CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (Autonomous)
Gandipet, Hyderabad -75
Department Of Electrical and Electronics Engineering
Course OutcomesStatements for BE(EEE)-R20

SNo	Course Code	Course Name	Course Outcomes Statements
1	20MT C05	Calculus	Apply the Matrix Methods to solve system of linear equations.
			Analyse the geometrical interpretation of Mean value theorems.
			Determine the extreme values of functions of two variables.
			Examine the convergence and divergence of infinite Series.
			Calculate the Euler's coefficients for Fourier series of a function
2	20CYC01	Chemistry	Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate ofchemical reactions.
			Discuss the properties and processes using thermodynamic functions, electrochemical cells and theirrole in batteries and fuel cells.
			Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
			Classify the various methods used in treatment of water for domestic and industrial use.
			Outline the synthesis of various Engineering materials & Drugs.
3	20CE C01	Engineering Mechanics-I	Calculate the components and resultant of coplanar forces system.
			Understand free body diagram and apply equilibrium equations to solve for unknown forces.
			Apply concepts of friction for solving engineering problems.
			Analyse simple trusses for forces in various members of a truss.
			Determine centroid for elementary, composite figures and bodies.
4	20CS C01	Programming for ProblemSolving	Identify and understand the computing environments for scientific and mathematical problems
			Formulate solutions to problems with alternate approaches and represent them using algorithms /Flowcharts.
			Choose data types and control structures to solve mathematical and scientific problem.
			Decompose a problem into modules and use functions to implement the modules.
			Apply arrays, pointers, structures, and unions to solve mathematical and scientific problems.
			Develop applications using file I/O.

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5	20CY C02	Chemistry Lab	Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
			Estimate the amount of chemical substances by volumetric analysis.
			Determine the rate constants of reactions from concentration of reactants/ products as a function oftime.
			Calculate the concentration and amount of various substances using instrumental techniques.
			Develop the basic drug molecules and polymeric compounds
6	20CS C02	Programming for ProblemSolving Lab	Identify and setup program development environment.
			Design and test programs to solve mathematical and scientific problems.
			Identify and rectify the syntax errors and debug program for semantic errors
			Implement modular programs using functions.
			Represent data in arrays, pointers, structures and manipulate them through a program.
			Create, read, and write to and from simple text files.
7	20ME C02	Workshop/ ManufacturingPractice	Understand safety measures to be followed in workshop to avoid accidents.
			Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting andmachining processes
			Make a given model by using workshop trades including fitting, carpentry, tinsmithy and House wiring.
			Perform various operations in welding, machining and casting processes.
			Conceptualize and produce simple device/mechanism of their choice.
8	20ME C03	Engineering Exploration	Understand the role of an engineer as a problem solver.
			Identify multi-disciplinary approaches in solving an engineering problem.
			Build simple systems using engineering design process.
			Analyze engineering solutions from ethical and sustainability perspectives.
			Use basics of engineering project management skills in doing projects.

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9	20MT C06	Vector Calculus and Differential Equations	Calculate the areas and volumes.
			Apply the vector differential operators to Scalars and Vector functions.
			Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.
			Calculate the solutions of first order linear differential equations.
			Solve higher order linear differential equations.
10	20EG C01	English	Illustrate the nature, process and types of communication and communicate effectively withoutbarriers.
			Construct and compose coherent paragraphs, emails and adhering to appropriate mobileetiquette.
			Apply techniques of precision to write a précis and formal letters by using acceptable grammarand appropriate vocabulary.
			Distinguish formal from informal reports and demonstrate advanced writing skills by draftingformal reports.
			Critique passages by applying effective reading techniques
11	20PY C06	Electromagnetic Theory andQuantum Mechanics	Interpret the wave nature of the light
			Extend the laws of electric and magnetic fields for wireless communication
			Explain the principles of lasers and fiber optic communication
			Find the applications of quantum mechanics.
			Identify semiconductors for engineering applications
12	20EE C01	Basic Electrical Engineering	Understand the concepts of Kirchhoff's laws and to apply them in superposition, Thevenin's andNorton's theorems to get the solution of simple dc circuits
			Obtain the steady state response of RLC circuits with AC input and to acquire the basics,relationship between voltage and current in three phase circuits.
			Understand the principle of operation, the EMF and torque equations and classification of AC andDC machines
			Explain various tests and speed control methods to determine the characteristic of DC and ACmachines.
			Acquire the knowledge of electrical wiring, types of wires, cables used and Electrical safetyprecautions to be followed in electrical installations.
			Recognize importance of earthing, methods of earthing and various low-tension switchgear used inelectrical installations
13	20EG C02	English lab	Define the speech sounds in English and understand the nuances of pronunciation in English
			Apply stress correctly and speak with the proper tone, intonation and rhythm.
			Analyze IELTS and TOEFL listening comprehension texts to enhance their listening skills.
			Determine the context and speak appropriately in various situations..
			Design and present effective posters while working in teams, and discuss and participate inGroup discussions

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14	20PY C09	Electromagnetic Theory andQuantum Mechanics Lab	Experiment with the concept of errors and find the ways to minimize the errors
			Demonstrate properties of light experimentally.
			Find the applications of lasers and optical fibers in engineering applications
			Make use of semiconductor devices for practical applications
			Illustrate the working of optoelectronic devices
15	20EE C02	Basic Electrical Engineering Lab	Get an exposure to common electrical components, their ratings and basic electrical measuringequipment.
			Make electrical connections by wires of appropriate ratings and able to measure electric power andenergy.
			Comprehend the circuit analysis techniques using various circuital laws and theorems.
			Determine the parameters of the given coil and calculate the time response of RL & RC series circuits.
			Recognize the basic characteristics of transformer and components of switch gear.
			Understand the basic characteristics of dc and ac machine by conducting different types of tests onthem.
16	20ME C01	CAD and Drafting	Become conversant with appropriate use of CAD software for drafting.
			Recognize BIS, ISO Standards and conventions in Engineering Drafting.
			Construct the projections of points, lines, planes, solids
			Analyse the internal details of solids through sectional views
			Create an isometric projections and views
17	20MB C02	Community Engagement	Gain an understanding of Rural life, Culture and Social realities.
			Develop a sense of empathy and bonds of mutuality with Local Communities.
			Appreciate significant contributions of Local communities to Indian Society and Economy.
			Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economicimprovements.
			Utilise the opportunities provided by Rural Development Programmes.
18	20MTC07	Applied Mathematics	Find Laplace, Inverse Laplace and solution of engineering problems.
			Find the solution of Difference Equation
			Understand the methods to find solution of linear and non-linear PDE and solution of wave equation.
			Solve Non-Linear algebraic and transcendental equations and first order differential equations.
			Understand the methods for analyzing the random fluctuations using probability distribution and also identify the importance of Principles of Least Squares approximations for predictions

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19	20 CS C06	Basic Data Structures	Identify various data structures, searching & sorting techniques and their applications.
			Describe the linear and non-linear data structures, searching and sorting techniques. .
			Apply suitable data structures to solve problems.
			Analyze various searching and sorting techniques.
			Evaluate the linear and non-linear data structures
20	20 EE C03	**Core- 1** Electrical Circuit Analysis	Apply various network analysis techniques to find the responses in the circuits with dependent and independent sources.
			Determine time constant, steady state and transient responses of RL, RC, RLC networks with initial conditions of network elements.
			Evaluate the response of electrical circuits with Laplace transformation using initial & final value theorems and to obtain the pole-zero diagrams using network functions.
			Calculate the response of RLC networks with sinusoidal input at steady state & resonance conditions and to analyze three-phase circuits with different loads
			Find the impedance, admittance, ABCD, h and g- parameters of given two-port network and interconnected two-port networks.
21	20 EE C04	**Core- 2** Analog Electronic Circuits	Comprehend the V-I characteristics of Diode and its applications.
			Understand the V-I characteristics of BJT & MOSFET and to analyze the significance of operating point in the biasing techniques of BJT & MOSFET.
			Apply the knowledge of differential amplifiers to understand the basic characteristics of Operational Amplifiers (Op-Amps) and their significance.
			Design and Analyze linear application circuits of Op-Amp like amplifiers, Integrator, differentiator, filters and regulators .
			Design and Analyze non-linear application circuits of Op-Amps and to design astable and monostable modes of 555 timer circuit.
22	20 EE C05	**Core- 3** Electrical Measurements and Instrumentation	Identify a suitable instrument to measure a given electrical parameter.
			Analyze the working principle by using suitable torque equations for DC and AC Instruments.
			Design Bridge Circuits for measuring passive electrical parameters.
			Distinguish between electrical and magnetic measurements and their instruments.
			Select an Electrical transducer for a given physical quantity measurement.
23	20 EE C06	**Core- 4** Signals & System	Understand the basics of signals and systems, their classification and properties.
			Determine the DTFT & DFT of given discrete signals.
			Analyze the continuous time systems by using Laplace transform.
			Apply the Z-transform techniques to discrete time systems
			Analyze the effect of aliasing and reconstruction of signal using sampling theorem.

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24	20 CE M01	Environmental Science	Identify the natural resources and realise the importance of water, food, forest, mineral, energy, land resources and effects of over utilisation.
			Understand the concept of ecosystems and realise the importance of interlinking of food chains.
			Contribute for the conservation of bio-diversity.
			Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
			Follow the environmental ethics and contribute to the mitigation and management of environmental disasters
25	20 EE C 07	Analog Electronic Circuits Lab	Demonstrate the working principle of PN junction diode, transistor and MOSFET from their V-I characteristics.
			Realize Half wave and Full wave rectifiers for C & π section filter combinations.
			Analyze the significance of choosing a DC operating point for a transistor/MOSFET and to analyze the frequency response of CE amplifier.
			Design of linear and non-applications of Op-Amps.
			Design a555 Timer in A stable mode to produce pulses for Pulse Width Modulation (PWM) Schemes
26	20 EE C08	Electrical Circuits and Measurements Lab	Obtain and plot the frequency response, locus diagrams of RLC circuits.
			Verify various circuit theorems.
			Determine various two-port network parameters.
			Design and validate DC and AC bridges for measuring unknown electrical parameters.
			Demonstrate the principles of magnetic measurements.
			Demonstrate the measurement of non-electrical quantity with an appropriate transducer
27	20 CS C07	Basic Data Structures Lab	Implement the abstract data type.
			Demonstrate the operations on stacks, queues using arrays and linked lists
			Apply the suitable data structures including stacks, queues to solve problems
			Analyze various searching and sortingtechniques.
			Choose proper data structures, sorting and searching techniques to solve real world problems
28	20 EE C09	**Core -5** Digital Electronics	Understand the fundamental concepts and techniques used in logical operations.
			Analyze and design various combinational circuits using k Maps and Q-M method
			Design and implement Sequential logic circuits like counters shift register sand sequence generators
			Understand the process of Analog to Digital conversion and Digital to Analog conversion.
			Implement PLD's to solve the given logical problems

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29	20 EE C10	**Core -6** Electrical Machines-1	Identify the various parts of electrical machines and distinguish the nomenclature of electric and magnetic circuits.
			Elucidate the principle of operation and characteristics of electrical machines.
			Analyze the starting methods and speed control of DC machine.
			Determine the performance parameters of a machine for a given data.
			Explain the parallel operation of DC generators and single-phase transformers.
			Choose a suitable DC machine and auto transformer for a specific application
30	20 EE C11	**Core -7** Electromagnetic Fields	Understand the basic concepts of vector calculus, various coordinate systems and apply them appropriately for solving electromagnetic field problems.
			Obtain the physical quantities like field intensity, flux density and potential due to various types of charge distributions in electric and magnetic fields using fundamental laws.
			Differentiate between conduction & convections currents, and describe the behaviour of static electric & magnetic fields in different media, boundary conditions and acquire the knowledge about energy storing elements.
			Illustrate Maxwell's equations and their application to time-harmonic fields, wave propagation in different media and Poynting's power-balance theorem.
			Recognize what is EMI & EMC, sources & effects of Electromagnetic Interferences in inter and intra systems and various methods to control EMI
31	20 EE C12	**Core -8** Power Electronics	Understand the construction, operation and characteristics of various power semiconducting devices and to identify their selection in appropriate application.
			Comprehend the driver/trigger circuits for various devices & also protection circuit, different turn-OFF methods, series & parallel operation of SCRs.
			Illustrate the principle of working of AC-DC, AC-AC, DC-DC & DC-AC converters.
			Analyse the performance for various power converters with different loads and modes of working.
			Describe various voltage control techniques in power electronic converters with their applications
32	20 EE C13	**Core -9** **Power systems I**	Discuss the construction and operation of conventional and non-conventional sources of energy along with financial management
			Determine the line parameters such as inductance and capacitance for different configurations of transmission line
			Calculate the sag and tension of given transmission line under different weather conditions
			Discuss the operation of underground cables, insulators and calculate the capacitance of cables and string efficiency of insulators
			Discuss the different tariff structures, types of costs and general aspects of distribution systems

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33	20EGM02	Indian Traditional Knowledge	Understand philosophy of Indian culture
			Distinguish the Indian languages and literature
			Learn the philosophy of ancient, medieval and modern India
			Acquire the information about the fine arts in India
			Know the contribution of scientists of different eras.
34	20EGM03	Universal Human Values-II: Understanding Harmony	Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
			They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
			They would have better critical ability.
			They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
			It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.
35	20 EE C14	Digital Electronics Lab	Demonstrate the truth table of various expressions and combinational circuits using logic gates.
			Design, test and implement various combinational circuits such as adders, subtractors, comparators.
			Apply knowledge of logic gates to design complex logic circuits like multiplexers and demultiplexers.
			Design, test and implement various sequential circuits using flip-flops
			Design various logic circuits using shift registers
36	20 EE C 15	Electrical Machines-1 Lab	Make the connections for DC machines and single-phase transformer for their applications.
			Choose the meter ratings for various applications of DC machines and single-phase transformer..
			Control the speed of the DC motor by different methods.
			Obtain the characteristics of the given DC generator.
			Determine the performance of DC machines and single-phase transformer
37	20 EE C 16	Power Electronics Lab	Plot the characteristics of various controlled switches and identifies effect of variation of control signal on the regions of switching operation.
			Demonstrate the effect of delay angle and nature of load on the performance of various power converters and able to plot the output voltage and current waveforms.
			Simulate various types of power converters and discriminate between simulation models and practical models of various power converters.
			Understand various voltage control techniques in different power converters.
			Select proper equipment, precautions, implement connections keeping technical, safety and economic issues.

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38	20 EE C17	**Core – 10** Electrical Machines-II	Acquire the knowledge of Constructional and operational features of ac machines.
			Understand the various starting methods and speed control of ac machines. .
			Explain the concepts of ac machines.
			Describe the applications of ac machines.
			Analyse the performance characteristics of ac machines
39	20 EE C18	**Core -11** Power Systems -II	Analyse the performance of different types of transmission lines and evaluate the corona effect on transmission lines
			Understand the application of per unit quantities in power systems
			Classify different types of faults and apply symmetrical components to solve the power system problem when subjected to different fault conditions
			Describe the causes of over voltages and analyse reflection and refraction coefficients of overhead lines and cables
			Apply Gauss Seidel method and Newton-Raphson method to find power flows and voltages of the given power system.
40	20 EE C19	**Core -12** Microcontrollers and Applications	Understand the internal architecture of 8051 Microcontroller
			Do Assembly Language Programming using 8051 Microcontroller
			Interface Application devices to 8051 Microcontroller and Communication Protocols
			Understand the internal architecture of ARM controller
			Programming using ARM controller LPC 2148
41	20 EE C20	**Core -13** Control Systems	Understand different mathematical models for any electromechanical LTI systems.
			Determine the Transfer function of an LTI system using block diagram & signal flow graph approach.
			Analyze the given first and second order systems based on their performance parameters &PID controllers
			Analyze absolute and relative stability of an LTI system using time and frequency domain techniques.
			To understand the concepts of compensators and be able to draw its frequency response
			Develop various state space models for LTI systems and to determine its Controllability and Observability.

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42	20 EE E 11	Electrical Distribution Systems	Solve the problems on load factor, loss factor, coincidence factor and discuss the characteristic so floads along with load growth
			Illustratethesubstationbusschemesanddeterminetherating,voltagedropofsubstations
			Describe types and characteristics of primary and secondary distribution system and find voltage drop and power losses.
			Find voltage drop and power loss of three-phase & non-three phase lines and analyzethedistributioncostsandvoltagecontrolmethodsinthedistributionsystem
			Calculate the reactive power requirements of the distribution system and summarize the functions and communications used in distribution automation
43	20 EE E 12	Advanced Power Converters	Outline various features and electrical specifications for a chosen modern power electronic device.
			Understand different power factor improvement techniques in converters.
			Comprehend the operation of Multi-Pulse converters and design its performance parameters.
			Apply the concepts of different Multilevel Inverters that suits for industrial applications.
			Recognize the applications of power converters.
44	20 EE E 13	Simulation Techniques in Electrical Engineering	Understand the basics of MATLAB programming
			Apply matrix mathematics and functions for solution of linear and nonlinear equations
			Understand the use of plots for visualization of the numerical solution. Develop and run the m-files
			Analyse the basic electrical and networks applications in MATLAB environment
			Analyse the computational Intelligence Techniques in MATLAB environment
45	20 EE E 14	Electronic Instrumentation	Understand the various standards available for the measurement process.
			Evaluate and perform accurate measurements for any engineering system with clear idea of the potential errors
			Understand the working principles of various transducers
			Analyse the working principles of instruments like spectrum analyzer, DSO and other virtual instrumentation techniques for appropriate measurements.
			Understand the fundamentals of various Biomedical instrumentation systems.
46	20 EE E 15	Electrical Machine Design	Calculate the various parameters required for designing.
			Acquire the knowledge of Output equation and cooling methods.
			Obtain the Main dimensions of AC machines.
			Design the AC electrical machine for a given power rating.
			Gain the concept of CAD

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47	20 EE E 16	Computer Architecture and Organization	Provide fundamentals on machine instructions and addressing modes.
			Comprehend the various algorithms for computer arithmetic.
			Analyse the performance of various memory modules in memory hierarchy.
			Compare and contrast the features of I/O devices and parallel processors.
			Outline the evaluation of memory organization
48	20 EE E 21	High Voltage Engineering	Understand various breakdown processes in solid, liquid and gaseous insulating materials.
			Acquire the knowledge about generation of DC, AC and impulse voltage and currents. .
			Know the measurement of DC, AC and impulse voltage & currents
			Gain knowledge about testing of HV equipment.
			Explain about HV laboratories and safety precautions in HV labs
49	20 EE E 22	Switch Mode Power Converters	Design different types of DC-DC converters.
			Comprehend different types of SMPS for electrical applications.
			Understand the operation of different resonant converters.
			Design a suitable filter along with the suitable selection of transformer and switches that are used in power electronic converter circuits.
			Compare different voltage control techniques in inverters
50	20 EE E 23	Optimization Techniques	Solve the single variable and multi variable problems with and without constraints using classical optimization techniques
			Determine the solution of linear programming problem using graphical method, simplex algorithm and revised simplex algorithm
			Calculate the optimum of a nonlinear function using various elimination and search methods
			Apply Steepest Descent, Conjugate Gradient, Newton method, David-Fletcher-Powell methods in finding the optimum of given non linear function
			Discuss the different operators, selection techniques in genetic algorithm and apply the suitable selection technique for finding the maximization of function .

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51	20 EE E 24	Renewable Energy Technologies	Know the benefits of different renewable energy sources
			Understand the generation of Wind Power
			Model the generator, turbine and converter suitable for a specific wind-generation topology.
			Understand the Solar PV generation and grid interconnection technologies
			Understand and apply the remedies for network integration issues
52	20 EE E 25	Special Electrical Machines	Recognize application specific special electrical machines
			Explain the working principle of various special electrical machines.
			Develop equivalent circuit of a given special electrical machine.
			Classify the special electrical machine based on construction
			Choose the type of armature winding suitable for a given SEM.
			Analyse the various control methods of a given Special Electric machine.
53	20 EE E 26	Basic VLSI Design	To design logic circuits using pMOS and nMOS technologies
			To design cMOS logic circuits.
			To simulate logical circuits using HDL programming
			To understand different modeling strategies
			To understand FPGA design strategies.
54	20 EE C21	Control Systems Lab	Demonstrate the characteristics of DC, AC Servo motors and Synchro Pair.
			Analyze the performance parameters of a given second order plant in time domain.
			Analyze the performance of different compensators through its frequency response.
			Design P, PI, PID and ON/OFF controller of a given system and to distinguish the merits and demerits of these controllers.
			Analyze the characteristics of magnetic amplifier for series and parallel connections.
			Demonstrate the effect of damping on the plant using D.C position control system
55	20 EE C22	Electrical Machines- II Lab	Make the connections for any given AC machine based on applications.
			Design the meter ratings for various applications of induction and synchronous machines.
			Control the speed of the induction motor by different methods.

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			Determine the efficiency and regulation of the given alternator using various methods.
			Test the induction motor for their no-load and load characteristics.
56	20 EE C23	Microcontrollers and Applications Lab	Develop the programs of 8051 and ARM using their respective instruction set.
			Understand the usage of various debugging tools available to program different microcontrollers
			Build code for 8051 and ARM7 to interface various input/output modules
			Analyze the hardware and software interaction and integration.
			Design and develop the 8051 and ARM 7 based embedded systems for various applications
57	20EGC03	Employability Skills	Become effective communicators, participate in group discussions with confidence and be able to make presentations in a professional context.
			Write resumes, prepare and face interviews confidently.
			Be assertive and set short term and long term goals, learn to mange time effectively and deal with stress.
			Make the transition smoothly from campus to work, use media with etiquette and understand the academic ethics.
			Enrich their vocabulary, frame accurate sentences and comprehend passages confidently
58	20 EE I02	Industrial / Rural Internship	Understand Engineer's responsibilities and ethics
			Use various materials, processes, products and quality control
			Provide innovative solutions to solve real world problems
			Acquire knowledge in technical reports writing and presentation
			Apply technical knowledge to real world industrial/rural situations
59	20 EE C24	**Core -13** Power System Protection	Understand basic terminology of relays and types of over current protection of power system.
			Distinguish the type of distance protection with principle & their application to three phase transmission lines.
			Choose suitable differential scheme for the protection of various equipment in electrical power system.
			Describe the principle of operation, and able to calculate the ratings of circuit breakers.
			Familiarize with different protection methods against over-voltages.
			Identify various elements of numerical relays, their functions and different techniques used in their design.

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60	20 EE C25	**Core -14** Power System Operation and Control	Demonstrate the Economic operation of power system without and with Losses
			Illustrate the concept of Unit Commitment
			Analyze the Load Frequency Control for single and two area systems
			Examine the rotor angle stability of a power system under any disturbance.
			Identify and Explain the Voltage Stability problems.
61	20 EE C26	**Core -15** Electrical Drives	Acquire the knowledge about classification, choice, dynamics and stability of Electric Drives.
			Analyse 1-Φ & 3-Φ converters fed DC motors.
			Understand the operational variance between single and multi-quadrant operation of various Electric Drives
			Analyse chopper fed DC motors.
			Comprehend the speed control of a converter fed induction motor drives and synchronous motor drives.
			Differentiate the features of closed loop operation of DC and AC electric drive and their controllers.
62	20 EE C27	**Core -16** IoT for Electrical Engineering	Understand the basic principles and terminologies of computer networking, network security, WSN, M2M, CPS, sensors and actuators.
			Describe various data types in IoT applications, connectivity protocols in IoT, communication protocols in IoT.
			Understand basic concepts of Arduino UNO and Design smart system applications using Arduino UNO.
			Apply Python programming for Problem solving and application development.
			Understand the working of Raspberry Pi and develop IoT applications.
63	20 EE E31	Advanced power System Protection	Remember the basic terminology and components of static relays and grounding methodologies
			Recognize the need and architecture of digital relays
			Comprehend the application of mathematics in power system protection
			Distinguish various mathematical algorithms used for the estimation of power system parameters.
			Explain various algorithms used for the digital protection of power system.
64	20 EE E32	Power Electronics for Renewable Energy Systems	Acquaint with different renewable energy sources
			Understand different techniques of Power extraction from Solar and Wind energy systems
			Modeling of generator, turbine and suitable converters for a RES and energy storage systems.
			Understand the concepts and working with fuel-cell for efficient energy system.
			Understand necessity and functioning of Hybrid Energy storage system.

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65	20 EE E33	Utilization of Electrical Energy	Acquire knowledge about electric heating concepts for a given application
			Understand principles of welding concepts for a given application
			Familiar with principles of illumination concepts
			Identify the necessity of illumination and luminaries for specified requirement
			Select proper traction system and its corresponding drive for industrial applications
			Able to estimate energy consumption levels at various modes of operation.
66	20 EE E34	Power Quality Engineering	Illustrate the basic concepts of power quality issues and power quality monitoring, standards and measuring instruments.
			Determine the voltage sag magnitude in radial, Non-radial and Meshed systems
			Analyze voltage sags effect on three-phase AC- Adjustable speed drive (ASD), DC- Adjustable speed drive (ASD) for industrial applications.
			Identify the sources of harmonics and its mitigation techniques in industrial systems.
			Discuss the protection devices for transient over voltages and solutions for Wiring and Grounding problems
67	20 EE E35	Advanced Electrical Drives	Identify and consider the requirement of power converters for a given application.
			Illustrate the digital methods of DC motor speed control techniques.
			Show how the changes effect in different speed control schemes of Induction motor.
			Analyse the performance of Synchronous motor with and without sinusoidal supply.
			Recognize and formulate problems encountered by special motor drives for a particular application.
68	20 EE E36	Digital Signal Processing	Represent signals mathematically in continuous and discrete-time, and in the frequency domain
			Analyse discrete-time systems using z-transform
			Analyse the Discrete-Fourier Transform (DFT) and FFT algorithms
			Design digital IIR filters
			Design digital FIR filters.
69	20 EG M01	Indian Constitution& Fundamental Principles	Understand the making of the Indian Constitution and its features.
			Identify the difference among Right To equality, Right To freedom and Right to Liberty.
			Analyze the structuring of the Indian Union and differentiate the powers between Union and States.
			Distinguish between the functioning of Lok Sabha and Rajya Sabha while appreciating the importance of Judiciary.
			Differentiate between the functions underlying Municipalities, Panchayats and Co-operative Societies.

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70	20 EE C28	Power Systems Lab	Calculate ABCD constants of transmission lines and evaluate regulation and efficiency.
			Examine relay setting and compensation techniques for safe operating of power system.
			Identity sequence parameters of transformer and alternator and discuss its importance.
			Calculate the time constant, perform Fault Analysis of an Alternator and Identify Fault location of an Underground Cable.
			Determine the dielectric strength of transformer oil and calculate the efficiency of string insulators of a transmission line.
71	20 EE C29	Electrical Simulation Lab	Analyze the DC and AC circuits
			Demonstrate the time and frequency response of the system
			Perform Load flow studies and economic load dispatch
			Conduct Load frequency control and transient stability studies
			Realize the Electrical operations using ANNs and Heuristic Techniques.
72	20 EE C30	Electrical Drives Lab	Analyze the control strategies to modify the output parameters of dc and ac drives.
			Develop, testing and experimental procedures by applying basic knowledge in electrical and electronics.
			Demonstrate the principle of energy efficient motors by load matching.
			Interpret the performance of a given drive by suitable experimentation.
			Investigate the performance of a given drive by using suitable simulation software.
73	20 EE C31	IoT Lab	Understand use of Arduino / Raspberry Pi board circuit
			Implement interfacing of various sensors with Arduino /Raspberry Pi
			Demonstrate the ability to transmit data wirelessly between different devices
			Show an ability to upload/download sensor data on cloud and server
			Analyze basic protocols in wireless sensor network
74	20 EE E41	Real Time Control of Power Systems	Estimate the state of Power System
			Asses the security of the power system under abnormalities.
			Illustrate the fundamental of SCADA system
			Demonstrate the role of EMS in control centers
			Explain the significance of WAMS in improving the power system operation
75	20 EE E42	HVDC Transmission Systems	Understand the basics of HVDC and compare between HVDC and HVAC.
			Analyse the converter circuits used in HVDC.
			Understand the HVDC control methods and be able to draw the control characteristics.
			Understand the HVDC filter design technique and protection methods.
			List out different MTDC links and their control.

SNo	Course		Course Outcomes Statements
	Code	Name	
76	20 EE E43	AI Techniques in Electrical Engineering	Understand the concepts of ANNs, Fuzzy logic and machine learning Techniques
			Remember the difference between knowledge based systems and algorithmic based systems.
			Understand the basics of machine learning concepts.
			Apply fuzzy logic controller and machine learning algorithms for real-world problems.
			Analyze critically the techniques presented and apply them to electrical Engineering problems.
77	20 EE E44	Digital Control Systems	Develop the discrete representation for the given continuous time Systems
			Analyse the stability of discrete-time systems.
			Build state space models for discrete time systems.
			Design digital controllers.
			Construct Lyapunov function and design feedback controller
78	20 EE E45	Machine Modelling and Analysis	Derive voltage equations on electrical side: driving equipment on mechanical side.
			Understand principles of two-pole machine
			Obtain typical eigen values of the state matrix for electrical machines.
			Apply the techniques to transform variables from one frame to another.
			Analyze any electrical machine by mathematical modelling.
79	20 EE E46	Advanced Microprocessors and Controllers	Understand the advanced microprocessor architectures
			Analyze the programming components of processor systems.
			Design of system using Pentium processors.
			Evaluate the performance of ARM microcontrollers MOTOROLA 68HC11.
			Apply embedded design approach for interfacing devices with advanced processors.
80	20 EG M04	Gender Sensitization	Understand the difference between "Sex" and "Gender" and be able to explain socially constructed theories of identity.
			Recognize shifting definitions of "Man" and "Women" in relation to evolving notions of "Masculinity" and "Femininity".
			Appreciate women's contributions to society historically, culturally and politically.
			Analyze the contemporary system of privilege and oppressions, with special attention to the ways gender intersects with race, class, sexuality, ethnicity, ability, religion, and nationality.
			Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning.

SNo	Course Code	Course Name	Course Outcomes Statements
81	20MB C01	Engineering Economics & Accountancy	Apply fundamental knowledge of Managerial Economics concepts and tools.
			Analyze various aspects of Demand Analysis, Supply and Demand Forecasting.
			Understand Production and Cost relationships to make best use of resources available.
			Apply Accountancy Concepts and Conventions and preparation of Final Accounts.
			Evaluate Capital and Capital Budgeting decision based on any technique.
82	20 EE C31	Project –Part-1	List the various approaches to the selected problem.
			Interpret the advantages and disadvantages of various approaches.
			Apply the selected approach for simulating / modeling /designing the problem.
			Analyse and write a report on the results of the simulation / modeling of the problem selected.
			Justify and present the results of the simulation / modeling / design before the departmental committee.
84	20 EE I03	Internship	Understand Engineer's responsibilities and ethics
			Use various materials, processes, products and quality control
			Provide innovative solutions to solve real world problems
			Acquire knowledge in technical reports writing and presentation
			Apply technical knowledge to real world industrial situations
85	20 EE E51	Smart Grid Technologies	Discuss the components and operation of Smart Grid at transmission and distribution level
			Select the communication technology required for smart grid applications
			Illustrate components and operation of smart metering and implementation of demand side integration
			Analyze the different types of micro grid, storage systems and communication infrastructure
			Explain the equipment used in distribution automation and implement the distribution management system functions
86	20 EE E52	Flexible AC Transmission System	Choose the appropriate FACTS device/controller based on the needs of inter connected power transmission systems.
			Analyze various Power Electronic Converters used in FACTS.
			Illustrate the operation of shunt compensators (i.e. SVC, STATCOM) for the end of line voltage support and transient stability problems
			Analyze the operation and control of GCSC, TCSC and SSSC.
			Explain the principles, operation and control aspects of UPFC for P and Q control

| SNo | Course | | Course Outcomes Statements |
	Code	Name	
87	20 EE E53	Electrical Estimation and Costing	Understand the concepts related to electrical Wiring and costing
			Estimate electrical installation and costing for Residential buildings.
			Estimate electrical installation estimation and costing for commercial and small industries.
			Understand the components and Estimate the materials required to Design Electrical Installation of Substation, Transmission and Distribution lines.
			Identify and design the various types of light sources for different applications.
88	20 EE E54	Advanced Control Systems	Develop discrete time system models and to perform stability tests on it.
			Develop state space representation of discrete time systems and applythe concepts of controllability and observability - tests for discrete- time systems.
			Design of state feed-back controller and observer for discrete-time systems.
			Analyze Stability of non-linear control systems.
			Justify the stability study through Lyapunov's criteria and to apply optimal control techniques to extremize a cost function
89	20 EE E55	Electric Hybrid Vehicles	Be familiar to the models of describing Electric and hybrid vehicles and their performance.
			Calculation of tractive effort required for EHV and EV with different vehicle parameters and optimisation of power train.
			Design optimisation of Electric power train and implementation of charging technology.
			Analyze the different possible ways of energy storage and battery selection.
			Illustrate the principle of Hybrid Electric Vehicle, Battery Electric Vehicle and Plug-in EHV and able to prepare. a business plans.
90	20EE E56	Embedded System Design	Understand the fundamentals of the embedded systems
			Analyze the hardware and software components of the embedded systems.
			Design interfacing of the systems with other processing systems.
			Evaluate the performance of an embedded system using debugging tools.
			Apply embedded design approach for various applications.
91	20 EE C32	Technical Seminar	Collect, Organize, Analyze and Consolidate information about emerging technologies from the literature.
			Exhibit effective communication skills, stage courage and confidence.
			Demonstrate intra-personal skills.
			Explain new innovations / inventions in the relevant field.
			Prepare and experience in writing the Seminar Report in a prescribed format.

SNo	Course		Course Outcomes Statements
	Code	Name	
92	20 EE C33	Project: Part-2	Recall the details of the approach for the selected problem.
			Interpret the approach to the problem relating to the assigned topic.
			Determine the action plan to conduct investigation.
			Analyze and present the model/simulation / design as needed.
			Evaluate, present and report the results of the analysis and justify the same.

R20 OPEN ELECTIVES

1	Odd	**20EEO02**	Energy Management System	Know the current Energy Scenario and importance of Energy Conservation.
				Understand the concepts of Energy Management, Energy Auditing.
				Interpret the Energy Management methodology, Energy security and Energy Strategy .
				Identify the importance of Energy Efficiency for Engineers and explore the methods of improving Energy Efficiency in mechanical systems, Electrical Engineering systems
				Illustrate the Energy Efficient Technologies in Civil and Chemical engineering systems
2	Odd	**20EEO04**	Energy Conservation	Know the current energy scenario and importance of energy conservation.
				Understand the concepts of energy conservation.
				Evaluate the performance of existing engineering systems
				Explore the methods of improving energy efficiency in different engineering systems
				Understanding different energy efficient devices.
3	Even	**20EEO01**	Engineering Materials	Classify the given material based on its properties.
				Select a proper material for a given application.
				Experiment on materials in order to test its adaptability.
				Investigate the suitability of material for the latest technological requirement.
				Compare and contrast the characteristics of the materials to assess the changes in properties.
4	Even	**20EEO03**	Energy Auditing	Know the current energy scenario and various energy sources
				Understand the concepts of energy auditing.
				Evaluate the performance of existing engineering systems
				Explore the methods of improving energy efficiency in different engineering systems
				Design different energy efficient appliances.

5	Even	**20EEO05**	Waste Management	Categorize the waste based on the physical and chemical properties.
				Explain the Hazardous Waste Management and Treatment process.
				Illustrate the Environmental Risk Assessment, methods, mitigation and control.
				Interpret the Biological Treatment of Solid and Hazardous Waste.
				Identify the waste disposal options, describe the design and construction, Operation, Monitoring,Closure of Landfills

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (Autonomous)
Gandipet, Hyderabad -75
Department Of Electrical and Electronics Engineering
Course Outcomes Statements for R18

SNo	Course Code	Course Name	Course Outcomes Statements
1.	18MT C01	Mathematics -I	Solve system of linear equations and identify the Eigenvalues and Eigen vectors in engineering problems.
			Check the series convergence.
			Find the evolutes of the given curves.
			Expand and find extreme values of functions of twovariables.
			Understanding the significance of gradient, divergence and curl.
			An ability to solve the problems and interpret in geometrical approach.
2.	18PY C04	Waves, Optics and Introduction To Quantum Mechanics	Describe the types of oscillations and analyze them.
			Demonstrate the wave nature of the light.
			Describe the types of lasers and optical fibres and their applications..
			Demonstrate the important concepts of Quantum Mechanics.
			Identify the electronic materials for engineering applications.
.3	18CS C01	Programming for Problem Solving	Identify the computing environments
			. 2. Formulate solutions to problems and represent them using algorithms/ Flowcharts.
			3. Choose proper control statements and data structures to implement the algorithms.
			4. Trace the programs with test the program solution.
			5. Decompose a problem into modules and use functions to implement the modules. 6. Develop applications using file I/O
4.	18EG C01	English	The students will understand the nature, process and types of communication and will communicate effectivelywithout barriers.
			The students will write correct sentences and coherent paragraphs.
			The students will know how to condense passages by writing précis and write essays by using accurate grammar and appropriate vocabulary.
			The students will demonstrate advanced writing skills bydrafting formal reports.
			The students will apply their reading techniques and analyze reading comprehension passages.
5.	18PY C07	Waves and Optics Laboratory	Understand the concept of errors and find the ways tominimize the errors. 2. Demonstrate interference and

SNo	Course		Course Outcomes Statements
	Code	Name	
			Decompose a problem into modules and use functions to implement the modules.
			Develop applications using file I/O.
6.	18CS C02	Programming For Problem Solving Lab	Identify and setup program development environment.
			Implement the algorithms using C programminglanguage constructs.
			Identify and rectify the syntax errors and debug program for semantic errors.
			Solve problems in a modular approach usingfunctions.
			Implement file operations with simple text data.
7.	18ME C02	Workshop/ Manufacturing Practice	Fabricate components with their own hands.
			Get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
			Assemblingdifferent components, student will be ableto producesmall mechanisms/devices of their interest.
			Gain practical skills of carpentry, tinsmithy, fitting, house wiring.
			Gain knowledge of different Engineering Materials and Manufacturing Methods and Understand trades and techniques used in Workshop and chooses the best material/ manufacturing process for the application
8.	8EG C02	English Lab	Differentiate the speech sounds in English.
			Interact with the software and understand thenuances of pronunciation in English.
			Speak with the proper tone, intonation and rhythm and apply stress correctly. The students will demonstrate their listening skills by analyzing the IELTS and TOEFLlisteningcomprehensiontexts.
			Speak with clarity and confidence.
			Work in teams and discuss various topics and demonstrate their presentation skills through posters.
9	18MT C03	Mathematics -II	Find the areas, volumes and surface of solids revolution.
			Use Greens, Gauss and Stoke's theorems to find thesurface and volume integrals.
			Able to solve solutions of differential equations withinitial and boundary value problems.
			Solve the problems on analytic functions, Cauchy's theorem and Cauchy's integral formula.
			Real and complex integrals by using Cauchy's theorems.
			Solve physical and engineeringproblems.
10	18CY C01	Chemistry	Get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
			Determine the rate constants of reactions from concentration of reactants/ products as a function of time

SNo	Course Code	Course Name	Course Outcomes Statements
			Calculate the concentration and amount of various substances using instrumental techniques.
			Develop the basic drug molecule and Identify theorganic compounds
			Analyse the molecular properties such as surfacetension and viscosity
11	18CE C01	Engineering Mechanics	Draw free body diagrams to analyze the forces in the given structure
			Understand the Concept of moments and Couples in plane systems.
			Understand the mechanism of friction and can solve friction problems
			Determine the centroid of plane areas and centers of gravity of bodies usingintegration methods
			Determine moments of inertia, product of inertia for all areas and mass momentsof inertia for bodies,
12	18ME C01	Engineering Graphics and Design	Introduction to engineering design and its place in society.
			Exposure to the visual aspects of engineering design.
			To become familiar with engineering graphics standards.
			Exposure to solid modelling.
			Exposure to computer-aided geometric design.
			Exposure to creating working drawings.
			Exposure to engineering communication.
13	18EE C01	Basic Electrical Engineering	Acquire the concepts of Kirchhoff's laws and network theorems and able to get the solution of simple dccircuits Obtain the steady state response of RLC circuits and also determine the different powers in ACcircuits
			Acquire the concepts of principle of operation ofTransformers and DC machines
			Acquire the concepts of principle of operation of DCmachines and AC machines
			Acquire the knowledge of electrical wiring and cables and electrical safety precautions
			Recognize importance of earthing and methods ofearthing and electrical installations
14	18EE C02	Basic Electrical Engineering Lab	Make electrical connections by wires of appropriate ratings.
			Understand the circuit analysis techniques.
			Determine the parameters of the given coil.
			Understand the basic characteristics of transformer.
			Understand the basic characteristics of dc and ac machines.
15	18CY C02	Chemistry Lab	Estimate rate constants of reactions from concentration of reactants/ products as a function of time.
			2. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials,chloride content of water, etc
			3. Synthesize a small drug molecule and Identify the organic compounds.
			4. understand importance of analytical instrumentation for different chemical analysis.
			5. Perform interdisciplinary research such that the findingsbenefit the common man.

SNo	Course		Course Outcomes Statements
	Code	Name	
16	**18EEC03**	Analog Electronic Circuits	Understand the V-I characteristics of Diode,transistor, MOSFET and the biasing techniques of transistors.
			Design the biasing techniques of MOSFETS anacquire knowledge in different operating configurations of MOSFET.
			Apply the knowledge of differential amplifiers to understandthe basic characteristics of Op-Amps and their significance
			Analyze different linear application circuits of Op-Amp.
			Analyze different non-linear application circuits of Op-Amps
17	**18EEC04**	Electrical Measurements and Instrumentation	Identify a suitable instrument to measure a given electrical parameter.
			Analyze the working principle by using suitable torque equations for DC and AC Instruments.
			Design Bridge Circuits for measuring passive electrical parameters.
			Distinguish between electrical and magnetic measurements and their instruments.
			Select an Electrical transducer for a given physical quantity measurement.
18	**18EEC05**	Electromagnetic Fields	Understand the basic concepts of vector calculus, various coordinate systems and apply them appropriately for solving electromagnetic field problems.
			Obtain the physical quantities like field intensity, flux densityand potential due to various types of charge distributions in electric and magnetic fields using fundamental laws
			Differentiate between conduction & convections currents, and describe the behaviour of static electric & magnetic fields in different media, boundary conditions and acquire the knowledge about energy storing elements.
			Illustrate Maxwell's equations and their application to time-harmonic fields, wave propagation in different media and Poynting's power-balance theorem.
			Recognize what is EMI & EMC, sources & effects of Electromagnetic Interferences in inter and intra systems and various methods to control EMI
19	**18EEC06**	Electrical Circuit Analysis	Calculate the response of RLC networks with sinusoidal input at steady state & resonance conditions and to analyze three-phase circuits with different loads
			Apply node and mesh analysis techniques to find the responses in the circuits with dependent and independent sources using various theorems.
			Develop incidence, tie set and cut set matrices for thegiven circuits and to apply dot convention to determine the response in coupled circuits.
			Determine time constant, steady state and transient responses of RL, RC, RLC networks with initialconditions of network elements.
			Evaluate the response of electrical circuits with Laplace transformation using initial & final value theorems and to

SNo	Course		Course Outcomes Statements
	Code	Name	
			obtain the pole-zero diagrams using
			network functions.
			Find the impedance, admittance, ABCD, h and g- parametersof given two-port network and interconnected two-port networks
20	**18EEC07**	Analog Electronic Circuits Lab	Demonstrate the working principle of PN junctiondiode, transistor and MOSFET from their V-I characteristics.
			Realize different rectifiers for different filter combinations.
			Analyze the significance of choosing a DC operating point for a given transistor.
			Design single and multi-stage amplifiers and to find heir frequency response.
			Analyze inverting and non-inverting modes of Op-Amp along with its linear and non-applications.
21	**18EEC08**	Electrical Measurements and Instrumentation Lab	Experiment on various secondary measuring instruments to measure the unknown electrical parameters.
			Design and validate DC and AC bridges for measuring unknown electrical parameters.
			different measuring concepts through Digital Storage Oscilloscope (DSO) and Digital Instruments.
			Demonstrate the principles of magnetic measurements.
			Select an appropriate transducer to estimate the given unknown electrical quantity by measuring non-electrical quantity
22	**18EEC01**	Basic Electrical Engineering	Understand the concepts of Kirchhoff's laws and applythem in Superposition, Thevenin's and Norton's theorems to get the solutions of simple dc circuits
			Obtain the steady state response of RLC circuits with AC input & understand the basics of three phase circuits.
			Understand the principle of operation, working of AC and DC machines and their classification
			Explain various tests and speed control methods to determine the characteristic of DC and AC machines.
			Acquire the knowledge of electrical wiring, types of wires, cables used and precautions to be followed in electrical installations
			Identify importance of earthing, methods of earthing and various low-tension switchgear used in electricalsafety precautions.
23	**18EEC02**	Basic Electrical Engineering Lab	Get an exposure to common electrical components, their ratings and basic electrical measuring equipment.
			Make electrical connections by wires of appropriate ratings and able to measure electric power and energy.
			Comprehend the circuit analysis techniques using various circuital laws and theorems.
			Determine the parameters of the given coil and calculate the time response of RL & RC series circuits.
			Recognize the basic characteristics of transformer and components of switch gear
			Understand the basic characteristics of dc and ac machine by conducting different types of tests on them.

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	Code	Name	
24	**18EEC09**	Digital Electronics	Understand the fundamental concepts and techniques used in logical operations.
			Analyze and design various combinational circuits using k Maps and Q-M method
			Design and implement Sequential logic circuits like counters shift register sand sequence generators
			Understand the process of Analog to Digital conversion and Digital to Analog conversion
			Implement PLD's to solve the given logical problems
25	**18EEC10**	Electrical Machines-1	Identify the various parts of electrical machines and memorize the nomenclature of electric and magneticcircuits.
			Interpret the principle of operation and characteristics of electrical machines.
			Analyze the starting methods and speed control of dc machine.
			Calculate the performance parameters of a machine for agiven data
			Outline the parallel operation of dc generators and single-phase transformers
			Choose a suitable dc machine and auto transformer for a specific application.
26	**18EEC11**	Power Systems-I	Discuss the construction and operation of conventional and non-conventional sources of energy along with financial management
			Determine the line parameters such as inductance and capacitance for different Configurations of transmission line
			Calculate the sag and tension of given transmission line under different weather Conditions
			Discuss the operation of underground cables, Insulators and calculate the capacitance of cables and string efficiency of Insulators
			Discuss the different tariff structures, types of costs and general aspects of AC-DC Distribution systems
27	**18EEC12**	Digital Electronics Lab	Demonstrate the truth table of various expressions and combinational circuits using logic gates.
			Design, test and implement various combinational circuits such as adders, subtractors, comparators.
			Apply knowledge of logic gates to design complex logic circuits like multiplexers and demultiplexers
			Design, test and implement various sequential circuits using flip-flops
			Design various logic circuits using shift registers
28	**18EEC13**	Electrical Machines-1 Lab	Make the connections for dc machines and single-phase transformer for their applications.
			Choose the meter ratings for various applications of dc machines and single-phase transformer.
			Control the speed of the dc motor by different methods.
			Obtain the characteristics of the given dc generator.
			Determine the performance of dc machines and single-phase transformer

SNo	Course		Course Outcomes Statements
	Code	Name	
29	**18EEC14**	Electrical Machines-II	Identify the various parts and nomenclature related to ac Machine windings
			Classify various ac Machines based on constructional and operational features.
			Associate the concepts with characteristics of ac Machines.
			Analyze various starting and speed control methods of ac Machine.
			Sketch and analyze the Characteristics of ac Machine based on application.
			Determine the performance parameters of ac machines.
30	**18EEC15**	Power Systems-II	Analyse the performance of different types of transmission lines and evaluate the effect of corona on transmission lines
			Understand the per unit quantities of the given power system
			Classify different types of faults and apply symmetricalcomponents to solve the power system problem when subjected to different fault conditions
			Describe the causes of over voltages and analyse reflectionand refraction coefficients of overhead lines and cables
			Apply Gauss Seidel method and Newton-Raphson method to find power flows and voltages of the given power system
31	**18EEC16**	Power Electronics	Understand the construction, operation and characteristics of various power semiconducting devices and to identify their selection in appropriate application.
			Comprehend the driver/trigger circuits for various devices & also protection circuit, different turn-OFF methods, series & parallel operation of SCRs.
			Illustrate the principle of working of AC-DC, AC-AC, DC-DC & DC-AC converters.
			Analyse the performance for various power converters with different loads and modes of working.
			Describe various voltage control techniques in power electronic converters with their applications
32	**18EEC17**	Electrical Machines-II Lab	Identify the connections for Induction and synchronous machines for their applications.
			Control the speed of the induction motor using different methods.
			Estimate the voltage regulation of alternator by various regulation methods.
			Illustrate the synchronization of alternator to bus bar.
			Determine the performance characteristics of induction machines by conducting suitable tests.
			Analyze the conversion principle employed in Scott

SNo	Course		Course Outcomes Statements
	Code	Name	
			connection of transformer.
33	**18EEC18**	Power Systems-I Lab	Analyze the working of various parts of Generating Station.
			Experiment with string of insulators and 3 core cables.
			Determine the dielectric strength of oil.
			Evaluate the Line Constants, ABCD constants, regulation and efficiency of a transmission line.
			Calculate the sequence parameters of the transformer and alternator.
34	**18EEC19**	Power Electronics Lab	Plot the characteristics of various controlled switchesand identifies effect of variation of control signal on the regions of switching operation.
			Demonstrate the effect of delay angle and nature of load on the performance of various power convertersand able to plot the output voltage and current waveforms.
			Simulate various types of power converters and discriminate between simulation models and practicalmodels of various power converters.
			Understand various voltage control techniques indifferent power converters.
			Select proper equipment, precautions, implement connections keeping technical, safety and economic issues
35	**18EEE01**	Wind and Solar Energy	Understanding the significance of non-conventional energy sources
			Apply the knowledge of physical requirement of wind power energy systems
			Analyze the required parameters for generator, turbine and converter suitable for a specific wind-generation topology
			Understand solar thermal systems
			Analyze the network integration issues
36	**18EEE02**	Optimization Techniques	Solve the single variable and multi variable problemswith and without constraints using classical optimization techniques
			Determine the solution of linear programming problem using graphical method, simplex algorithmand revised simplex algorithm
			Calculate the optimum of a nonlinear function usingvarious elimination and search methods
			Analyze Steepest Descent, Conjugate Gradient, Newton method, David-Fletcher-Powell methods infinding the optimum of given non linear function
			Discuss the operators, selection techniques in geneticalgorithm and apply the genetic algorithm to economic load dispatch problem

SNo	Course Code	Course Name	Course Outcomes Statements
37	**18EEE03**	Electrical Engineering Materials	Classify the given conducting material based on its properties
			Understand and select proper insulating material in the field of Electrical engineering
			Investigate the suitability of material for the latest technological requirement
			Select a suitable material for optical applications.
			Illustrate the materials used in Direct Energy Conversion Devices
			Illustrate the materials used in Direct Energy Conversion Devices
38	**18EEE04**	Electronic Instrumentation	Understand the various standards available for the measurement process.
			Acquire knowledge on various transducers with the analysis in their working principles.
			Select an electrical transducer for a given physical quantity measurement.
			Identify instruments like spectrum analyzer, DSO and other virtual instrumentation techniques such as SCADA for appropriate measurements.
			Illustrate the applications of various Bio-medical instruments used in healthcare
39	**18EEE05**	Simulation Techniquesin Electrical Engineering	Understand basic syntax of MATLAB and PSpice programming
			Apply matrix mathematics, plots and functions for solvingand visualization of the numerical solution
			Determine DC, AC and transient analysis in PSpice environment
			Design modelling parameters of Diode, BJT, MOSFET, IGBTand SCR
			Analyse the response of uncontrolled and controlled rectifierswith different controlled parameters and loads
40	**18EEE06**	Energy Conservation & Auditing	Understand about current energy scenario and importance of energy conservation
			Apply the concepts of energy management
			Analyze the performance of existing electrical and industrial systems
			Understand different energy efficient systems in electrical and industrial systems
			Apply the energy efficiency techniques in electrical systems
41	**18EEE07**	Industrial Electrical Systems	Understand various components of industrialelectrical systems
			Apply residential and commercial electrical wiringrules and guidelines for installation of electrical systems
			Design various Illumination schemes and lightingsystems
			Understand HT connection, Industrial loads and LTpanel components
			Select the proper size of various electrical systemcomponents

SNo	Course		Course Outcomes Statements
	Code	Name	
42	**18EEE08**	Electrical Estimation & Costing	Define the principles related to electrical wiring andcosting.
			Summarize the electrical specifications of residentialbuilding and electrification requirements.
			Distinguish between Residential and CommercialInstallations.
			Estimate the materials required to Design ElectricalInstallation of Substation, Transmission and Distribution Systems.
			Identify and Design the various types of light sourcesfor different applications.
43	**18EEC20**	Control Systems	Understand different mathematical models for any electromechanical LTI systems.
			Analyze the given first and second order systems based on their performance parameters.
			Analyze absolute and relative stability of an LTI system using time and frequency domain techniques
			Analyze the effects of controller on a given system and to understand the concepts of compensators.
			Develop various state space models for LTI systems and to check the concepts of Controllability and Observability.
44	18EEC21	Microprocessors and Microcontrollers	Understand the basic concepts of Microcontrollers and Embedded Systems
			describe the architecture and different modes of operations of 8051 Microcontroller
			Apply knowledge of instruction set and addressing modes for writing Assembly Language Programming using 8051 Microcontroller.
			Develop application circuits by interfacing peripherals likeA/D, D/A, display and motors to 8051 Microcontroller.
			Develop Systems using 8051 Microcontroller with the help of Communication Protocols like blue-tooth.
45	**18EEC22**	Power Systems Operation and Control	Determine the equal incremental cost with and without transmission losses and Bmn coefficents
			Calculate the steady state stability limit and transient stability when the synchronous machine connected to infinite bus is subjected to three-phase fault using Equalarea criterion and step by step method.
			Perform Security Analysis and Contingency Analysis for different Outage Conditions
			Elaborate different State Estimation techniques in Power Systems.
			Analyze the performance of primary Load frequency controlloop and automatic voltage regulator loop
46	**18EEC23**	Control Systems Lab	Demonstrate the characteristics of DC, AC Servo motors and Synchro pair.
			Analyze the performance parameters for a given second order plant both in time and frequency domain.
			Analyze the performance of different compensators through frequency response
			Design P, PI, PID and ON/OFF controller for a given system and to distinguish the merits and demerits of these controllers.
			Apply different stability techniques for linear time invariant systems using simulation and then verify with the theoretical calculations

SNo	Course Code	Course Name	Course Outcomes Statements
47	**18EEC24**	Microprocessors Lab	Use instruction set of 8051 microcontroller to developALPs.
			To write and execute simple programs using 8051 microcontroller
			Demonstrate the functioning of different instructions and subroutines using 8051 programming.
			Create small application models by interfacing devices to8051 programming through Keil/ Ride software.
			Apply the knowledge of experiments done in the laboratoryfor doing mini projects and academic projects.
48	**18EEE09**	Power Quality	Illustrate the basic concepts of power quality issues and power quality monitoring, standards and measuring instruments.
			Determine the voltage sag magnitude in radial, Non-radial and Meshed systems
			Analyze voltage sags effect on three-phase AC-ASD, DC-ASD for industrial applications
			Identify the sources of harmonics and its mitigation techniques in industrial systems.
			Discuss the protection devices for transient over voltages and solutions for Wiring and Grounding problems
49	**18EEE10**	Advanced Power Converters	Outline various features and electrical specifications for achosen modern power electronic device.
			Understand different power factor improvement techniques in converters.
			Comprehend the operation of Multi-Pulse converters and design its performance parameters.
			Apply the concepts of different Multilevel Inverters that suitsfor industrial applications.
			Recognize the applications of power converters.
50	**18EEE11**	Electrical Distribution Systems	Solve the problems on load factor, loss factor, coincidence factor and discuss the characteristics of loadsalong with load growth
			Illustrate the substation bus schemes and determine the rating, voltage drop of substations
			Determine the voltage drop and power losses of primary and secondary distribution systems
			Analyze the distribution costs and voltage control methods inthe distribution system
			Calculate the reactive power requirements of the distributionsystem and summarize the functions and communications used in distribution systems
51	**18EEE12**	HVDC Transmission Systems	Understand the basics of HVDC and compare between HVDCand HVAC.
			Analyze the converter circuits used in HVDC
			Understand the HVDC control methods and able to raw the control characteristics.
			Understand the HVDC filter design technique and protection methods.
			List out different MTDC links and their control.
52	**18EEE13**	AI Techniques In Electrical Engineering	Understand the concepts of ANNs, Fuzzy logic and metaheuristic Techniques
			Identify and describe Artificial Neural Network and Fuzzy Logic techniques in building intelligent machines
			Apply Artificial Neural Network & Fuzzy Logic models to handle uncertainty and solve engineering problems
			Understand how metaheuristics can be used to find good enough solutions for computationally hard optimization problems
			Apply metaheuristic techniques to the optimization problemsrelated

SNo	Course Code	Course Name	Course Outcomes Statements
		Course	to electrical Engineering
			Develop fuzzy logic control and metaheuristic technique for applications in electrical engineering
53	**18EEE14**	Electric Hybrid Vehicles	Be familiar to the models of describing hybrid vehicles andtheir performance.
			Model the electric vehicles with different acceleration andrange
			Design Electric power train for Electric Vehicles
			Analyze the different possible ways of energy storage
			Illustrate the principle of Hybrid Electric Vehicle and Battery transmission systems.
54	**18EEE15**	FACTS	Analyze various converter circuits used in FACTS for harmonic reduction.
			Illustrate the operation of shunt compensators (i.e. SVC, STATCOM) for the end of line voltage support and transient stability problems
			Analyze the operation and control of GCSC, TCSC and SSSC.
			Explain the principles, operation and control aspects of UPFCfor P and Q control
55	**18EEE16**	Special Electrical Machines	Recognize application specific special electrical machines
			Explain the working principle of various special electrical machines.
			Develop equivalent circuit of a given special electrical machine.
			Classify the special electrical machine based on construction
			Choose the type of armature winding suitable for a given SEM.
			Analyze the various control methods of a given Special Electric machine
56	**18EEC25**	Power System Protection	Understand basic terminology of relays and types of over current protection of power system.
			Distinguish the type of distance protection with principle& their application to three phase transmission lines.
			Choose suitable differential scheme for the protection of various equipment in electrical power system.
			Describe the principle of operation, and able to calculatethe ratings of circuit breakers.
			Familiarize with different protection methods againstover-voltages. .
			Identify various elements of numerical relays, their functionsand different techniques used in their design
57	**18EEC26**	Electrical Drives	Analyze 1-Φ & 3-Φ converters fed DC motors as well as chopper fed DC motors.
			Understand the operational variance between single and multi-quadrant operation of various Electric Drives..
			Comprehend the speed control of an AC-AC & DC-ACconverter fed induction motor on stator and rotor side.
			Illustrate the principles of speed control of synchronous motor with VSI, CSI and cyclo-converter
			Differentiate the features of closed loop operation of DC and AC electric drive and their controllers

SNo	Course		Course Outcomes Statements
	Code	Name	
58	**18EEC27**	Signals & Systems	Understand the basics of signals and systems and classify them
			Analyse systems in complex frequency domain.
			Understand sampling theorem and its implications.
			Explore the applications of Laplace transforms to continuous time systems
			Apply the Z-transform techniques to discrete time systems
59	**18EEC28**	Power Systems-II Lab	Apply the load flow studies for any given power system.
			Analyze the fault in the real time power system.
			Estimate the consequences of transient stability, economic power scheduling and load frequency control
			Examine function of different types of relays for different power system applications.
			Illustrate the functionality of each component in the substation.
60	**18EEC29**	Electrical Drives Lab	Analyse the control strategies to modify the output parameters of dc and ac drives.
			Develop, testing and experimental procedures by applying basic knowledge in electrical and electronics.
			Demonstrate the principle of energy efficient motors by load matching
			Interpret the performance of a given drive by suitable experimentation.
			Investigate the performance of a given drive by using suitable simulation software.
61	**18EEC30**	Project: Part-1	1. List the various approaches to the selected problem.
			Interpret the advantages and disadvantages of various approaches
			Apply the selected approach for simulating / modelling / designing the problem.
			Analyse and write a report on the results of the simulation / modelling of the problem selected
			. Justify and present the results of the simulation / model / design before the departmental committee.
62	**18EEE18**	Switch Mode Power Converters	Design different types of DC-DC converters.
			Comprehend different types of SMPS for electrical applications.
			Understand the operation of different resonant converters..
			Design a suitable filter along with the suitable selection of transformer and switches that are used in power electronicconverter circuits
			Compare different voltage control techniques in inverters.
63	**18EEE19**	Electrical Machine Design	Recognize the various parameters required for machine design.
			Interpret the electrical machines based on different design constraints.
			Assess the size of a machine with the given data.
			Describe the various computational methods applicable in machine design.
			Design an electric machine with the given conditions.
64	**18EEE20**	High Voltage Engineering	Define Townsend's first and second ionization coefficients
			Illustrate various breakdown mechanisms in gas, liquidand solid insulating materials.
			Analyze the generation of dc, ac and impulse voltage andcurrents.
			Discuss the various measurement methods of dc, ac and impulse voltages and currents
			Explain the testing of high voltage equipment, HV laboratories and safety precautions in HV labs.

SNo	Course Code	Course Name	Course Outcomes Statements
65	**18MEO03**	Research Methodologies	Define research problem. (BL-1)
			Review and assess the quality of literature from various sources. (BL-2)
			Understand and develop various sresearch designs. (BL-2
			Analyze problem by statistical techniques: ANOVA,F-test,Chi-square.　　　　(BL-4)
			Improve the style and format of writing a report for technical paper/Journal report.　　　(BL-4)
66	**18MEO04**	Entreprenurship	Understand the concept and essence of entrepreneurship. (BL-2)
			Identify business opportunities and nature of enterprise. (BL-3)
			Analyze the feasibility of new business plan. (BL-4)
			Apply project management techniques like PERT and CPM for effective planning and execution of projects.(BL-3)
			Use behavioral, leadership and time management aspects in entrepreneurial journey (BL-3)
67	**18EGO01**	Technical Writing Skills	Communicate effectively, without barriers and understand aspects of technical communication.
			Differentiate between general writing and technical writing and write error free sentences using technology specific words
			Apply techniques of writing in business correspondence and in writing articles.
			Draft technical reports and technical proposals.
			Prepare agenda and minutes of a meeting and demonstrate effective technical presentation skills.
68	**18CSO04**	Basics of Data Science using R	Summarize the basics of R and in-built data visualizationpackages. Describe the data analysis using Bayesian and stochastic modelling.
			Relate gibbs, Z- sampling distributions and compare the binomial, chi-square, wilcoxon and Fisher's exact tests in hypothesis testing
			Explore the ANOVA in Regression analysis and classifythe multivariate data.
			Experiment with the biological data using R tool andapply clustering algorithms to biological data.
			Identify R commands for data manipulation and database technologies for datasets of bioinformatics.
69	**18CSO07**	Basics of Cyber Security	List the different types of cybercrimes and analyze legal frameworks to handle cybercrimes.
			Identify the Tools and Methods used in cybercrimes
			Analyze and resolve cyber security issues and laws governing Cyberspace.
			Describe the need of Digital Forensics and the importance of digital evidence in prosecution.
			Interpret the commercial activities in the event of significant information security incidents in the Organization..
			Discuss the vulnerabilities in networking protocols and their mitigation techniques

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70	**18EEC31**	Technical Seminar	Collect, Organize, Analyze and Consolidate information about emerging technologies from the literature.
			Exhibit effective communication skills, stage courage, and confidence.
			Demonstrate intrapersonal skills
			Explain new innovations/inventions in the relevant field
			Prepare and experience in writing the Seminar Report in a prescribed format.
71	**18EEC32**	Project: Part-2	Recall the details of the approach for the selected problem.
			Interpret the approach to the problem relating to the assigned topic.
			Determine the action plan to conduct investigation.
			Analyze and present the model / simulation /design as needed.
			Evaluate, present and report the results of the analysis and justify the same.
72	**18EEE21**	Advanced Electric Drives	Identify and consider the requirement of power converters for a given application.
			Illustrate the digital methods of DC motor speed control techniques.
			Show how the changes effect in different speed control schemes of Induction motor.
			Analyse the performance of Synchronous motor with and without sinusoidal supply
			Recognize and formulate problems encountered by special motor drives for a particular application.
73	**18EEE22**	Digital Signal Processing	Represent signals mathematically in continuous and discrete-time domain
			Analyse discrete-time systems using z-transformation
			Analyse the Discrete-Fourier Transform (DFT) and FFT algorithms
			Design analog IIR filter and covert into digital IIR filters by using various digitized techniques
			Design analog FIR filter by using various windowing techniques
74	**18EEE23**	**Smart Grid**	Discuss the components and operation of Smart Grid at transmission and distribution level
			Select the communication technology required for smart grid applications
			Illustrate components and operation of smart metering and implementation of demand side integration
			Analyze the different types of micro grid, storage systems and communication infrastructure
			Explain the equipment used in distribution automation and implement the distribution management system functions
75	**18EEE24**	Digital Control System	Understand the concepts of discrete representation of the continuous time system
			Analyze the stability of open loop and closed loop discrete-time systems.
			Develop the state space models for discrete time systems and to examine the effect of pole-zero cancellation on a system
			Design digital controllers to improve the system reliability
			Apply the concepts of quadratic function to analyze the stability of linear and nonlinear systems

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76	**18MEO07**	Intellectual Property Rights (IPR)	Understand the evolution of IP, working of organization's at global level to protect and promote IP. (BL-2)
			Familiarize with the patent filing process at national and international level. (BL-2)
			Draw the logical conclusion of research, innovation and patent filing. (BL-3)
			Compare different kinds of IP and their patenting system. (BL-4)
			Understand the techno-legal-business angle of IP, infringement and enforcement mechanisms for protection. (BL-2)
77	**18CEO02**	Disaster Mitigation and Management (DMM)	Identify and understand the fundamental terminologies in disaster management.
			Distinguish between the Hydro-meteorological disasters and apply the concepts of structural and non-structuralmitigation measures.
			Categorize different Geographical Disasters and apply the knowledge in utilizing the early warning systems.
			Analyze various mechanisms and consequences of human induced disasters.
			Develop an awareness of disaster management phases and formulating effective disaster management plans, ability to understand various participatory roles of stakeholders- Central and State Government bodies at different levels.
78	**18ITO02**	Python Programming	Understand the fundamental concepts and control structures of python programming.
			Write user defined iterative & recursive functions, identify appropriate predefined functions and perform file handling Operations
			Use suitable data structures such as sequences, dictionariesand sets in python programming
			Apply concepts of OOP, exception handling and build regular expressions using Python
			Design and Develop GUI based applications and visualize thedata
79	**18EGO02**	Gender Sensitization	Understand the difference between "Sex" and "Gender" and be able to explain socially constructed theories of identity.
			Recognize shifting definitions of "Man" and "Women" in relation to evolving notions of "Masculinity" and "Femininity".
			Appreciate women's contributions to society historically, culturally and politically.
			Analyze the contemporary system of privilege and oppressions, with special attention to the ways gender intersects with race, class, sexuality, ethnicity, ability, religion, and nationality
			Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning
80	**18PY O01**	History of Science and Technology	Demonstrate the process of beginning of science andcivilization, knowledge acquisition and philosophical approach of science and its advancements in the Stone Agesand Antiquity period.
			Illustrate the advancements in science and technology in the medieval period across Asia and Arab countries and decline and revival of science in Europe.
			Explain the scientific approach and its advances of theEuropeans and how the role of engineer during the industrial revolution and the major advancements.
			Make use of the advancements in the field of science and technology by adopting new philosophies of 19th and first half of 20th century in finding ethical solutions to the societal problems

		Course	Interpret the changes in specializations of science and the technology and build the relation between information and society from second half of 20th century onwards.

SNo	Course Name	Code	Course Outcomes Statements
1	Engineering Mathematics - I	16MTC01	Solve system of linear equations and identify the Eigen values and Eigen vector in engineering problems
			Expand and find extreme values of functions of two variables
			Trace and interpret curve behavior in physical systems
			Find the areas, volumes and surface of solids revolution
			Use-differential equations to model engineering phenomena such as circuit theory, networks
			An ability to solve the problems and interpret it in geometrical approach
2	Engineering Chemistry	16CYC01	Identify the spontaneous and non-spontaneous processes
			Describe the concepts in the separation of metals from mixture of metals
			Classify the conventional sources of energy and their importance.
			Explain the concepts of electrochemistry to produce electrical energy
			Illustrate the various instrumental methods to analyze the chemical compounds
			Discuss the principles of Green Chemistry
4	Applied Physics	16PYC02	Understand the advances in laser physics, holography, optical fibers and apply them in engineering & technology
			Explain the importance of wave mechanics and band theory of solids
			Analyze and apply distributions of statistical mechanics for problem solving
			Identify the materials with semiconducting and superconducting properties for engineering applications
			Understand the role of novel materials and their characterization techniques in engineering and technology
6	Programming and Problem Solving	16CS C01	Develop algorithms for scientific problems.
			Explore algorithmic approaches to problem solving.
			Understand the components of computing systems.
			Choose data types and structure to solve mathematical problem.
			Develop modular programs using control structure, arrays and structures.
			Write programs to solve real world problems using structured features.
7	Elements of Mechanical Engineering	16MEC01	Select the material depending upon requirement.
			Evaluate performance of Petrol & Diesel engines.
			Demonstrate his/her knowledge in preparing process chart for various machining operations.
			Estimate the power required for various power transmitting devices like belt and gear trains.
			Become a successful entrepreneur after studying principles of management.
			Apply various quality control techniques after studying principles of industrial engineering.
8	Elements of Electronics and Communication Engineering	16ECC01	Familiar with the basic electronic devices and simple circuits
			Work with Boolean algebra principles, build the simple combinational and sequential circuits
			Appreciate the need for modulation, filtering and multiplexing
			Understand the working principles of a few communication systems
			Familiar to the selected applications
9	Professional Ethics and Human Values	16CEC03	Students develop the capability of shaping themselves into outstanding personalities, through a value based life.
			Students turn themselves into champions of their lives.
			Students take things positively, convert everything into happiness and contribute for the happiness of others.
			Students become potential sources for contributing to the development of the society around them and institutions/ organizations they work in.
			Students shape themselves into valuable professionals, follow professional ethics and are able to solve their ethical dilemmas.
10	Programming Laboratory	16CS C02	Identify and setup Integrated Development Environment for program development
			Apply C language constructs to solve mathematical and scientific calculation
			Debug C programs using modern tools
			Represent data as arrays, pointer, structures and manipulate
			Design and develop modular programs using functions for solving complex problems
			Develop applications using file

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1	Mechanical and IT Workshop	16MEC03	To make a perfect rectangular MS flat
			To do parallel cuts using Hack saw
			To drill a hole and tap it
			To make male and female fitting using MS flats-Assembly1
			To make male and female fitting using MS flats-Assembly2
2	Applied Physics Laboratory	16PYC04	Understand the various applications of semiconductor devices and their suitability in engineering
			Demonstrate the working of lasers and optical fibers and their applications in the field of Communication
			Analyze the electrical properties of a given solid based on its energy band gap
			Verify the resistance and thermoelectric power properties with temperature variation
			Demonstrate the Concept of electron and its charge experimentally
3	Engineering Chemistry Laboratory	16CYC03	Identify the basic Concepts in chemical analysis of various substances
			Estimate the amount of chemical substances by volumetric analysis.
			Calculate the Concentration and amount of various substances using instrumental techniques
			Determine the distribution Coefficient of immiscible liquids
			Develop the procedures to synthesize the basic polymeric Compounds.
4	Engineering Mathematics -II	16MTC02	Solve the solutions of Differential Equations which arise in electrical circuits, vibrations and other linear systems.
			Able to solve solutions of differential equations with initial and boundary value problems.
			Evaluating definite integrals using Beta, Gamma functions.
			Understating the significance of gradient, divergent and Curl.
			Use Greens, Gauss and Stoke"s theorems to find the surface and volume integrals.
			Able to solve and analyse the Engineering problems.
5	Engineering Physics	16PYC01	Describe the types of oscillations and analyze them
			Demonstrate the wave nature of the light
			Develop the concepts related to electromagnetic behavior
			Identify the various crystal systems and defects
			Explain the origin of magnetism and dielectric polarization and applications of these materials in the field of engineering & technology
6	Applied Chemistry	16CYC02	Identify the various methods used in treatment of water for domestic and industrial use.
			Illustrate the mechanism of various types of Corrosion & its prevention
			Discuss the polymers which gives better insight to industrial applications
			Describe the charging & discharging reactions in batteries & Fuel cells
			Outline the synthesis of nano materials and their applications
			Classify the Composite materials and their applications in space technology.
7	Elements of Electrical Engineering	16EE C01	Acquire the knowledge of basic Concepts of electrical circuits such as Ohm's law, Kirchhorff's laws etc.
			Acquire the knowledge of basic Faraday's laws of electromagnetic induction.
			Acquire the knowledge to solve the problem of AC circuits.
			Acquire the knowledge of specifications of batteries, types of cells and sources of renewable energy.
			Acquire the knowledge of electrical wiring and cables and their types and electrical equipment and their specification.
			Acquire the knowledge of safety precautions in handling electrical appliances, importance of grounding and methods of earthing
8	Engineering Mechanics	16CEC01	Solve problems dealing with forces in planar force systems
			Draw free body diagrams to analyze the forces in the given structure
			Understand the Concept of moments and Couples in plane systems.
			Understand the mechanism of friction and can solve friction problems
			Determine the centroid of plane areas and centers of gravity of bodies using integration methods
			Determine moments of inertia, product of inertia for all areas and mass moments of inertia for bodies,

SNo	Course Name	Code	Course Outcomes Statements
9	Professional Communication in English	16EGC01	Understand the nature, process and types of Communication and will Communicate effectively without barriers.
			Understand the nuances of listening and will learn to make notes
			Read different texts, Comprehend and draw inferences and Conclusions.
			Write effective paragraphs, letters and reports
			Critically analyze texts and write book reviews
10	Environmental Studies	16CEC02	To understand the scope and importance of environmental studies, identify the natural resources and ecosystems and contribute for their conservation.
			To understand the ecological services of biodiversity and contribute for their conservation.
			To develop skills to solve the problems of environmental pollution and Contribute for the framing of legislation for protection of environment.
			To relate the social issues and the environment and Contribute for the sustainable development.
			To understand the essence of the ethical values of the environment for Conserving depletable resources and pollution Control.
11	Engineering Graphics	16MEC02	Use of various drawing instruments, grades of pencils. Different types of lines, letters, number, Geometric constructions
			Draw Ellipse, Parabola, Hyperbola, cycloidal and involute curves by various methods
			Draw orthographic projections of points, Straight lines inclined to one and both the reference planes
			Draw projection of perpendicular planes and oblique planes
			Draw projection of solids inclined to one plane and parallel to another reference plane and section of solids in simple position
			Use basic drawing and editing commands using graphic packages
12	Engineering Physics Laboratory	16PYC03	Understand the Concept of errors and find the ways to minimize the errors
			Demonstrate interference and diffraction phenomena experimentally
			Distinguish between polarized and unpolarized light
			Determine the loss of energy of a ferromagnetic material and its uses in electrical engineering
			Understand the suitability of dielectric materials in engineering applications
13	Applied Chemistry Laboratory	16CYC04	Identify the basic chemical methods to analyze the substances quantitatively.
			Determine the hardness of water for both domestic & industrial purpose
			Identify the amount of alkalinity present in various water samples.
			Calculate the amount of Strong & weak acids by Conductometric methods.
			Estimate the chemical Compounds using their potentials by instrumental methods
14	Professional Communication Laboratory	16EGC02	he students will understand the speech sounds in English and the nuances of pronunciation.
			The students will understand tone, intonation and rhythm and apply stress Correctly.
			The students will be able to participate in group discussions with clarity and Confidence.
			The students will speak Confidently on stage with appropriate body language.
			The students will debate on various issues and learn to work in teams.
15	Engineering Mathematics –III	16MTC05	Expand functions in the given intervals.
			Solve linear and non linear PDEs.
			Solve one-dimension, two-dimension, Heat steady state equations and also one-dimension wave equation.
			Solve problems on Analytic functions, Cauchy's theorem and Cauchy's integral formula.
			Expand functions by using Taylor's and Laurent's series.
			Solve Real and Complex integrals by using Cauchy Theorems.

SNo	Course Name	Code	Course Outcomes Statements
16	Electrical Circuits-I	16EE C02	Acquire concepts of the nature of different circuit elements, network theorems and electrical circuit analysis
			Analyze R-L-C circuits under steady state condition.
			Analyze the behavior of circuits under transient conditions.
			Analyze balanced and unbalanced 3-phase AC circuits.
			Acquire the knowledge of resonance, coupled circuits and network topology.
			Acquire knowledge to apply the Electrical Circuits concepts to Electrical Engineering.
17	Electrical Measurements and Instruments	16EE C03	Identify a suitable instrument to measure a given parameter.
			Analyze the need of CT/PT for a given system.
			Illustrate the concept of the instrument with relevant examples and proper justification.
			Distinguish between electrical and magnetic measurements and their instruments.
			Recognize the appropriate bridge method of measurement for a given parameter.
			Specify the right digital instrument for a given requirement.
18	Electronics Engineering	16EC C16	To understand semiconductor devices such as PN junction Diodes, BJT, JFET and MOSFET
			To analyze application of diodes
			To study V-I characteristics BJT, JFET and MOSFET
			To study the switching behavior of BJT, JFET, MOSFET.
			To study the equivalent model of PN junction diode, BJT, JFET and MOSFET
			To analyze transistor amplifier with and without feedback in various configurations - BJT, JFET.
19	Prime Movers and Pumps	16ME C11	Estimate the loss of head due to friction.
			Determine power developed by different types of the hydraulic turbines.
			Differentiate fire tube boilers from water tube boilers
			Estimate power developed by different types of the steam turbines and gas turbines.
			Evaluate the power required by reciprocating pumps. 6. Determine the power required by centrifugal pumps
20	Engineering Economics and Accountancy	16MB C01	Apply fundamental knowledge of Managerial economics concepts and tools.
			Understand various aspects of demand analysis and forecasting.
			Understand price determination for different markets.
			Study production theory and analyze various costs & benefits involved in it so as to make best use of resources available.
			Analyze different opportunities and come out with best feasible capital investment decisions.
			Apply accountancy concepts and conventions, Final accounts and financial analysis.
21	Circuits and Measurements Lab	16EE C04	Specify the suitable technique to be adopted for the analysis of the given circuit.
			Distinguish the adaptability of different techniques to prove theorems experimentally.
			Analyze the transient response of a given circuit.
			Know the right instruments (digital / analog) and its usage for a given circuit parameter.
			Select a suitable bridge technique available for a given fundamental parameter measurement.
			Identify the circuit parameters for a given locus diagram.

SNo	Course Name	Code	Course Outcomes Statements
22	Electronics Engineering Lab	16EC C17	Verify the working of PN junction diodes, transistors and their characteristic behavior.
			Design various rectifiers with different filter combinations.
			Set up bias point in a transistor
			Build an amplifier and find the frequency response of amplifier.
			Build a feedback amplifier and find the frequency response of amplifier
			Build a multi stage amplifier and find the frequency response of amplifier.
23	Prime Movers and Pumps Lab	16ME C12	Determine the principle of measurement of discharge of fluid.
			Determine the direction of flow of fluid in the pipe.
			Determine loss of head due to friction.
			Estimate the power developed by Pelton, Francis and Kaplan turbines. Determine the power required by various types of pumps.
			Evaluate the performance of internal combustion engines.
24	Electrical Circuits -II	16EEC06	Apply Laplace transform for circuit analysis and also able to draw the pole zero plots.
			Find network functions and two port parameters and transform.
			Acquire the knowledge to find the Fourier series of given function.
			Acquire the knowledge synthesize the RL and RC circuits.
			Design of the different types of filters.
			Acquire knowledge to design of filters in mitigating harmonics.
25	Electrical Machinery - I	16EE C07	Apply basic principles of electromechanical laws and energy conversion.
			Acquire knowledge about operating characteristics of generators, speed control of DC motors and their application in Industry and domestic appliances.
			Acquire the concept of single phase and three phase transformers and their applications
			Distinguish between different types of 3-phase transformers connection.
			Analyze the performance of single- phase and 3-phase transformers during parallel operations.
			Understand a 3-phase to 2-phase conversion system through Scott connection
26	Power Systems - I	16EE C08	Gain knowledge of construction and operation of conventional and non-conventional sources of energy along with financial management.
			Know the effects sag on transmission lines.
			Acquire the concepts to study the performance of insulators and cables.
			Gain knowledge in calculating the current practices in tariff.
			Gain the knowledge to classify the connection schemes of distribution systems.
			Acquire knowledge in different constructional aspects of over-head lines, underground cables and also economic aspects of Power generation
27	Electromagnetic Theory	16EE C09	Recognize the importance of different coordinate systems and vector algebra in field theory.
			Analyze electric and magnetic field intensity, flux density and potential due to various charge distributions.
			Differentiate between conduction & convection currents through various materials.
			Apply Maxwell's equations for EM wave propagation.
			Identify EMI & EMC, the causes and effects, various control methods of EMI.
			Acquire knowledge in applying Electro Magnetic theory in design of electrical machines

SNo	Course Name	Code	Course Outcomes Statements
28	Digital Elctronics and Logic Design	16EE C10	Apply Boolean algebra rules, K-maps, Tabulation methods to minimize Boolean algebraic expressions.
			Classify, describe and compare the characteristics of various digital logic families.
			Acquire the knowledge to build the combinational logic circuits
			Acquire the knowledge to build the sequential logic circuits.
			Design the counters.
			Acquire the knowledge to synthesize the digital circuits using D, JK & T Flip-flops.
29	Linear Integrated Circuits	16EE C11	Understand the basic characteristics of op-amps and their significance
			Analyze a typical op-amp equivalent circuit by calculating its voltage gain and input resistance.
			Define stability for a amplifier circuit.
			Analyze an instrumentation amplifier circuit and discuss its applications.
			Analyze higher order filter circuits and explain their significance.
			Analyze and design voltage regulators (Fixed voltage and adjustable voltage)
30	Electrical Machinery - I Lab	16EE C12	Acquire requisite knowledge to evaluate and compare the characteristics and performance aspects of different types DC generators and DC motors by conducting suitable tests.
			Acquire knowledge to analyze the single phase transformer by performing the suitable tests.
			Gain practical knowledge to know different losses and efficiency in DC machine and their dependence on other Parameters such as speed, field current etc., and also calculate efficiency at different loads.
			Gain knowledge to perform speed control of DC shunt motor.
			Calculate moment of inertia of DC machine through retardation curve.
			Acquire knowledge to evaluate the performance aspects of DC generator, DC motor and Transformer
31	Linear Integrated Circuits Lab	16EE C13	Design and conduct experiments using op-amps, as well as analyze and interpret result.
			Design basic application circuits using op-amp
			Analyze circuits for inverting and non-inverting amplifiers, diff. amps and comparators.
			Recognize and make use of the DC & AC limitations of OP-AMPS
			Understand and implements the working of basic digital circuits
			Acquire knowledge concerning the application aspects of synchronous as Asynchronous counters, A/D and D/A converters.
32	Soft Skills and Employability Enhancement Lab	16EG C03	Be effective communicators and participate in group discussions and case studies with confidence. Also be able to make presentations in a professional context.
			Write resumes, prepare and face interviews confidently.
			Be assertive and set short term and long term goals. Also learn to mange time effectively and deal with stress.
			Make the transition smoothly from Campus to Corporate. Also use media with etiquette and know what academic ethics are.
			To do a live, mini project by collecting and analyzing data and making oral and written presentation of the same
33	Power Systems – II	16EEC15	Compute the inductance and capacitance of Transmission lines.
			Solve the problems on transmission line performance and power circle diagrams.
			Analyze the causes of corona and factors affecting corona.
			Describe different types of faults and its relevance in relay settings.
			Develop the transmission line wave equation and find various coefficients of lines which will be useful to draw Bewley Lattice diagram.
			Calculate the per unit values of the given power systems.

SNo	Course Name	Code	Course Outcomes Statements
34	Electrical Machinery – II	6EEC16	Describe different methods of cooling arrangements of transformers.
			Apply basic principles of tap changing and auto-transformer
			Explain the operation and performance analysis of three phase induction motors.
			Apply the concepts of speed control and starting methods of three phase induction motors.
			Analyze unbalanced operation of three phase induction motors and three phase transformers.
			Discuss the concept of single phase induction motors and operate different types of single phase induction motors
35	Power Electronics	16EEC17	Gain knowledge of basic operation of various power semiconductor devices and to compare their characteristics.
			Analyze protection circuit, turn-ON & turn-OFF methods for SCR.
			Acquaint with the principles of phase controlled converters.
			Analyze the operation principles of different DC-DC, AC-AC converters.
			Identify different topologies of DC-AC converters.
			Know the practical application of static switches and power electronic converters
36	Linear Control Systems	16EEC18	Define different mathematical models for any LTI systems.
			Outline the transfer function of components used in feedback control systems.
			Specify design region in the s-plane in terms of settling-time, rise-time and overshoot to step-response
			Illustrate the concepts of stability analysis in time domains, which is essential to analyze any system performance.
			Illustrate the concepts of stability analysis in frequency domains, which is essential to analyze any system performance.
			Employ the concepts of state space controls
37	Electrical Machinery – II Lab	16EEC19	Apply phase conversion method to obtain balanced two phase supply from three phase supply.
			Appraise the voltage regulation of Synchronous generator using various methods.
			Assess the performance of three phase induction motor by conducting noload test and blocked rotor tests.
			Discuss practical aspects of AC machine analysis.
			Assess the proper AC machine and its usage for a given load application
			Use capacitors for power factor improvement
38	Power Electronics Lab	16EEC20	Analyze the effects of control signals on static switches..
			Distinguish the characteristics of different controlled switches and their applications.
			Acquainted with the conversion principles of AC-DC converters.
			Observe the operation of different DC-DC choppers.
			Familiar with AC-AC converters
			Understand the principle of DC-AC conversion
39	Linear Control Systems Lab	16EEC21	Define DC, AC Servo Motors Characteristics.
			Describe and analyze Synchro pair Characteristics.
			Design and Analyze the performance of a given second order plant in time domain.
			Design and Analyze the performance of a given second order plant in frequency domain.
			Select and state the design function of position and level control systems.
			Acquire knowledge in analyzing the performance of P, PI, PID and ON/ OFF controller.

	Course		Course Outcomes Statements
SNo	Name	Code	
40	Non Conventional Energy Sources (NCES)	16EE E01	Acquire the knowledge of various Non conventional energy sources and its relative merits and demerits.
			Identify the need of energy conservation and storage methods.
			Experiment with solar photo voltaic systems to validate theoretical analysis
			Compare the various MPPT techniques.
			Assess the solar thermal application for a given requirement
			Justify the suitability of wind Energy Conversion Systems for a given site conditions
41	Electrical Engineering Materials (EEM)	16EE E02	Classify the given material based on its properties.
			Select a proper material for a given application.
			Experiment on materials in order to test its adaptability
			Investigate the suitability of material for the latest technological requirement.
			Compare and contrast the characteristics of the materials
			Assess the changes in properties while alloying
42	Electronic Instrumentation (EI)	16EE E03	Choose appropriate transducer for a given application
			Design data converters to the required specifications
			Estimate the distortion of a signal.
			Construct different signal generators.
			Explain the working of different subsystems of different CRO's
			Develop/design the automatic instrumentation systems
43	Statistical and Numerical Methods (SNM)	16MT E01	Analyse the statistical averages and different properties for probability function.
			Fit the probability distribution for the random data.
			Solve the non-linear equations for finding the roots.
			Solving the Differentiation & Integration for numerical data.
			Solving the ordinary differential equations using single & multi-step methods.
			Solving the multivariable problems
44	Electrical Machinery – III	16EEC23	Explain basic principles of synchronous machines
			Estimate the voltage regulation of alternators by different methods.
			Describe the various starting methods of synchronous motors.
			Analyze the concepts of synchronous motor.
			Examine the stability of synchronous machines under different operating conditions.
			Explain and apply the concept of permanent magnet motor and special machines for a given load application.
45	Switchgear and Protection	6EEC24	Classify various components used in power system protection.
			Indicate the relay settings of over current and distance relays.
			Recognize arc quenching mechanisms used in different circuit breakers.
			Explain the concept of unit and non-unit protection, and how the various associated parameters affect it.
			Distinguish types and testing of CBs and their applications
			Review protection of transmission lines, equipment protection and types of lightening arrestors against over voltages

	Course		Course Outcomes Statements
SNo	Name	Code	
46	Power Semiconduc tor Drives	6EEC25	Select a particular drive for a given application.
			Design a proper controller for a D.C motor drive with the given detailed specifications
			Acquire knowledge in various speed control techniques of induction motor drives.
			Acquire knowledge in various speed control techniques of synchronous motor drives.
			Identify the adaptability of a particular drive (synchronous motor, BLDC, stepper motors and SRM) for given load requirements.
			Discuss about heating- cooling conditions, classes of duty and determine the motor rating
47	Microprocessor and Microcontrollers	16EEC26	Outline the Internal architecture of 8086 processor.
			Summarize the instruction in set of 8086 processor..
			Apply the knowledge of instruction set to write .
			Review of different interfacing devices that are compatible with 8086 Microprocessor.
			Outline the internal architecture of 8051 microcontroller.
			Indentify different communicating devices that are compatible with 8051 Microcontroller
48	Microprocessor and Microcontrollers Lab	16EEC27	Use instruction set of 8086 Microprocessor to develop ALP's.
			Write ALP programs of 8086 microprocessor that suits for MASM software.
			Demonstrate the functioning of interfacing devices using 8086 programming.
			Use instruction set of 8051 microcontroller to develop ALP's
			Demonstrate the functioning of interfacing devices using 8051 programming through Keil software.
			Relate the experiments done in laboratory for doing mini projects and academic project.
49	Power Systems Lab	16EEC28	Calculate ABCD constants of transmission lines and evaluate regulation, efficiency.
			Examine relay setting for safe operating of power system.
			Identity sequence parameters of transformer and alternator and draw its importance.
			Calculate the time constant of an alternator.
			Devise the dielectric strength of oil and calculate the efficiency of string insulators.
			Appraise regulation and efficiency of transmission lines, calculate ABCD constants, importance of protective relays and calculation of parameters of transformers, alternators by conducing suitable tests
50	Mini Project	16EEC29	Identify scope to carryout mini project in the area pertaining to Electrical and Electronics Engineering.
			Formulate project scope and collect required information as literature survey.
			Formulate problem to apply suitable techniques to solve.
			Discuss the results and draw the conclusions
			Discuss the practical aspects for suitable implementation. 6. Get exposure in report writing
51	Industrial Visit	16EEC30	Know the importance of visiting an engineering industry from the point of view of process of manufactory procedures and set-up.
			Summarize the required information with regard to materials, source of supply in respect of a product.
			Know the stages in manufactory of a product.

SNo	Course Name	Course Code	Course Outcomes Statements
			Prepare the 'industry visit' technical report covering the details of visit and it importance.
			Visualize the safety precautions to be follow in industry, confidentiality of the product processing as the man power required
52	High Voltage Engineering (HVE)	16EEE05	Describe breakdown mechanism in Gases and specially pertaining to high voltage engineering and its importance.
			Discuss different aspects of breakdown mechanism in liquids and solids specifically pertaining to high voltage aspect.
			Distinguish in respect of generation of High Voltages and currents, generation of impulse voltage and currents. To Analyze multistage impulse generation of impulses voltages and current generation.
			Explain relating to measurement of high AC currents, High DC currents measurement of impulse currents and associated measuring equipment.
			Classify in testing of high voltage electrical equipment such as power capacitor, power transformers, circuit breakers, insulators, bushings, cables, surge arresters etc.
			Summarize (i) Breakdown mechanism in Gases, Liquids and solid dielectrics. (ii) Methods of generation and measurement of High voltages and currents and (iii) Classify the procedure for testing of High voltage equipment.
53	Artificial Intelligence Techniques in Electrical Engineering (AITEE)	16EEE06	Understand concepts of ANNs, Fuzzy logic and metaheuristic Techniques.
			Remember difference between knowledge based systems and algorithmic based systems.
			Understand operation of Fuzzy controller and metaheuristic algorithms
			Apply soft computing techniques for real-world problems
			Analyse critically the techniques presented and apply them to electrical Engineering problems.
			Apply metaheuristic techniques to Electrical problems.
54	Switch Mode Power Converters (SMPC)	16EEE07	Outline various features of advanced power electronics devices.
			Develop and analyze various converter topologies.
			Analyze different resonant converter topologies
			Apply the knowledge of different Multilevel Inverters that suits for industrial applications.
			Compare the AC and DC power supplies.
			Design AC and DC switched mode power supplies
55	Optimization Techniques (OT)	16EEE08	Solve the classical optimization problems.
			Formulate linear programming problem and get the solution with simplex method, Graphical method.
			Solve the nonlinear programming problems with various search methods such as Fibonacci method, golden section method etc.
			Solve the non-linear programming problem with gradient methods
			Explain different mechanisms in Genetic algorithms.
			Estimate the Economic load dispatch using genetic algorithms
56	Advanced Control System (ACS)	16EEE09	Design different types of compensators.
			Represent discrete time systems and obtain solution.
			Calculate and analyze sample data control system stability.
			Apply the concepts of controllability and observability - tests for discretetime systems.
			Analyze the response of non-linear systems and construction of phase plane trajectories.
			Justify the stability study through Liapunov's criteria and construction of Lyapunov function
57	Electrical Distribution Systems & Automation (EDSA)	16EEE10	Estimate the load factors, diversity factor etc. for different systems. functions and communication used in Distribution automation
			Describe the substation bus schemes and calculate the rating of substations.
			Compute voltage drop and power losses of primary and secondary distribution systems.
			Estimate the reactive power requirements of distribution systems.
			Describe the voltage control methods used in Distribution Systems.
			Explain the Distribution automation control

SNo	Course Name	Code	Course Outcomes Statements
58	High Voltage DC Transmission (HVDC)	16EEE11	Compare between HVDC and HVAC Transmission systemsand discuss about basics of HVDC.
			Analyze 6 pulse,12 pulse circuits and to calculate power conversion between Ac to DC and DC to AC.
			Discuss about various control methods and also able to draw the control characteristics.
			Discuss about the various filters used in HVDC/HVAC transmission systems.
			Discuss about the protection of HVDC transmission systems.
			Discuss about MTDC transmission systems and their control aspects.
59	Simulation Techniques for Electrical Engineering(STEE)	16EEE12	Classify software techniques based on application and system requirement.
			Infer various logical operations.
			Draw the graphs for analysis of data.
			Identify the bug in the program and also procedure to debug the same.
			Model circuit elements by distinguishing them AC and DC.
			Simulate the given circuit and validate by conventional means.
60	INDUSTRIAL ELECTRONICS (BE 3/4 ECE, VI Sem)	16EE E13	Analyze basic operation of various power semiconductor devices and to compare their characteristics.
			Design protection circuit and control circuits for SCR.
			Analyze the operation principles of different AC-DC, DC-DC, AC-AC, and DC-AC converters.
			Identify different voltage control strategies in different converters.
			Be acquainted with different quadrant operation of power converters.
			Know the practical application of power electronic converters
61	Power System Operation and control	16EE C31	Acquire knowledge in assessing the importance of load flow studies in power system operation. Carryout Load-Flow studies with different methods compare and interpret the results.
			Acquire knowledge in conducting Economic operation of power system without and with losses
			Acquire knowledge in conducting Load Frequency Control for single and two area systems and also distinguish between different control methods.
			Acquire knowledge in analyzing the Stability aspects of power system.
			Acquire knowledge in assessing the system improvement through reactive power control and FACTS controllers.
62	Utilization of Electrical Energy	16EE C32	Select the proper furnace system for a given requirement
			Distinguish the adaptability of heating and welding concepts for a given application
			Identify the necessity of illumination for specified requirement
			Select proper traction system and its corresponding drive for industrial applications
			Able to estimate energy consumption levels at various modes of operation
63	DSP and Embedded Systems	16EE C33	Identify the digital system and find its response
			Design FIR and IIR filter.
			Be familiar with architecture and features of TMS 320F/2047 DSP.
			Understand the basic concepts of real time operating systems
			Be familiar with architecture and features of ARM processor.
64	Power Systems Simulation Lab	16EE C34	Acquire knowledge about Load frequency control
			Analyse Load flow studies and economic load dispatch
			Acquire knowledge about transient stability studies
			Analyse semi, full and buck & boost converters
			Acquire knowledge about time and frequency response of the system
65	Digital Signal Processor and Embedded Systems Lab`	16EE C35	Control AC machines using DSP
			Control DC machines using DSP
			To simulate control signals using MATLAB
			To generate the output sequence using micro controller.
			Control the operation of different equipments to embedded controller

	Course	Code	Outcomes
	Basic VLSI Design	16EEE14	To design logic circuits using pMOS and nMOS technologies
			To design cMOS logic circuits.
			To simulate logical circuits using HDL programming
			To understand different modeling strategie
66	Computer Methods in Power Systems(CMPS)	16EEE15	Draw the graph and find the network metrics for the given power system network.
			Modify the Zbus for changes in the network structure.
			Determine the fault currents in three-phase power system for different faults
			Acquire the knowledge of different transformation techniques
			Find the ZBUS for given three-phase network.
67	Power Quality Engineering(PQE)	16EEE16	Understand the basic concepts of power quality and acquire the knowledge in measurement and standards of PQ problems
			Acquire the knowledge to analyze voltage sag in distribution systems
			Acquire the knowledge of theoretical concepts and standards of Power Quality issues in industrial systems.
			Acquire the knowledge in identifying sources of harmonic & mitigation of harmonics in industrial systems.
			Acquire the knowledge in Solutions to Wiring and Grounding Problems.
68	Special Electrical Machines(SEM)	16EEE17	Identify appropriate machine for a specific application.
			Recognize the principle of operation and characteristics of the given special machine.
			Familiar with driver circuit used for special machines
			Develop equivalent circuit of a given special electrical machine
			Distinguish the special machine with the obtained characteristics
69	History of Science and Technology	16PY O01	Demonstrate knowledge of broad concepts in the history of science, technology ranging over time, space and cultures.
			Recognize the values of a wide range of methodologies, conceptual approaches and the impact of competing narratives within the history of science, technology.
			Identify, locate and analyze relevant primary and secondary sources in order to construct evidence-based arguments.
			Think independently and critically, using appropriate methodologies and technologies to engage with problems in the history of science, technology.
			Demonstrate academic rigor and sensitivity to cultural and other diversity, and understanding of the ethical implications of historical and scientific enquiry within a global context.
70	Gender Sensitization	16EG O02	Develop a better understanding of important issues related to what gender is in contemporary India.
			Attain a finer grasp of how gender discrimination works in our society and how to counter it. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
			Understand what constitutes sexual harassment and domestic violence and be made aware of New forums of Justice.
			Draw solutions as to how men and women, students and professionals can be better equipped to work and live together as equals.
71	Disaster Mitigation and Management (DMM)	16CE O02	To equip the students with the basic knowledge of hazards, disasters, risks and vulnerabilities including natural, climatic and human induced factors and associated impacts
			To impart knowledge in students about the nature, causes, consequences and mitigation measures of the various natural disasters
			To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters
			To enable the students to understand and assimilate the impacts of any disaster on the affected area depending on its position/ location, environmental conditions, demographic, etc.
			To equip the students with the knowledge of the chronological phases in a disaster management cycle and to create awareness about the disaster management framework and legislations in the context of national and global conventions
72	Machine Learning Using Phyton	16CS O10	Understand the basics concepts of Machine Learning and Python.
			Apply feature engineering techniques and visualization tools to the data.
			Analyze the various types of data by using python based machine learning techniques.
			Identify and evaluate various recommender systems.

			Design solutions to real world problems using deep learningalgorithms.
73	Entrepreneurship	16ME O01	Identify opportunities and deciding nature of industry
			Brainstorm ideas for new and innovative products or services
			Analyze the feasibility of a new business plan and preparation ofBusiness plan
			Use project management techniques like PERT and CPM
			Analyze behavioural aspects and use time management matrix
74	Electrical Machine Design(EMD)	16EE E18	Design the given AC electrical machine for a given power rating.
			Calculate the various parameters required for designing.
			Choose the proper material for a given requirement of the machine.
			Use software tools for DC & AC machine design.
			Acquire the knowledge of CAD
75	Flexible AC Transmission Systems(FACTS)	16EE E19	Select the appropriate FACTS device/controller based on the needs of inter connected power transmission systems.
			Analyze various converter topologies used in FACTS for harmonic reduction.
			Demonstrate the knowledge of shunt compensators(i.e SVC,STATCOM) for the end of line voltage support and transient stability problems
			Analyze the operation and control of GCSC, TCSC and SSSC.
			Demonstrate the principles, operation and control aspects of UPFC for P and Q control
76	Power System Reliability (PSR)	16EE E20	Acquire knowledge and to apply probability theory and distribution functions to engineering applications.
			Acquire knowledge to study and to classify types of causes of failures, reliability logic diagram for different configurations.
			Acquire knowledge to study discrete and continuous Markov chains and process and give thrust to reliability evaluation of repairable systems.
			Evaluate various generation and load models
			Apply reliability analysis on a given generation and distribution system.
77	Smart Grid(SG)	16EE E21	Recognize the concept of Smart Grid communication and Measurement
			Comprehend the concept of tools used for Smart Grid Design
			Know the concept of Stability Analysis Tools for Smart Grid
			Understand the concept of State Estimation
			Understand the transmission and distribution management systems
78	Embedded System Design (ESD)	16EE E22	Acquire the knowledge on ARM processor
			Have knowledge on RTOS functional units
			Have basic knowledge on embedded programming
			Have basic knowledge on advanced embedded processors
			Have a basic knowledge on development of embedded system
79	Advanced Power System Protection (APSP)	16EE E23	Comprehend the basic components of static relays and their characteristics
			Understand the operating principles of different distance relays.
			Acquaint with the various grounding methods & bus-bar protection
			Explicate the principles of transformer protection and auto re-closures.
			Know various types of pilot protection schemes, their adaptability and basic principle of travelling wave relays.
80	Power System Operation and Deregulation(PS OD)	16EE E24	Calculate the optimal power flows for the given power system
			Carry out contingency analysis
			Determine the state estimation of the system and difference between conventional LF and SE.
			Understand the benefits of deregulation
			Determine the available transfer capability of a line and know the various pricing methods in Deregulated power system.
81	Electrical Estimation and Costing(EEC)	16EE E25	Understand the design considerations of electrical installations.
			Design electrical installation estimation and costing for buildings and small industries.
			Design electrical installation estimation and costing for commercial and small industries.

SNo	Course Name	Code	Course Outcomes Statements
			Design electrical installation estimation and costing for transmission and distribution systems.
			Identify and design the various types of light sources for different applications.
82	Technical Writing Skills	16EG O01	Communicate effectively, without barriers and understand aspects of technical communication.
			Differentiate between general writing and technical writing and write error free sentences using technology specific words
			Apply techniques of writing in business correspondence and in writing articles.
			Draft technical reports and technical proposals.
			Prepare agenda and minutes of a meeting and demonstrate effective technical presentation skills
83	Intellectual Property Rights (IPR)	16ME O04	Will respect intellectual property of others
			Learn the art of understanding IPR
			Develop the capability of searching the stage of innovations.
			Will be capable of filing a patent document independently.
			Completely understand the techno-legal business angle of IPR and converting creativity into IPR and effectively protect it.
84	Industrial Administration and Financial Management (IAFM)	16 ME O08	Understand the role of different types of business organizations along with the need and importance of various types of layouts used in manufacturing industries
			Apply the techniques of method study and work measurement in industry to enhance productivity
			Understand the importance of quality control and plot the control charts
			Apply the techniques of project management in industry
			Calculate the total cost of the product based on its elements.
85	IOT and Applications	16CS O03	Understand Internet of Things and its hardware and software components.
			Interface I/O devices, sensors & communication module.
			Remotely monitor data and control devices.
			Develop real time IoT based projects.
			Advance towards research based IoT
86	Basics of Data Science Using R	16CS O04	Understanding the basics of R, various statistical measures, algorithms useful for data analysis.
			Explore the programming skills needed to use R tool for biological data.
			Analyze biological data using R tool.
			Apply classification and clustering algorithms to bilogical data.
			Identify and work with the technologies and resources related to bioinformatics.

Member, BoS   **Chairman, BoS, EEE**