3rd Sem			
Sl No	**Subject**	**Subject Code**	**Course outcomes:**
1	**Engineering Mathematics-III**	**15MAT31**	At the end of the course the student will be able to: • Know the use of periodic signals and Fourier series to analyze circuits and system communications. • Explain the general linear system theory for continuous-time signals and digital signal processing using the Fourier Transform and z-transform. • Employ appropriate numerical methods to solve algebraic and transcendental equations. • Apply Green's Theorem, Divergence Theorem and Stokes' theorem in various applications in the field of electro-magnetic and gravitational fields and fluid flow problems. • Determine the externals of functional and solve the simple problems of the calculus of variations.
2	**Electric Circuit Analysis**	**15EE32**	**Course outcomes:** At the end of the course the student will be able to: • Apply knowledge of mathematics, science, and engineering to the analysis and design of electrical circuits. • Identify, formulate, and solve engineering problems in the area circuits and systems. • Analyze the solution and infer the authenticity of it
3	**Transformers and Generators**	**15EE33**	**Course outcomes:** At the end of the course the student will be able to: •Explain the construction and operation and performance of transformers. •Explain different connections for the three phase operations, their advantages and applications. •Explain the construction and operation of Synchronous machines and evaluate the regulation of synchronous machines by different methods. •Analyze the operation of the synchronous machine connected to infinite machine
4	**Analog Electronic Circuits**	**15EE34**	**Course outcomes:** At the end of the course the student will be able to: •Utilize the characteristics of transistor for different applications. •Design and analyze biasing circuits for transistor. • Design, analyze and test transistor circuitry as amplifiers and oscillators.
5	**Digital System Design**	**15EE35**	**Course outcomes:**

			At the end of the course the student will be able to: •Design and analyze combinational & sequential circuits •Design circuits like adder, sub tractor, code converter etc. •Understand counters and sequence generators.
6	**Electrical and Electronic Measurements**	**15EE36**	**Course outcomes:** At the end of the course the student will be able to: •Explain the importance of units and dimensions. •Measure resistance, inductance and capacitance by different methods. •Explain the working of various meters used for measurement of power and energy. •Explain the working of different electronic instruments and display devices
7	**Electrical Machines Laboratory -1**	**15EEL37**	**Course outcomes:** At the end of the course the student will be able to: •Conduct different tests on transformers and synchronous generators and evaluate their performance. •Connect and operate two single phase transformers of different KVA rating in parallel. •Connect single phase transformers for three phase operation and phase conversion. •Assess the performance of synchronous generator connected to infinite bus.
8	**Electronics Laboratory**	**15EEL38**	**Course outcomes:** At the end of the course the student will be able to: •Design and test different diode circuits. •Design and test amplifier and oscillator circuits and analyse their performance. •Use universal gates and ICs for code conversion and arithmetic operations. •Design and verify on of different counters.
4th sem			
Sl No	**Subject**	**Subject Code**	**Course outcomes:**
1	**Engineering Mathematics-IV**	**15MAT41**	**Course outcomes:** • Use appropriate single step and multi-step numerical methods to solve first and second order ordinary differential equations arising in flow data design problems. • Explain the idea of analyticity, potential fields residues and poles of complex potentials in field theory and electromagnetic theory. • Employ Bessel's functions and

			Legendre's polynomials for tackling problems arising in continuum mechanics, hydrodynamics and heat conduction. • Describe random variables and probability distributions using rigorous statistical methods to analyze problems associated with optimization of digital circuits, information, coding theory and stability analysis of systems. • Apply the knowledge of joint probability distributions and Markov chains in attempting engineering problems for feasible random events.
2	**Power Generation and Economics**	**15EE42**	**Course outcomes:** At the end of the course the student will be able to: •Describe the working of hydroelectric, steam, nuclear power plants and state functions of major equipment of the power plants. •Classify various substations and explain the importance of grounding. •Understand the economic aspects of power system operation and its effects. •Explain the importance of power factor improvement.
3	**Transmission and Distribution**	**15EE43**	**Course Outcomes:** At the end of the course the student will be able to: •Explain the concepts of various methods of generation of power. •Explain the importance of HVAC, EHVAC, UHVAC and HVDC transmission. •Design and analyze overhead transmission system for a given voltage level. •Calculate the parameters of the transmission line for different configurations and assess the performance of line. •Explain the use of underground cables and evaluate different types of distribution systems.
4	**Electric Motors**	**15EE44**	**Course Outcomes:** At the end of the course the student will be able to: •Explain the constructional features of Motors and select a suitable drive for specific application. •Analyze and assess the performance characteristics of DC motors by conducting suitable tests and control the speed by suitable method. •Explain the constructional features of Three Phase and Single phase induction Motors and assess their

			performance. •Control the speed of induction motor by a suitable method. •Explain the operation of Synchronous motor and special motors.
5	**Electromagnetic Field Theory**	**15EE45**	**Course Outcomes:** At the end of the course the student will be able to: • Use different coordinate systems to explain the concept of gradient, divergence and curl of a vector. • Use Coulomb's Law and Gauss Law for the evaluation of electric fields produced by different charge configurations. • Calculate the energy and potential due to a system of charges. • Explain the behavior of electric field across a boundary between a conductor and dielectric and between two different dielectrics. • Explain the behavior of magnetic fields and magnetic materials. • Assess time varying fields and propagation of waves in different media.
6	**Operational Amplifiers and Linear ICs**	**15EE46**	**Course Outcomes:** At the end of the course the student will be able to: •Explain the basics of linear ICs. •Design circuits using linear ICs. •Demonstrate the application of Linear ICs. •Use ICs in the electronic projects.
7	**Electrical Machines Laboratory -2**	**15EEL47**	**Course Outcomes:** At the end of the course the student will be able to: • Test dc machines to determine their characteristics. • Control the speed of dc motor. • Pre-determine the performance characteristics of dc machines by conducting suitable tests. • Perform load test on single phase and three phase induction motor to assess its performance. • Conduct test on induction motor to pre-determine the performance characteristics. • Conduct test on synchronous motor to draw the performance curves.
8	**Op- amp and Linear ICs Laboratory**	**15EEL48**	**Course Outcomes:** At the end of the course the student will be able to: •To conduct experiment to determine the characteristic parameters of OP-Amp •To design test the OP-Amp as Amplifier,

			adder, subtractor, differentiator and integrator ●To design test the OP-Amp as oscillators and filters ●Design and study of Linear IC's as multivibrator power supplies.
5 Sem			
Sl No	**Subject**	**Subject Code**	**Course outcomes:**
1	**Management and Entrepreneurship**	**15EE51**	At the end of the course the student will be able to: • Explain the field of management, task of the manager, planning and the need of proper staff, recruitment and selection process. • Discuss work allocation, the structure of organization, the modes of communication and importance of managerial control in business. • To explain need of coordination between the manager and staff in exercising the authority and delegating duties. • To explain the social responsibility of business and leadership • Explain the concepts of entrepreneurship and the role and importance of the entrepreneur in economic development. • Show an understanding of the role and importance of Small Scale Industries, business plan and its presentation. • Discuss the concepts of project management, capitol building process, project feasibility study, project appraisal and project financing. • Discuss the state /central level institutions / agencies supporting business enterprises.
2	**Microcontroller**	**15EE52**	At the end of the course the student will be able to: • Discuss the history of the 8051 and features of other 8051 family members and the internal architecture of the 8051. • Explains the use of an 8051 assembler, the stack and the flag register, loop, jump, and call instructions. • Discuss 8051 addressing modes, accessing data and I/O port programming, arithmetic, logic instructions, and programs. • Develop 8051C programs for time delay, I/O operations, I/O bit manipulation, logic and arithmetic operations, data conversion and data serialization • Discuss the hardware connection of the

			8051 chip, its timers, serial data communication and its interfacing of 8051to the RS232. • Discuss in detail 8051 interrupts and writing interrupt handler programs. • Interface 8051 with real-world devices such as LCDs and keyboards, ADC, DAC chips and sensors. • Interface 8031/51 with external memories, 8255 chip to add ports and relays, opt isolators and motors.
3	**Power Electronics**	**15EE53**	At the end of the course the student will be able to: • Explain application area of power electronics, types of power electronic circuits and switches their characteristics and specifications. • Explain types of power diodes, their characteristics, and the effects of power diodes on RL circuits. • Explain the techniques for design, operation and analysis of single phase diode rectifier circuits. • Explain steady state, switching characteristics and gate control requirements of different power transistors and their limitations. • Discuss different types of Thyristors, their operation, gate characteristics and gate control requirements. • Explain designing, analysis techniques and characteristics of thyristor controlled rectifiers. • Discuss the principle of operation of single phase and three phase DC - DC, DC –AC converters and AC voltage controllers.
4	**Signals and Systems**	**15EE54**	At the end of the course the student will be able to: • Classify the signals and systems. • Explain basic operations on signals and properties of systems. • Use convolution in both continuous and discrete domain for the analysis of systems given the impulse response of a system. • Evaluate response of a given linear time invariant system. • Provide block diagram representation of a linear time invariant system. • Apply continuous time Fourier transform representation to study signals and linear time invariant systems. • Apply discrete time Fourier transform representation to study signals and linear time invariant systems. Use Z-transform and properties of Z transform for the analysis of discrete time systems**.**

5	**(Professional Elective – I)** **Electrical Engineering Materials**	**15EE552**	At the end of the course the student will be able to: • Discuss electrical and electronics materials, their importance, classification and operational requirement • Discuss conducting materials used in engineering, their properties and classification. • Discuss dielectric materials used in engineering, their properties and classification. • Discuss insulating materials used in engineering, their properties and classification. • Discuss magnetic materials used in engineering, their properties and classification • Explain the phenomenon superconductivity, super conducting materials and their application in engineering. • Explain the plastic and its properties and applications. • Discuss materials used for Opto electronic devices.
6	**Open Elective – I** **1-Programmable Logic controllers** **2-Renewable Energy Systems**	**15EE562** **15EE563**	At the end of the course the student will be able to: • Discuss history of PLC, its sequence of operation, advantages and disadvantages, main parts and their functions. • Describe the hardware components of PLC: I/O modules, CPU, memory devices, other support devices, operating modes and PLC programming. • Describe field devices Relays, Contactors, Motor Starters, Switches, Sensors, Output Control Devices, Seal-In Circuits, and Latching Relays commonly used with I/O module. • Convert relay schematics and narrative descriptions into PLC ladder logic programs • Analyze PLC timer and counter ladder logic programs • Describe the operation of different program control instructions • Discuss the execution of data transfer instructions, data compare instructions and the basic operation of PLC closed-loop control system. • Describe the operation of mechanical sequencers, bit and word shift registers, processes and structure of control systems and communication between the processes. At the end of the course the student will be able to: • Discuss causes of energy scarcity and its

			solution, energy resources and availability of renewable energy. • Discuss energy from sun, energy reaching the Earth's surface and solar thermal energy applications. • Discuss types of solar collectors, their configurations, solar cell system, its characteristics and their applications. • Discus generation of energy from hydrogen, wind, geothermal system, solid waste and agriculture refuse. • Discuss production of energy from biomass, biogas. • Discuss tidal energy resources, energy availability and power generation. • Discuss power generation sea wave energy and ocean thermal energy
7	**Microcontroller Laboratory**	**15EEL57**	At the end of the course the student will be able to: • Write assembly language programs for data transfer, arithmetic, Boolean and logical instructions. • Write ALP for code conversions. • Write ALP using subroutines for generation of delays, counters, configuration of SFRs for serial communication and timers. • Perform interfacing of stepper motor and dc motor for controlling the speed. • Generate different waveforms using DAC interface. • Work with a small team to carryout experiments using microcontroller concepts and prepare reports that present lab work.
8	**Power Electronics Laboratory**	**15EEL58**	At the end of the course the student will be able to: • Obtain static characteristics of semiconductor devices to discuss their performance. • Trigger the SCR by different methods • Verify the performance of single phase controlled full wave rectifier and AC voltage controller with R and RL loads. • Control the speed of a dc motor, universal motor and stepper motors. • Verify the performance of single phase full bridge inverter connected to resistive load. • Perform commutation of SCR by different methods.
6th sem			
1	**Control Systems**	**15EE61**	At the end of the course the student will be able to: •Discuss the effects of feedback and types of feedback control systems. •Evaluate the transfer function of a linear

			time invariant system. •Evaluate the stability of linear time invariant systems. •Apply block diagram manipulation and signal flow graph methods to obtain transfer function of systems. •Demonstrate the knowledge of mathematical modeling of control systems and components •Determine transient and steady state time response of a simple control system. •Investigate the performance of a given system in time and frequency domains. •Discuss stability analysis using Root locus, Bode plots and Nyquist plots. •Determine the controller or compensator configuration and parameter values relative to how it is connec ted to the controlled process given the design specifications.
2	**Power System Analysis – 1**	**15EE62**	• Show understanding of per unit system, its advantages and computation. • Show the concept of one line diagram and its implementation in problems • Perform short circuit analysis on a synchronous machine and simple power system to select a circuit breaker for the system. • Evaluate symmetrical components of voltages and currents in un-balanced three phase circuits. • Explain the concept of sequence impedance and sequence networks of power system components and power system. • Analyze three phase synchronous machine and simple power systems for different unsymmetrical faults using symmetrical components. • Discuss the dynamics of synchronous machine, stability and types of stability. • Discuss equal area criterion for the evaluation of stability of a simple system under different fault conditions.
3	**Digital Signal Processing**	**15EE63**	• Compute the DFT of various signals using its properties and linear filtering of two sequences. • Apply fast and efficient algorithms for computing DFT and inverse DFT of a given sequence • Design infinite impulse response Butterworth digital filters using impulse invariant / bilinear transformation technique. • Design infinite impulse response Chebyshev digital filters using impulse invariant or bilinear transformation technique. • Realize a digital IIR filter by direct, cascade, parallel and ladder methods of

			realization. • Discuss different window functions and frequency sampling method used for design of FIR filters. • Design FIR filters by use of window function or by frequency sampling method. • Realize a digital FIR filter by direct, cascade, and linear phase form.
4	**Electrical Machine Design**	**15EE64**	• Discuss design factors, limitations, modern trends in design, manufacturing of electrical machines and properties of materials used in the electrical machines. • Derive the output equations of transformer, DC machines and AC machines. • Discuss selection of specific loadings and magnetic circuits of different electrical machines • Design the field windings of DC machine and Synchronous machine. • Design stator and rotor circuits of a DC and AC machines. • Estimate the number of cooling tubes, no load current and leakage reactance of core type transformer. • Discuss short circuit ratio and its effects on performance of synchronous machines. • Design salient pole and non-salient pole alternators for given specifications.
5	**Computer Aided Electrical Drawing**	**15EE651**	• Discuss the terminology and types of DC and AC armature windings. • Develop armature winding diagram for DC and AC machines • Develop a layout for substation using the standard symbols for substation equipment. . • Draw sectional views of core and shell types transformers using the design data • Draw sectional views of assembled DC machine or its parts using the design data or the sketches. • Draw sectional views of assembled alternator or its parts using the design data or the sketches
6	**Sensors and Transducers**	**15EE662**	• Discuss need of transducers, their classification, advantages and disadvantages. • Show an understanding of working of various transducers and sensors. • Discuss recent trends in sensor technology and their selection. • Discuss basics of signal conditioning and signal conditioning equipment. • Discuss configuration of Data Acquisition System and data conversion. • Show knowledge of data transmission and telemetry. • Explain measurement of non-electrical quantities -temperature, flow, speed, force,

			torque, power and viscosity.
7	**Control System Laboratory**	**15EEL67**	• Use software package or discrete components in assessing the time and frequency domain reposes of a given second order system. • Design and analyze 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. • 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. • Write a script files to plot root locus, bode plot, Nyquist plots to study the stability of the system using a software package. • Work with a small team to carryout experiments and prepare reports that present lab work.
8	**Digital Signal Processing Laboratory**	**15EEL68**	• Give physical interpretation of sampling theorem in time and frequency domains. • Evaluate the impulse response of a system. • Perform convolution of given sequences to evaluate the response of a system. • Compute DFT and IDFT of a given sequence using the basic definition and/or fast methods. • Provide a solution for a given difference equation. • Design and implement IIR and FIR filters • Conduct experiments using software and prepare reports that present lab work

7 Sem

Sl No	Subject	Subject Code	Course outcomes:
1	**POWER SYSTEM ANALYSIS – 2 (Core Subject)**	**15EE71**	At the end of the course the student will be able to: • Formulate network matrices and models for solving load flow problems. • Perform steady state power flow analysis of power systems using numerical iterative techniques. • Suggest a method to control voltage profile. • Show knowledge of optimal operation of generators on a bus bar, optimal unit commitment,
2	**Power System Protection**	**15EE72**	At the end of the course the student will be able to: • Discuss performance of protective relays, components of protection scheme and relay terminology

			over current protection. • Explain the working of distance relays and the effects of arc resistance, power swings, line length and source impedance on performance of distance relays. • Discuss pilot protection; wire pilot relaying and carrier pilot relaying. • Discuss construction, operating principles and performance of differential relays for differential protection. • Discuss protection of generators, motors, Transformer and Bus Zone Protection. • Explain the principle of circuit interruption in different types of circuit breakers. • Describe the construction and operating principle of different types of fuses and to give the definitions of different terminologies related to a fuse. • Discuss protection against Over voltages and Gas Insulated Substation (GIS).
3	**Testing and Commissioning of Power System Apparatus**	**15EE752**	At the end of the course the student will be able to: • Describe the process to plan, control and implement commissioning of electrical equipment's. • Differentiate the performance specifications of transformer and induction motor. • Demonstrate the routine tests for synchronous machine, induction motor, transformer & switchgears. • Describe corrective and preventive maintenance of electrical equipment's. • Explain the operation of an electrical equipment's such as isolators, circuit breakers, induction motor and synchronous machines.
4	**Utilization of Electrical Power**	**15EE742**	At the end of the course the student will be able to: • Discuss electric heating, air-conditioning and electric welding. • Explain laws of electrolysis, extraction and refining of metals and electro deposition. • Explain the terminology of illumination, laws of illumination, construction and working of electric lamps. • Design interior and exterior lighting systems- illumination levels for factory lighting- flood lighting street lighting. • Discuss systems of electric traction, speed time curves and mechanics of train movement. • Explain the motors used for electric traction and their control. • Discuss braking of electric motors, traction

			systems and power supply and other traction systems. • Explain the working of electric and hybrid electric vehicles.
5	**High Voltage Engineering**	**15EE73**	At the end of the course the student will be able to: • Explain conduction and breakdown phenomenon in gases, liquid dielectrics. • Explain breakdown phenomenon in solid dielectrics. • Explain generation of high voltages and currents • Discuss measurement techniques for high voltages and currents. • Discuss overvoltage phenomenon and insulation coordination in electric power systems. • Discuss non-destructive testing of materials and electric apparatus and high-voltage testing of electric apparatus
6	**Power system Simulation Laboratory**	**15EEL76**	At the end of the course the student will be able to: • Develop a program in MATLAB to assess the performance of medium and long transmission lines. • Develop a program in MATLAB to obtain the power angle characteristics of salient and non-salient pole alternator. • Develop a program in MATLAB to assess the transient stability under three phase fault at different locations in a of radial power systems. • Develop programs in MATLAB to formulate bus admittance and bus impedance matrices of interconnected power systems. • Use Mi-Power package to solve power flow problem for simple power systems. • Use Mi-Power package to study unsymmetrical faults at different locations in radial power systems • Use of Mi-Power package to study optimal generation scheduling problems for thermal power plants.
7	**Relay and High Voltage Laboratory**	**15EEL77**	At the end of the course the student will be able to: • Experimentally verify the characteristics of over current, over voltage, under voltage and negative sequence relays both electromagnetic and static type. • Experimentally verify the characteristics of microprocessor based over current, over voltage, under voltage relays and distance relay. • Show knowledge of protecting generator, motor and feeders.

			• Analyze the spark over characteristics for both uniform and non-uniform configurations using High AC and DC voltages. • Measure high AC and DC voltages and breakdown strength of transformer oil. • **Draw electric field and** measure the capacitance of different electrode configuration models. • Show knowledge of generating standard lightning impulse voltage to determine efficiency, energy of impulse generator and 50% probability flashover voltage for air insulation.
8	**Project Phase – I + Seminar**	**15EEP78**	At the end of the course the student will be able to: • Demonstrate a sound technical knowledge of their selected project topic. • Undertake problem identification, formulation and solution. • Design engineering solutions to complex problems utilising a systems approach. • Communicate with engineers and the community at large in written an oral forms. • Demonstrate the knowledge, skills and attitudes of a professional engineer.
	8 SEM		
Sl No	**Subject**	**Subject Code**	**Course outcomes:**
1	**POWER SYSTEM OPERATION AND CONTROL(Core Course)**	**15EE81**	At the end of the course the student will be able to: • Describe various levels of controls in power systems, the vulnerability of the system, components, architecture and configuration of SCADA. • Solve unit commitment problems • Explain issues of hydrothermal scheduling and solutions to hydro thermal problems • Explain basic generator control loops, functions of Automatic generation control, speed governors • Develop and analyze mathematical models of Automatic Load Frequency Control • Explain automatic generation control, voltage and reactive power control in an interconnected power system. • Explain reliability, security, contingency analysis, state estimation and related issues of power systems.
2	**INDUSTRIAL DRIVES AND APPLICATIONS(Core Course)**	**15EE82**	At the end of the course the student will be able to: • Explain the advantages and choice of

			electric drive. • Explain dynamics and different modes of operation of electric drives. • Suggest a motor for a drive and control of dc motor using controlled rectifiers. • Analyze the performance of induction motor drives under different conditions. • Control induction motor, synchronous motor and stepper motor drives. • Suggest a suitable electrical drive for specific application in the industry.
3	**INTEGRATION OF DISTRIBUTED GENERATION(Professional Elective)**	**15EE833**	At the end of the course the student will be able to: • Explain energy generation by wind power and solar power. • Discuss the variation in production capacity at different timescales, the size of individual units, and the flexibility in choosing locations with respect to of wind and solar systems. • Explain the performance of the system when distributed generation is integrated to the system. • Discuss effects of the integration of DG: the increased risk of overload and increased losses. • Discuss effects of the integration of DG: increased risk of overvoltages, increased levels of power quality disturbances. • Discuss effects of the integration of DG: incorrect operation of the protection • Discuss the impact the integration of DG on power system stability and operation.
4	**INTERNSHIP / PROFESSIONAL PRACTICE**	**15EE84**	At the end of the course the student will be able to: • Gain practical experience within industry in which the internship is done. • Acquire knowledge of the industry in which the internship is done. • Apply knowledge and skills learned to classroom work. • Develop a greater understanding about career options while more clearly defining personal career goals. • Experience the activities and functions of professionals. • Develop and refine oral and written communication skills. • Identify areas for future knowledge and skill development. • Expand intellectual capacity, credibility, judgment, intuition. • Acquire the knowledge of administration, marketing, finance and economics.
5	**Project Work Phase -II**	**15EEP85**	At the end of the course the student will be able to:

			• Present the project and be able to defend it. • 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. • Habituated to critical thinking and use problem solving skills • Communicate effectively and to present ideas clearly and coherently in both the written and oral forms. • Work in a team to achieve common goal. • Learn on their own, reflect on their learning and take appropriate actions to improve it.
6	**Seminar**	**15EES86**	At the end of the course the student will be able to: • Present the project and be able to defend it. • 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. • Habituated to critical thinking and use problem solving skills • Communicate effectively and to present ideas clearly and coherently in both the written and oral forms. • Work in a team to achieve common goal. • Learn on their own, reflect on their learning and take appropriate actions to improve it.