and reliability criteria for generation, transmission, distribution and reliability evaluation and analysis, grid reliability, voltage disturbances and their remedies
21EE721.4	Discuss planning and implementation of electric –utility activities, market principles and the norms framed.

Course Name	POWER SYSTEM PLANNING
Course Code	21EE721
Course outcomes (COs): At the end of the course the student will be able to:	
21EE721.1	Discuss primary components of power system planning, planning methodology for optimum power system expansion and load forecasting. and understand economic appraisal to allocate the resources efficiently and appreciate the investment decisions
21EE721.2	Discuss expansion of power generation and planning for system energy in the country, evaluation of operating states of transmission system, their associated contingencies and the stability of the system.
21EE721.3	Discuss principles of distribution planning, supply rules, network development and the system studies and reliability criteria for generation, transmission, distribution and reliability evaluation and analysis, grid reliability, voltage disturbances and their remedies
21EE721.4	Discuss planning and implementation of electric –utility activities, market principles and the norms framed.

Course Name	ELECTRICAL VEHICLE TECHNOLOGIES
Course Code	21EE724
Course outcomes (COs): At the end of the course the student will be able to:	
21EE724.1	(1)Explain the working of electric vehicles and recent trends.
21EE724.2	(2)Analyze different power converter topology used for electric vehicle application.
21EE724.3	(3)Develop the electric propulsion unit and its control for application of electric vehicles.
21EE724.4	(4)Design converters for battery charging and explain transformer less topology.

Course Name	COMPUTER AIDED ELECTRICAL DRAWING
Course Code	21EE731
Course outcomes (COs): At the end of the course the student will be able to:	
21EE731.1	Develop armature winding diagram for DC and AC machines.
21EE731.2	Develop a Single Line Diagram of Generating Stations and substation using the standard symbols.
21EE731.3	Construct sectional views of core type and shell type transformers using the design data.
21EE731.4	Construct sectional views of assembled DC and AC machine and their parts using the design data or the sketches.

Course Name	INDUSTRIAL DRIVES AND APPLICATIONS
Course Code	21EE734
Course outcomes (COs): At the end of the course the student will be able to:	
21EE734.1	Explain the advantages, choice and control of electric drive
21EE734.2	Explain the dynamics, generating and motoring modes of operation of electric drives
21EE734.3	Explain the selection of motor power rating to suit industry requirements
21EE734.4	Analyze the performance & control of DC motor drives using controlled rectifiers , control of converter fed Induction motor, synchronous motor & stepper motor drives.

Course Name	ENERGY CONSERVATION AND AUDIT
Course Code	21EE745
Course outcomes (COs): At the end of the course the student will be able to:	
21EE745.1	Analyze about energy scenario nationwide and worldwide , also outline Energy Conservation Act and its features.
21EE745.2	Discuss load management techniques and energy efficiency.and understand the need of energy audit and energy audit methodology.
21EE745.3	Understand various pillars of electricity market design. and Conduct energy audit of electrical systems and buildings.
21EE745.4	Show an understanding of demand side management and energy conservation

2018 Scheme(UG)

Course Outcomes of Second -Year Courses

Course Name	TRANSFORM CALCULUS,FOURIER SERIES & NUMERICAL TECHNIQUES
Course Code	18MAT31
Course outcomes (COs): At the end of the course the student will be able to:	
18MAT31.1	Illustrate the concepts of– Laplace, Fourier & Z transformation, Fourier series, Numerical solutions of ODE and Calculus of variation .
18MAT31.2	Apply the above acquired knowledge to solve the problems in engineering.
18MAT31.3	Analyze the solutions of the real world problems using above techniques.
18MAT31.4	Interpret the overall knowledge gained to demonstrate the problems arising in practical situations.

Course Name	ELECTRIC CIRCUIT ANALYSIS
Course Code	18EE32
Course outcomes (COs): At the end of the course the student will be able to:	
18EE32.1	Understand the basic concepts, basic laws and methods of analysis of DC and AC networks and reduce the complexity of network using source shifting, source transformation and network reduction using transformations
18EE32.2	complex electric circuits using network theorems
18EE32.3	Discuss resonance in series and parallel circuits and also the importance of initial conditions and their evaluation
18EE32.4	Synthesize typical waveforms using Laplace transformation. AND Solve unbalanced three phase systems and also evaluate the performance of two port networks

Course Name	TRANSFORMER AND GENERATORS
Course Code	18EE33
Course outcomes (COs): At the end of the course the student will be able to:	
18EE33.1	Understand the construction and operation of 1-phase, 3-Phase transformers and Autotransformer.
18EE33.2	Analyze the performance of transformers by polarity test, Sumpner's Test, phase conversion, 3-phase connection, and parallel operation.
18EE33.3	Understand the construction and working of AC and DC Generators. Analyze the performance of the AC Generators on infinite bus and parallel operation.
18EE33.4	Determine the regulation of AC Generator by Slip test, EMF, MMF, and ZPF Methods

Course Name	ANALOG ELECTRONIC CIRCUITS
Course Code	18EE34
Course outcomes (COs): At the end of the course the student will be able to:	
18EE34.1	Obtain the output characteristics of clipper and clamper circuits.
18EE34.2	Design and compare biasing circuits for transistor amplifiers & explain the transistor switching.
18EE34.3	Explain the concept of feedback, its types and design of feedback circuits
18EE34.4	Design and analyze the power amplifier circuits and oscillators for different frequencies. and analysis of FET and MOSFET amplifiers

Course Name	DIGITAL SYSTEM DESIGN
Course Code	18EE35
Course outcomes (COs): At the end of the course the student will be able to:	
18EE35.1	Simplify the switching equations using Karnaugh maps and Quine-McClusky methods
18EE35.2	Design digital combinational circuits.
18EE35.3	Design sequential control circuits.
18EE35.4	Explain the functioning of different types of memory units

Course Name	ELECTRICAL AND ELECTRONIC MEASUREMENT
Course Code	18EE36
Course outcomes (COs): At the end of the course the student will be able to:	
18EE36.1	Measure resistance, inductance and capacitance using bridges and determine earth resistance
18EE36.2	Explain the working of various meters used for measurement of Power, Energy & understand the adjustments, calibration & errors in energy meters.
18EE36.3	Understand methods of extending the range of instruments & instrument transformers.
18EE36.4	Explain the working of different electronic instruments. & the working of different display and recording devices

Course Name	ELECTRICALMACHINES LABORATORY – 1
Course Code	18EEL37
Course outcomes (COs): At the end of the course the student will be able to:	
18EEL37.1	Evaluate the performance of transformers from the test data obtained, Compute the voltage regulation of synchronous generator using the test data obtained in the laboratory. ·
18EEL37.2	Connect and operate two single phase transformers of different KVA rating in parallel.
18EEL37.3	Connect single phase transformers for three phase operation and phase conversion.
18EEL37.4	Evaluate the performance of synchronous generators from the test data and assess the performance of synchronous generator connected to infinite bus

Course Name	ELECTRONICS LABORATORY
Course Code	18EEL38
Course outcomes (COs): At the end of the course the student will be able to:	
18EEL38.1	Design and test rectifier circuits with and without capacitor filters.
18EEL38.2	Design and test BJT and FET amplifiers and oscillator circuits. .
18EEL38.3	Realize Boolean expressions, adders, subtractors and code converters.
18EEL38.4	Design and test counters and sequence generators

Course Name	COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS
Course Code	18MAT41
Course outcomes (COs): At the end of the course the student will be able to:	
18MAT41.1	llustrate the concepts of– complex functions, transformation, Probability distributions and Statistical methods.
18MAT41.2	Apply the above acquired knowledge to solve the problems in engineering.
18MAT41.3	Analyze the solutions of the real world problems using above techniques.
18MAT41.4	Interpret the overall knowledge gained to demonstrate the problems arising in practical situations.

Course Name	POWER GENERATION AND ECONOMICS
Course Code	18EE42
Course outcomes (COs): At the end of the course the student will be able to:	
18EE42.1	Describe the working of hydroelectric, steam, nuclear power plants and state functions of major equipment of the power plants.
18EE42.2	Classify various substations and explain the functions of major equipments in substations
18EE42.3	Explain the types of grounding and its importance.
18EE42.4	Infer the economic aspects of power system operation and its effects. Explain the importance of power factor improvement

Course Name	TRANSMISSION AND DISTRIBUTION
Course Code	18EE43
Course outcomes (COs): At the end of the course the student will be able to:	
18EE43.1	Explain transmission and distribution scheme, identify the importance of different transmission systems and types of insulators.
18EE43.2	Analyze and compute the parameters of the transmission line for different configurations.
18EE43.3	Assess the performance of overhead lines.
18EE43.4	Interpret corona, explain the use of underground cables.& Classify different types of distribution systems; examine its quality & reliability

Course Name	ELECTRIC MOTORS
Course Code	18EE44
Course outcomes (COs): At the end of the course the student will be able to:	
18EE44.1	Explain the construction, operation and classification of DC Motor, AC motor and Special purpose motors.
18EE44.2	Describe the performance characteristics & applications of Electric motors. Control the speed of DC motor and induction motor.
18EE44.3	Demonstrate and explain the methods of testing of DC machines and determine losses and efficiency.
18EE44.4	Explain the starting methods, equivalent circuit and phasor diagrams, torque angle, effect of change in excitation and change in load, hunting and damping of synchronous motors

Course Name	ELECTROMAGNETIC FIELD THEORY
Course Code	18EE45
Course outcomes (COs): At the end of the course the student will be able to:	
18EE45.1	Use different coordinate systems , Coulomb's Law and Gauss Law for the evaluation of electric fields produced by different charge configurations.
18EE45.2	Calculate the energy and potential due to a system of charges & Explain the behavior of electric field across a boundary conditions.
18EE45.3	Explain the Poisson's, Laplace equations and behavior of steady magnetic fields.
18EE45.4	Explain the behavior of magnetic fields and magnetic materials.· Asses time varying fields and propagation of waves in different media

Course Name	OPERATIONAL AMPLIFIERS AND LINEAR ICs
Course Code	18EE46
Course outcomes (COs): At the end of the course the student will be able to:	
18EE46.1	Describe the characteristics of ideal and practical operational amplifier.
18EE46.2	Design filters and signal generators using linear ICs., Demonstrate the application of Linear ICs
18EE46.3	Analyze voltage regulators,Amplifiers,oscillators and comparators for given specification using Linear devices
18EE46.4	Summarize the basics of OPamps,Timers and PLL. circuits

Course Name	ELECTRICAL MACHINES LABORATORY – 2
Course Code	18EEL47
Course outcomes (COs): At the end of the course the student will be able to:	
18EEL47.1	Test DC machines to determine their characteristics and also to control the speed of DC motor.
18EEL47.2	Pre-determine the performance characteristics of DC machines by conducting suitable tests.
18EEL47.3	Perform load test on single phase and three phase induction motor to assess its performance.
18EEL47.4	Conduct test on induction motor to pre-determine the performance characteristics. Conduct test on synchronous motor to draw the performance curves.

Course Name	OP- AMP AND LINEAR ICS LABORATORY
Course Code	18EEL48
Course outcomes (COs): At the end of the course the student will be able to:	
18EEL48.1	Conduct experiment to determine the characteristic parameters of OP-Amp
18EEL48.2	Design test the OP-Amp as Amplifier, adder, subtractor, differentiator and integrator
18EEL48.3	Design test the OP-Amp as oscillators and filters.
18EEL48.4	Design and study of Linear IC’s as multivibrator power supplies.

Course Outcomes of Third -Year Courses

Course Name	MANAGEMENT AND ENTREPRENEURSHIP
Course Code	18EE51
Course outcomes (COs): At the end of the course the student will be able to:	
18EE51.1	Explain the field of management, task of the manager, planning and steps in decision making.& Discuss the structure of organization, importance of staffing, leadership styles, modes of communication, techniques of coordination and importance of managerial control in business.
18EE51.2	Explain the concepts of entrepreneurship and a businessman's social responsibilities towards different groups
18EE51.3	Show an understanding of role of SSI's in the development of country and state/central level institutions/agencies supporting business enterprises.
18EE51.4	Discuss the concepts of project management, capital budgeting, project feasibility studies, need for project report and new control techniques

Course Name	MICROCONTROLLER
Course Code	18EE52
Course outcomes (COs): At the end of the course the student will be able to:	
18EE52.1	Understand the architecture of 8051.
18EE52.2	Develop the programming skills using assembly language and C.
18EE52.3	Utilize the interrpt features with external devices.
18EE52.4	Understand the timers, counters and interfacing of 8051.

Course Name	POWER ELECTRONICS
Course Code	18EE53
Course outcomes (COs): At the end of the course the student will be able to:	
18EE53.1	Give an overview of applications power electronics, different types of power semiconductor devices, their switching characteristics, power diode characteristics, types, their operation and the effects of power diodes on RL circuits.
18EE53.2	Explain the techniques for design and analysis of single phase diode rectifier circuits.
18EE53.3	Explain different power transistors, their steady state and switching characteristics and limitations. To explain different types of Thyristors, their gate characteristics and gate control requirements.
18EE53.4	Explain the design, analysis techniques, performance parameters and characteristics of controlled rectifiers, DC- DC, DC -AC converters and Voltage controllers

Course Name	SIGNALS AND SYSTEMS
Course Code	18EE54
Course outcomes (COs): At the end of the course the student will be able to:	
18EE54.1	Explain the generation of signals, behavior of system and the basic operations that can be performed on signals and properties of systems.
18EE54.2	Apply convolution in both continuous and discrete domain for the analysis of systems given impulse response of a system.
18EE54.3	Solve the continuous time and discrete time systems by various methods and their representation by block diagram.
18EE54.4	Perform Fourier analysis for continuous and discrete time, linear time invariant systems.&Apply Z-transform and properties of Z transform for the analysis of discrete time systems.

Course Name	ELECTRICAL MACHINE DESIGN
Course Code	18EE55
Course outcomes (COs): At the end of the course the student will be able to:	
18EE55.1	Identify and list, limitations, modern trends in design, manufacturing of electrical machines and properties of materials used in the electrical machines..
18EE55.2	Derive the output equation of DC machine, discuss selection of specific loadings and magnetic circuits of DC machines, design the field windings of DC machine, and design stator and rotor circuits of a DC machine.
18EE55.3	Develop the output equation of induction motor, discuss selection of specific loadings and magnetic circuits of induction motor, design stator and rotor circuits of a induction motor.
18EE55.4	Formulate the output equation of alternator, design the field windings of Synchronous machine, discuss short circuit ratio and its effects on performance of synchronous machines, design salient pole and non-salient pole alternators for given specifications.
Course Name	HIGH VOLTAGE ENGINEERING
Course Code	18EE56
Course outcomes (COs): At the end of the course the student will be able to:	
18EE56.1	Explain conduction and breakdown phenomenon in gases, liquid dielectrics and breakdown phenomenon in solid dielectrics.
18EE56.2	Summarize generation of high voltages and currents,,Outline measurement techniques for high voltages and currents
18EE56.3	Summarize overvoltage phenomenon and insulation coordination in electric power systems
18EE56.4	Explain non-destructive testing of materials and electric apparatus, high-voltage testing of electric apparatus

Course Name	MICROCONTROLLER LABORATORY
Course Code	18EEL57
Course outcomes (COs): At the end of the course the student will be able to:	
18EEL57.1	Apply assemblly level programs for different operations on data
18EEL57.2	Develop the assembly level programs as counters and delay generators.
18EEL57.3	Develop C programs for serial data communication.
18EEL57.4	Understand the C programs for interfacing the external devices.

Course Name	POWER ELECTRONICS LABORATORY
Course Code	18EEL58
Course outcomes (COs): At the end of the course the student will be able to:	
18EEL58.1	Obtain static characteristics of semiconductor devices to discuss their performance. Trigger the SCR by different methods
18EEL58.2	Verify the performance of single phase controlled full wave rectifier and AC voltage controller with R and RL loads.
18EEL58.3	Control the speed of a DC motor, universal motor and stepper motors.
18EEL58.4	Verify the performance of single phase full bridge inverter connected to resistive load.

Course Name	CONTROL SYSTEMS
Course Code	18EE61
Course outcomes (COs): At the end of the course the student will be able to:	
18EE61.1	Analyze and model electrical and mechanical system using analogous.Formulate transfer functions using block diagram and signal flow graph
18EE61.2	Analyze the stability of control system, ability to determine transient and steady state time response.
18EE61.3	Illustrate the performance of a given system in time and frequency domains, stability analysis using Root locus and Bode plots
18EE61.4	Discuss stability analysis using Nyquist plots, Design controller and compensator for a given specification

Course Name	POWER SYSTEM ANALYSIS – 1
Course Code	18EE62
Course outcomes (COs): At the end of the course the student will be able to:	
18EE62.1	Model the power system components & construct per unit impedance diagram of power system.
18EE62.2	Analyze three phase symmetrical faults on power system. ·
18EE62.3	Compute unbalanced phasors in terms of sequence components and vice versa, also develop sequence networks.
18EE62.4	Analyze various unsymmetrical faults on power system. Examine dynamics of synchronous machine and determine the power system stability.

Course Name	DIGITAL SIGNAL PROCESSING
Course Code	18EE63
Course outcomes (COs): At the end of the course the student will be able to:	
18EE63.1	Apply DFT and IDFT to perform linear filtering of long sequences.
18EE63.2	Apply fast and efficient algorithms to compute DFT and IDFT.
18EE63.3	Design and realize IIR digital filters.
18EE63.4	Design and realize FIR digital filters.

Course Name	EMBEDDED SYSTEMS
Course Code	18EE644
Course outcomes (COs): At the end of the course the student will be able to:	
18EE644.1	Identify the Embedded system components.,Apply technological aspects to various interfacing with devices.
18EE644.2	Elaborate various design tradeoffs.
18EE644.3	Apply software aspects and programming concepts to the design of Embedded System.
18EE644.4	Explain how to interface subsystems with external systems.

Course Name	CONTROL SYSTEM LABORATORY
Course Code	18EEL66
Course outcomes (COs): At the end of the course the student will be able to:	
18EEL66.1	Utilize software package and discrete components in assessing the time and frequency domain response of a given second order system.
18EEL66.2	Design, analyze and simulate Lead, Lag and Lag – Lead compensators for given specifications. Determine the performance characteristics of ac and DC servomotors and synchro-transmitter receiver pair used in control systems.
18EEL66.3	Simulate the DC position and feedback control system to study the effect of P, PI, PD and PID controller and Lead compensator on the step response of the system.
18EEL66.4	Develop a script files to plot Root locus, Bode plot and Nyquist plot to study the stability of system

Course Name	DSP LABORATORY
Course Code	18EEL67
Course outcomes (COs): At the end of the course the student will be able to:	
18EEL67.1	Compute DFT and IDFT using basic definitions and FFT methods.
18EEL67.2	Interpret sampling theorm in time and frequency domains.
18EEL67.3	Perform convolution and provide the solution for a difference equation.
18EEL67.4	Design and implement IIR and FIR filters

Course Outcomes of Final -Year Courses

Course Name	POWER SYSTEM ANALYSIS – 2
Course Code	18EE71
Course outcomes (COs): At the end of the course the student will be able to:	
18EE71.1	Formulate network matrices and models for solving load flow problems.
18EE71.2	Perform steady state power flow analysis of power systems using numerical iterative techniques.
18EE71.3	Solve issues of economic load dispatch and unit commitment problems. Analyze short circuit faults in power system networks using bus impedance matrix
18EE71.4	Apply Point by Point method and Runge Kutta Method to solve Swing Equation.

Course Name	POWER SYSTEM PROTECTION
Course Code	18EE72
Course outcomes (COs): At the end of the course the student will be able to:	
18EE72.1	Discuss performance of protective relays, components of protection scheme and relay terminology over current protection.
18EE72.2	Explain the working of distance relays and the effects of arc resistance, power swings, line length and source impedance on performance of distance relays.
18EE72.3	Analyze pilot protection, construction, operating principles and performance of_differential relays and discuss protection of generators, motors, transformer and Bus Zone Protection.
18EE72.4	Explain the construction and operation of different types of circuit breakers. Outline features of fuse, causes of overvoltages and its protection, also modern trends in Power System Protection..

Course Name	SOLAR AND WIND ENERGY
Course Code	18EE731
Course outcomes (COs): At the end of the course the student will be able to:	
18EE731.1	Explain the role of renewable energy sources, energy storage and storage device.
18EE731.2	Understand the principle and design of PV systems.
18EE731.3	Analyze the applications of solar energy in heating and cooling.
18EE731.4	Understand the principles of Wind Energy Conversion systems and wind machines

Course Name	INDUSTRIAL DRIVES AND APPLICATIONS
Course Code	18EE741
Course outcomes (COs): At the end of the course the student will be able to:	
18EE741.1	Explain the advantages, choice and control of electric drive & ·explain the dynamics, generating and motoring modes of operation of electric drives
18EE741.2	Explain the selection of motor power rating to suit industry requirements
18EE741.3	Analyze the performance & control of DC motor drives using controlled rectifiers
18EE741.4	Analyze the performance & control of converter fed Induction motor, synchronous motor & stepper motor drives

Course Name	POWER SYSTEM SIMULATION LABORATORY
Course Code	18EEL76
Course outcomes (COs): At the end of the course the student will be able to:	
18EEL76.1	Develop a program in suitable package to assess the performance of medium and long transmission lines and to obtain the power angle characteristics of salient and non-salient pole alternator.
18EEL76.2	Develop a program in suitable package to assess the transient stability under three phase fault at different locations in a of radial power systems and to formulate bus admittance and bus impedance matrices of interconnected power systems.
18EEL76.3	Use suitable package to solve power flow problem for simple power systems and to study unsymmetrical faults at different locations in radial power systems
18EEL76.4	Use of suitable package to study optimal generation scheduling problems for thermal power plants.

Course Name	RELAY AND HIGH VOLTAGE LABORATORY
Course Code	18EEL77
Course outcomes (COs): At the end of the course the student will be able to:	
18EEL77.1	Verify the characteristics of over current, over voltage, under voltage and negative sequence relay both electromagnetic and static type.and the Characteristics of microprocessor based over current, over voltage, under voltage relays and distance relay
18EEL77.2	Show knowledge of protecting generator, motor and feeders. · Analyze the spark over characteristics for both uniform and non-uniform configurations using High A and DC voltages.
18EEL77.3	Measure high AC and DC voltages and breakdown strength of transformer oil. · Draw electric field and measure the capacitance of different electrode configuration models
18EEL77.4	Show knowledge of generating standard lightning impulse voltage to determine efficiency, energy of impulse generator and 50% probability flashover voltage for air insulation

Course Name	PROJECT PHASE – I
Course Code	18EEP78
Course outcomes (COs): At the end of the course the student will be able to:	
18EE741.1	Demonstrate a sound technical knowledge of their selected project topic.
18EE741.2	Undertake problem identification, formulation and solution.
18EE741.3	Design engineering solutions to complex problems utilizing a systems approach.
18EE741.4	Communicate with engineers and the community at large in written an oral forms.

Course Name	POWER SYSTEM OPERATION AND CONTROL
Course Code	18EE81
Course outcomes (COs): At the end of the course the student will be able to:	
18EE81.1	Describe various levels of controls in power systems, architecture and configuration of SCADA.
18EE81.2	Develop and analyze mathematical models of Automatic Load Frequency Control and Automatic Generation Control in Interconnected Power system
18EE81.3	Discuss the Control of Voltage , Reactive Power and Voltage collapse
18EE81.4	Explain security, contingency analysis, state estimation of power systems.

Course Name	POWER SYSTESM PLANING
Course Code	18EE824
Course outcomes (COs): At the end of the course the student will be able to:	
18EE824.1	Discuss primary components of power system planning, planning methodology for optimum power system expansion and load forecasting.& · Understand economic appraisal to allocate the resources efficiently and appreciate the investment decisions
18EE824.2	Discuss expansion of power generation and planning for system energy in the country, evaluation of operating states of transmission system, their associated contingencies and the stability of the system.
18EE824.3	Discuss principles of distribution planning, supply rules, network development and the system studies
18EE824.4	Discuss reliability criteria for generation, transmission, distribution and reliability evaluation and analysis, grid reliability, voltage disturbances and their remedies &Discuss planning and implementation of electric –utility activities, market principles and the norms framed

Course Name	PROJECT WORK PHASE -II
Course Code	18EEP83
Course outcomes (COs): At the end of the course the student will be able to:	
18EEP83.1	Present the project and be able to defend it and Learn on their own, reflect on their learning and take appropriate actions to improve it.
18EEP83.2	Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
18EEP83.3	Habituated to critical thinking and use problem solving skills and Work in a team to achieve common goal.
18EEP83.4	Communicate effectively and to present ideas clearly and coherently in both the written and oral forms

Course Name	TECHNICAL SEMINAR
Course Code	18EES84
Course outcomes (COs): At the end of the course the student will be able to:	
18EES84.1	Attain, use and develop knowledge in the field of engineering through independent and collaborative study.
18EES84.2	Improve oral and written communication skills.
18EES84.3	Identify, understand and discuss current real-time issues.
18EES84.4	Apply principles of ethics and respect in the interaction with others.

Course Name	INTERNSHIP
Course Code	18EEI85
Course outcomes (COs): At the end of the course the student will be able to:	
18EEI85.1	Gain practical experience within industry in which the internship is done
18EEI85.2	Acquire knowledge of the industry in which the internship is done., Apply knowledge and skills learned to classroom work.
18EEI85.3	Develop a greater understanding about career options while more clearly defining personal career goals.
18EEI85.4	Develop and refine oral and written communication skills. Experience the activities and functions of professionals,,