Kalinga University
Technology
Bachelor Of Technology (Electrical Engineering)

PO

S. No.	Program Outcome (PO) Description
1	Engineering Knowledge; Apply the knowledge of mathematics ,science ,engineering fundamentals and an engineering specialization to the solution of complex engineering problems .
2	Problem analysis; Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3	Design/Development of solutions ; Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety ,and the cultural ,societal, and environmental considerations.
4	Conduct investigations of complex problems ; Use research based knowledge and research methods including design of experiments ,analysis and interpretation of data and synthesis of the information to provide valid conclusions.
5	Modern tool Usage; create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	The engineer and society; Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	Environment and sustainability; understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.

8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
10	Communication: communicate effectively on complex engineering activities with the engineering community and with society at large such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work as a member and leader in a team;to manage projects and multidisciplinary environments.
12	Life-long learning : Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSO

S. No.	Program Specific Outcome (PSO) Description
1	Develop scientific thinking and acquire deep analytical knowledge of Electrical engineering to meet requirements of global consumers in energy sector.
2	Ability to develop integrated systems in a field of Electrical drives and control by applying modern tools and skills to meet the challenges of industry.
3	Graduates will demonstrate the ability to apply innovation and to create constructive environment in a field of renewable energy for designing smart grid.
4	Should have the capability to analyze , design and develop electrical systems for a variety of engineering applications.
5	Should be able to solve real life problems of power system and power Electronics using Mi power ,PSPICE and MATLAB software tools and hardware.

CO

S.No.	Course Code	Course Name	Course Outcome (CO's) - Description
1	BTEE101	Programming for Problem Solving	**CO1:** To develop simple algorithms for arithmetic and logical problems.
			CO2: To translate the algorithms to programs & execution (in C language).
			CO3: To implement conditional branching, iteration and recursion.
			CO4: To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
			CO5: To use arrays, pointers and structures to develop algorithms and programs.
2	BTEE102	Emerging Domain in Electronics Engineering	**CO1:** Understand the concept of PN Junction and devices.
			CO2: Understand the concept of BJT, FET and MOFET.
			CO3: Understand the concept of Operational amplifier.
			CO4: Understand the concept of measurement instrument.
			CO5: Understand the working principle of different type of sensor and their uses.
			CO6: Understand the concept of IoT system & Understand the component of IoT system.
3	BTEE103	Engineering Chemistry	**CO1:** Use of different analytical instruments.
			CO2: Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
			CO3: Measure hardness of water.
			CO4: Estimate the rate constant of reaction.
4	BTEE104	Engineering Mathematics-I	**CO1:** Remember the concept of matrices and apply for solving linear simultaneous equations.
			CO2: Understand the concept of limit, continuity and differentiability and apply in the study of Rolle,s , Lagrange,s and Cauchy mean value theorem and Leibnitz theorems .
			CO3: Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
			CO4: Illustrate the working methods of multiple integral and apply for finding area, volume, centre of mass and centre of gravity.
			CO5: Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.
			CO1: Students will be enabled to understand the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.

5	BTEE105	English	**CO2:**	Students would be able to create substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.
			CO3:	Students will apply it at their work place for writing purposes such as Presentation/official drafting / administrative communication and use it for document/project/report/research paper writing.
			CO4:	Students will be made to evaluate the correct & error-free writing by being well-versed in rules of English grammar & cultivate relevant technical style of communication & presentation at their work place & also for academic uses.
			CO5:	Students will apply it for practical and oral presentation purposes by bei+G6ng honed up in presentation skills and voice-dynamics. They will apply techniques for developing inter-personal communication skills and positive attitude leading to their professional competence.
6	BTEE106	Emerging Technology for Engineers	**CO1:**	Understand the concepts of internet of things, smart cities and industrial internet of things.
			CO2:	Understand the concepts of cloud computing .
			CO3:	Understand the concepts of block chain, cryptocurrencies, smart contracts.
			CO4:	Understand design principles, tools, trends in 3 D printing and drones.
			CO5:	Understand augmented reality (AR), virtual reality (VR), 5G technology, brain computer interface and human brain.
7	BTEE201	Fundamentals of Mechanical Engineering & Mechatronics	**CO1:**	Identification of key elements of mechatronics system and its representation in terms of block diagram.
			CO2:	Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O.
			CO3:	Interfacing of Sensors, Actuators using appropriate DAQ micro-controller.
			CO4:	Time and Frequency domain analysis of system model (for control application).
			CO5:	PID control implementation on real time systems.
			CO6:	Development of PLC ladder programming and implementation of real life system.
8	BTEE202	Basic Electrical Engineering	**CO1:**	Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
			CO2:	Analyze the steady state behavior of single phase and three phase AC electrical circuits.
			CO3:	Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.

			CO4:	Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
			CO5:	Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.
9	BTEE203	Engineering Physics	**CO1:**	To solve the classical and wave mechanics problems.
			CO2:	To develop the understanding of laws of thermodynamics and their application in various processes.
			CO3:	To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory.
			CO4:	To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams.
10	BTEE204	Engineering Mathematics-II	**CO1:**	Understand the concept of differentiation and apply for solving differential equations.
			CO2:	Remember the concept of definite integral and apply for evaluating surface areas and volumes.
			CO3:	Understand the concept of convergence of sequence and series. Also evaluate Fourier series.
			CO4:	Illustrate the working methods of complex functions and apply for finding analytic functions.
			CO5:	Apply the complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals.
11	BTEE205	Environmental Science	**CO1:**	Understand the fundamental principles and concepts of environmental science, including ecosystems, biodiversity, natural resources, pollution, and sustainability.
			CO2:	Recognize and analyze the impacts of human activities on the environment, including pollution, deforestation, climate change, and habitat destruction.
			CO3:	Evaluate and apply scientific methods and tools for studying and monitoring the environment, including data collection, analysis, and interpretation.
			CO4:	Develop an awareness of environmental laws, policies, and regulations, and their implications for environmental protection and sustainability.
			CO5:	Apply critical thinking skills to assess and propose solutions to environmental challenges, such as resource management, pollution control, and conservation.
			CO6:	Enhance communication skills through effective presentation and discussion of environmental issues, both orally and in writing.
			CO7:	Foster an appreciation for the value of biodiversity, natural ecosystems, and the interdependence of humans and the environment.

			CO8: Foster a sense of personal responsibility and ethical consideration towards the environment and promote sustainable practices in daily life.
12	BTEE206	Artificial Intelligence for Engineers	**CO1:** Understand the evolution and various approaches of AI.
			CO2: Understand data storage, processing, visualization, and its use in regression, clustering etc.
			CO3: Understand natural language processing and chatbots.
			CO4: Understand the concepts of neural networks.
			CO5: Understand the concepts of face, object, speech recognition and robots.
13	BTEE301	Mathematics–III	**CO1:** Remember the concept of partial differential equation and to solve partial differential equations.
			CO2: Analyze the concept of partial differential equations to evaluate the problems concerned with partial differential equations.
			CO3: Understand the concept of correlation, moments, skewness and kurtosis and curve fitting.
			CO4: Remember the concept of probability to evaluate probability distributions.
			CO5: Apply the concept of hypothesis testing and statistical quality control to create control charts.
14	BTEE302	Technical Communication	**CO1:** Students will be enabled to understand the nature and objective of Technical Communication relevant for the work place as Engineers.
			CO2: Students will utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions.
			CO3: Students would imbibe inputs by presentation skills to enhance confidence in face of diverse audience.
			CO4: Technical communication skills will create a vast know-how of the application of the learning to promote their technical competence.
			CO5: It would enable them to evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics.
15	BTEE303	Electromagnetic Field Theory	**CO1:** Apply different coordinate systems and their application in electromagnetic field theory, establish a relation between any two systems and also understand the vector calculus.
			CO2: Understand the concept of static electric field. Understand the concept of current and properties of conductors. Establish boundary conditions and to calculate capacitances of different types of capacitors

		Theory	**CO3:** Understand the concept of static magnetic field, magnetic scalar and vector potential.
			CO4: Understand the forces due to magnetic field, magnetization, magnetic boundary conditions and inductors.
			CO5: Understand displacement current, time varying fields, propagation and reflection of EM waves and transmission lines.
16	BTEE304	Electrical Measurements & Instrumentation	**CO1:** Evaluate errors in measurement as well as identify and use different types of instruments for the measurement of voltage, current, power and energy.
			CO2: Display the knowledge of measurement of electrical quantities resistance, inductance and capacitance with the help of bridges.
			CO3: Demonstrate the working of instrument transformers as well as calculate the errors in current and potential transformers.
			CO4: Manifest the working of electronic instruments like voltmeter, multi-meter, frequency meter and CRO.
			CO5: Display the knowledge of transducers, their classifications and their applications forthemeasurementofphysicalquantitieslikemotion,force,pressure, temperature, flow and liquid level.
17	BTEE305	Basic Signals & Systems	**CO1:** Represent the various types of signals & systems and can perform mathematical operations on them.
			CO2: Analyze the response of LTI system to Fourier series and Fourier transform and to evaluate their applications to network analysis.
			CO3: Analyze the properties of continuous time signals and system using Laplace transform and determine the response of linear system to known inputs.
			CO4: Implement the concepts of Z transform to solve complex engineering problems using difference equations.
			CO5: Develop and analyze the concept of state-space models for SISO & MIMO system.
18	BTEE306	Constitution of India, Law & Engineering	**CO1:** Identify and explore the basic features and modalities about Indian constitution.
			CO2: Differentiate and relate the functioning of Indian parliamentary system at the center and state level.
			CO3: Differentiate different aspects of Indian Legal System and its related bodies.
			CO4: Discover and apply different laws and regulations related to engineering practices.
			CO5: Correlate role of engineers with different organizations and governance models.
			CO1: Choose proper semiconductor device for various applications.
			CO2: Analyze the Special Diodes and Power Devices with their characteristics and applications.

19	BTEE401	Analog Devices & Electronic Circuits	**CO3:** Analyze the structure operation, V-I characteristics and detail circuit of BJT with help of small signal model.
			CO4: Analyze the structure operation, V-I characteristics and detail circuit of MOSFET with help of small signal model.
			CO5: Demonstrate the use of Op-Amp circuits and its internal parameters along with its applications.
20	BTEE402	Universal Human Values	**CO1:** Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society.
			CO2: Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
			CO3: Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society.
			CO4: Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.
			CO5: Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.
21	BTEE403	Digital Electronics	**CO1:** Apply concepts of Digital Binary System and implementation of Gates.
			CO2: Analyze and design of Combinational logic circuits.
			CO3: Analyze and design of Sequential logic circuits with their applications.
			CO4: Implement the Design procedure of Synchronous & Asynchronous Sequential Circuits.
			CO5: Apply the concept of Digital Logic Families with circuit implementation.
22	BTEE404	Electrical Machines-I	**CO1:** Analyze the various principles & concepts involved in Electromechanical Energy conversion.
			CO2: Demonstrate the constructional details of DCmachines as well astransformers, and principleof operationofbrushless DCmotor, StepperandDCServo motors.
			CO3: Evaluate the performance and characteristics of DC Machine as motor and as well as generator.
			CO4: Evaluate the performance of transformers, individually and in parallel operation.
			CO5: Demonstrate and perform various connections of three phase transformers.

23	BTEE405	Networks Analysis & Synthesis	**CO1:**	Apply the knowledge of basic circuital law, nodal and mesh methods of circuit analysis and simplify the network using Graph Theory approach.
			CO2:	Analyze the AC and DC circuits using Kirchhoff's law and Network simplification theorems.
			CO3:	Analyze steady-state responses and transient response of DC and AC circuits using classical and Laplace transform methods.
			CO4:	Demonstrate the concept of complex frequency and analyze the structure and function of one and two port network. Also evaluate and analysis two-port network parameters.
			CO5:	Synthesize one port network and analyze different filters.
24	BTEE406	Indian Tradition, Culture & Society	**CO1:**	To enable the students to understand the importance of our surroundings and encourage the students to contribute towards sustainable development.
			CO2:	To sensitize students towards issues related to 'Indian' culture, tradition and its composite character.
			CO3:	To make students aware of holistic life styles of Yogic-science and wisdom capsules in Sanskrit literature that are important in modern society with rapid technological advancements and societal disruptions.
			CO4:	To acquaint students with Indian Knowledge System, Indian perspective of modern.
			CO5:	scientific world-view and basic principles of Yoga and holistic health care system.
25	BTEE501	Power System - I	**CO1:**	Describe the working principle and basic components of conventional power plants as well as the other aspects of power generation.
			CO2:	Recognize elements of power system and their functions, as well as compare the different types of supply systems. Illustrate different types of conductors, transmission lines and various performance parameters of transmission line for short, medium and long transmission line.
			CO3:	Calculate sag and tension in overhead lines with and without wind and ice loading. Classify different type of insulators, determine potential distribution over a string of insulator, string efficiency and its improvement.
			CO4:	Compute the inductance and capacitance of single phase, three phase lines with symmetrical and unsymmetrical spacing, Composite conductors-transposition, bundled conductors, and understand the effect of earth on capacitance of transmission lines.
			CO5:	Elucidate different types of cables and assess the Resistance and capacitance parameters of cables, grading of cables and compare overhead lines and cables.

26	BTEE502	Control System	**CO1:** Obtain transfer functions to predict the correct operation of open loop and closed loop control systems and identify the basic elements, structures and the characteristics of feedback control systems.
			CO2: Measure and evaluate the performance of basic control systems in time domain. Design specification for different control action.
			CO3: Analyze the stability of linear time-invariant systems in time domain using Routh-Hurwitz criterion and root locus technique.
			CO4: Determine the stability of linear time-invariant systems in frequency domain using Nyquist criterion and Bode plot.
			CO5: Design different type of compensators to achieve the desired performance of control System by root locus and Bode plot method. Develop and analyze the intermediate states of the system using state space analysis.
27	BTEE503	Electrical Machines-II	**CO1:** Demonstrate the constructional details and principle of operation of three phase Induction and Synchronous Machines.
			CO2: Analyze the performance of the three phase Induction and Synchronous Machines using the phasor diagrams and equivalent circuits.
			CO3: Select appropriate three phase AC machine for any application and appraise its significance.
			CO4: Start and observe the various characteristics of three phase Induction & Synchronous Machines.
			CO5: Explain the principle of operation and performance of Single-Phase Induction Motor & Universal Motor.
28	BTEE504A	Robotics	**CO1:** Learn the basic terminology used in robotics.
			CO2: Conceptualize 3-D translation & orientation of robot arm kinematics.
			CO3: Understand different robotic actuators and power transmission systems.
			CO4: Classify the types of robotic grippers used in automation industries.
			CO5: Realization of robotic sensoric system and their interfacing with robot controller.
29	BTEE504B	Sensors and Transducers	**CO1:** Understand the working of commonly used sensors in industry for measurement of displacement, force and pressure.
			CO2: Recognize the working of commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.
			CO3: Identify the application of machine vision.
			CO4: Conceptualize signal conditioning and data acquisition methods.
			CO5: Comprehend smart sensors and their applications in automation systems

30	BTEE504C	Industrial Automation and Control	**CO1:** Understand the concept of automation, its terminology and basic communication protocol.
			CO2: Apply Relay logic for automation.
			CO3: Learn about PLC, its operation and application in automation.
			CO4: Analyze the industrial sensors, its terminology and how one can interface with PLC.
			CO5: Demonstrate Pneumatic system and its application in industry.
31	BTEE504D	Electrical Standards and Engineering Practices	**CO1:** Interpret different National & International Electrical Standards in practice.
			CO2: Understand Indian standards for cables, lighting and motors.
			CO3: Understand Indian standards of transformers, LV & HV switchgears.
			CO4: Demonstrate the basic guidelines for National codes and design practices.
			CO5: Select the size and type of transformer, cable & switchgear for electrical applications.
32	BTEE505A	Optimization Techniques	**CO1:** Understand the importance of optimization techniques in engineering applications.
			CO2: Learn optimization methods for solving linear programming problems.
			CO3: Learn optimization methods for solving nonlinear programming problems.
			CO4: Be aware of the concept of simulation and modern methods of optimization.
			CO5: Apply optimization techniques to electrical engineering problems.
33	BTEE505B	Neural Networks & Fuzzy System	**CO1:** Apply the concepts of feed forward neural networks and their learning techniques.
			CO2: Comprehend the architecture, develop algorithms and apply the concepts of back propagation networks.
			CO3: Differentiate between the fuzzy and the crisp sets, apply the concepts of fuzziness and the fuzzy set theory.
			CO4: Select the membership functions, write rules and develop the fuzzy controller for Industrial applications.
			CO5: Demonstrate the working of fuzzy neural networks and identify its applications.
34	BTEE505C	Digital Signal Processing	**CO1:** Represent discrete sequence and LTI systems, frequency domain of discrete sequence. Compute Fourier transform. Draw structure of systems based on System type-IIR & FIR Systems.
			CO2: Describe sampling of signal and its reconstruction, processing of continuous time and discrete time signals. Sampling rate variation and application of multirate signal processing. Sampling effect in A/D and D/A conversion.
			CO3: Evaluate the response of LTI system and rational system function. Drive linear phase systems. Compute discrete Fourier transform (DFT) and calculate linear and circular convolution.

			CO4:	Design IIR & FIR filters with the desired specification with the help of impulse invariant and bilinear transformation method for IIR, with the help of window techniques for FIR. Design Butterworth and Chebyshev filter response.
			CO5:	Compute DFT using efficient algorithm like FFT in decimation in time and decimation in frequency both, using convolution property and Goertzel algorithm. Comparison between wavelet and Fourier transform. Application of WCT & DCT.
35	BTEE505D	Analog & Digital Communication	**CO1:**	Understand the Amplitude Modulation in communication system.
			CO2:	Comprehend the Frequency & Phase modulation.
			CO3:	Realize the Pulse Modulation Techniques.
			CO4:	Get the Digital Modulation Techniques and their use in communication system.
			CO5:	Apply the concept of Information Theory in Communication Engineering.
36	BTEE506A	Real Time Systems	**CO1:**	Describe concepts of Real-Time systems and modeling.
			CO2:	Recognize the characteristics of a real-time system in context with real time scheduling.
			CO3:	Classify various resource sharing mechanisms and their related protocols.
			CO4:	Interpret the basics of real time communication by the knowledge of real time models and protocols.
			CO5:	Apply the basics of RTOS in interpretation of real time systems.
37	BTEE506B	Embedded System	**CO1:**	Understand the basics of embedded system and its structural units.
			CO2:	Analyze the embedded system specification and develop software programs.
			CO3:	Evaluate the requirements of the programming embedded systems, related software architecture.
			CO4:	Understand the RTOS based embedded system design.
			CO5:	Understand all the applications of the embedded system and designing issues.
38	BTEE506C	Introduction To Mems	**CO1:**	Understand the Basic concept of MEMS Fabrication Technologies, Piezoresistance Effect, Piezoelectricity, Piezoresistive Sensor.
			CO2:	Explain Mechanics of Beam and Diaphragm Structures.
			CO3:	Understand the Basic concept of Air Damping and Basic Equations for Slide-film Air Damping, Couette-flow Model, Stokes-flow Model.
			CO4:	Know the concept of Electrostatic Actuation.
			CO5:	Understand the applications of MEMS in RF.
39	BTEE506D	Object Oriented Programming	**CO1:**	Apply Java in developing Object Oriented code.
			CO2:	Apply the knowledge of Multi-threading and Streams in developing Java applications.
			CO3:	Design and implement applications using GUI and Networking in Java.

		Programming	**CO4:** Apply the knowledge of Collections and Generics for building Java applications.
			CO5: Design and develop Java based applications for solutions to real world problems.
40	BTEE506E	Numerical Techniques	**CO1:** Understand about the basics of Ordinary Differential Equations, Separable equations, Equations made separable by change of variables.
			CO2: Retrieve the information content of Power series method.
			CO3: Apply problem specific Bessel's equation, Bessel Functions to engineering applications.
			CO4: Understand about the basics of matrix, Eigen values and eigen vectors.
			CO5: Analysis of Stage wise Processes by the Calculus of Finite Differences, Countercurrent Liquid- Liquid Extraction.
41	BTEE506F	GIS & Remote Sensing	**CO1:** Understand about the principles of Remote Sensing and its advantages and limitations.
			CO2: Retrieve the information content of remotely sensed data.
			CO3: Apply problem specific remote sensing data for engineering applications.
			CO4: Analyze spatial and attribute data for solving spatial problems.
			CO5: Create GIS and cartographic outputs for presentation.
42	BTEE601	Power System-II	**CO1:** Identify power system components on one line diagram of power system and its representation including the behaviour of the constituent components and sub systems and Analyse a network under both balanced and unbalanced fault conditions and design the rating of circuit breakers.
			CO2: Perform load flow analysis of an electrical power network and interpret the results of the analysis.
			CO3: Describe the concept of travelling waves in transmission lines and use the travelling wave theory to determine the over voltage caused by surge propagation in transmission networks.
			CO4: Assess the steady state and transient stability of the power system under various conditions.
			CO5: Describe Operating Principle of a relay and classify them according to applications. Explain working principle of Circuit breaker and phenomenon of arc production and quenching.
43	BTEE602	Microprocessor and Microcontroller	**CO1:** Demonstrate the basic architecture of 8085 & 8086 microprocessors.
			CO2: Illustrate the programming model of microprocessors & write program using 8085 microprocessor.
			CO3: Interface different external peripheral devices with 8085 microprocessor.
			CO4: Comprehend the architecture of 8051 microcontroller .
			CO5: Compare advancelevel microprocessor&microcontroller fordifferent applications.

44	BTEE603	Power Electronics	**CO1:**	Demonstrate the characteristics as well as the operation of BJT, MOSFET, IGBT, SCR, TRIAC and GTO and identify their use in the power switching applications.
			CO2:	Comprehend the non-isolated DC-DC converters and apply their use in different Power electronics applications.
			CO3:	Analyze the phase controlled rectifiers and evaluate their performance parameters.
			CO4:	Apprehend the working of single-phase ac voltage controllers, cyclo-converters and their various applications.
			CO5:	Explain the single-phase and three phase bridge inverters differentiate between CSI and VSI and apply PWM for harmonic reduction.
45	BTEE604A	Special Electrical Machines	**CO1:**	Describe the working principle, Constructional Features of different types of electrical machines including the fractional kilowatt machines.
			CO2:	Analyse torque- speed characteristics of different electrical machines and interpret their performance and identify the suitable machine for an operation.
			CO3:	Study different types of control techniques for a machine and identify the best control strategy based upon different constraints.
			CO4:	Illustrate the use of stepper, BLDCs, SRM, and other special machines in the area of the various industrial and domestic as well as commercial applications of various fractional kilowatt machines.
46	BTEE604B	Electrical Machine Design	**CO1:**	Classify insulating materials for electrical machines and calculate mmf and magnetizing current.
			CO2:	Design the core, yoke, windings and the cooling system of a transformer.
			CO3:	Illustrate the core and armature design of DC and 3-phase synchronous machine. Design design of three phase induction motors, field system of DC machine and synchronous machines.
			CO4:	Analyse computer aided design approaches and apply the concepts of of optimization for the design of transformer, dc machine, three phase induction and synchronous machines.
47	BTEE604C	Digital Control System	**CO1:**	Represent discrete time systems under the form of z-domain transfer functions and state-space models.
			CO2:	Obtain the model of discrete-time systems by pulse transfer function.
			CO3:	Analyze stability, transient response and steady state behaviour of linear discrete- time systems, analytically and numerically using tools such as MATLAB and Simulink.
			CO4:	Design sampled data control systems.

			CO5: Describe Discrete state space model and test controllability and observability of systems.
48	BTEE604D	Electrical and Hybrid Vehicles	**CO1:** Choose a suitable drive scheme for developing an electric hybrid vehicle depending on resources.
			CO2: Design and develop basic schemes of electric vehicles and hybrid electric vehicles.
			CO3: Choose proper energy storage systems for vehicle applications.
			CO4: Identify various communication protocols and technologies used in vehicle networks.
49	BTEE605A	Utilization of Electrical Energy & Electric Traction	**CO1:** Analyze the methods of electric heating,
			CO2: Obtain the performance of speed time curve and its simplification.
			CO3: Demonstrate thevarious Illumation techniques.
			CO4: Demonstrate procedures and analysisof energy saving Power Electronic control of dc and ac traction drives .
50	BTEE605B	Introduction to Smart Grid	**CO1:** Study the concept of Electric grid and smart frid.
			CO2: Analyze the Smart Grid Technologies.
			CO3: Analyze smart substations.
			CO4: Demonstrate procedures and analysis of Power Quality Management in Smart Grid.
51	BTEE605C	Computer Aided Power System Analysis	**CO1:** Study the concept of Modern Power Systems Operation and Control.
			CO2: Analysis of Faulted Power System.
			CO3: Analyze Security Analysis.
			CO4: Stability Analysis: Classification of Power System.
52	BTEE605D	High Voltage Engineering	**CO1:** Describe conduction and breakdown phenomenon in gases, liquid dielectrics and solid dielectrics.
			CO2: Explain generation of high voltages and currents.
			CO3: Explain measurement techniques for high voltages and currents.
			CO4: Describe overvoltage phenomenon and insulation coordination in electric power systems.
			CO5: Describe non-destructive testing of materials and electric apparatus andhigh-voltage testing of electric apparatus
53	BTEEOE606A	Digital & Social Media	**CO1:** Understand what social media is, the various channels through which it operates, and its role in marketing strategy.
			CO2: Use principles of consumer and social psychology to develop social media content and campaigns that engage consumers.

53	BTEEOE606A	Marketing	**CO3:** Draw on knowledge about word-of-mouth marketing to develop effective approaches for propagating ideas, messages, products, and behaviors across social networks.
			CO4: Measure the impact of a social media campaign in terms of a specific marketing objective.
54	BTEEOE606B	Idea to Business Model	**CO1:** Examine the challenges associated with defining the concepts of entrepreneur and entrepreneurship.
			CO2: Discuss how the evolution of entrepreneurship thought has influenced how we view the concept of entrepreneurship today.
			CO3: Discuss how the list of basic questions in entrepreneurship research can be expanded to include research inquiries that are important in today's world.
			CO4: Discuss how the concepts of entrepreneurial uniqueness, entrepreneurial personality traits, and entrepreneurial cognitions can help society improve its support for entrepreneurship.
			CO5: Apply the general venturing script to the study of entrepreneurship.
55	BTEEOE606C	Machine Learning	**CO1:** Gain knowledge about basic concepts of Machine Learning .
			CO2: Identify machine learning techniques suitable for a given problem.
			CO3: Solve the problems using various machine learning techniques.
			CO4: Apply Dimensionality reduction techniques.
			CO5: Design application using machine learning techniques.
56	BTEEOE606D	Renewable Energy Resources	**CO1:** Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.
			CO2: Know the need of renewable energy resources, historical and latest developments.
			CO3: Describe the use of solar energy and the various components used in the energy production with respect to applications like - heating, cooling, desalination, power generation, drying, cooking etc.
			CO4: Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications.
			CO5: Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications.
			CO6: Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations.
			CO7: Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications.

57	BTEEOE606E	Operation Research	**CO1:** Identify and develop operational research models from the verbal description of the real system.
			CO2: Understand the mathematical tools that are needed to solve optimization problems.
			CO3: Use mathematical software to solve the proposed models.
			CO4: Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.
58	BTEE701	Electric Drives	**CO1:** Demonstrate the characteristics of Electric Drives and its parts.
			CO2: Determination of motor power rating for continuous duty, short time duty and intermittent duty.
			CO3: Analyze the Electric Braking and its Purpose and types of electric braking.
			CO4: Understand the Power Electronic Control of AC Drives Three Phase induction Motor Drive.
			CO5: Explain the Three Phase induction Motor Drive and Static Voltage control schem.
59	BTEE703	Power System Protection	**CO1:** Describe the relays and different protective schemes.
			CO2: Explain Relay types and its application.
			CO3: Describe types of faults and protection scheme for major components of power system.
			CO4: Describe the circuit breaker operation, testing and types.
			CO5: Explain the electronic relay, microprocessor and computer based protection schemes.
60	BTEE704A	Energy Efficiency & Conservation	**CO1:** Study the concept of Energy conservation.
			CO2: Analysis of Energy management Team Consideration in lamenting energy conservation Programme.
			CO3: Demonstration of Voltage and Reactive power in Distribution Systems.
			CO4: Explain the Efficiency in Motors and Lighting system.
61	BTEE704B	Reliability Engineering	**CO1:** Study the concept of reliability.
			CO2: Analyze the Smart Grid Technologies.
			CO3: Analyze smart substations.
			CO4: Demonstrate procedures and analysis of Power Quality Management in Smart Grid.
62	BTEE704C	EHVAC &DC Transmission	**CO1:** Need of EHV transmission.
			CO2: Describe the characteristics and generation of impulse voltage.
			CO3: Explain the converter controls characteristics.
			CO4: Analysis of protection against over currents and over voltages.

63	BTEE704D	Power Quality and Facts	**CO1:**	Classify the power quality issues in electrical distribution network.
			CO2:	Describe the sources of voltage sag and protective devices including voltage regulators, active series compensator and UPS.
			CO3:	Describe the different phenomenon causing electrical transients and devices for over voltage protection.
			CO4:	Explain the working and application of different type of FACT devices like SSC, SVC, TSC, SSS, TCSC, UPFC.
			CO5:	Explain the causes of harmonics, its effect on motor ,capacitor, cables and mitigation techniques.
64	BTEEOE705A	Filter Design	**CO1:**	Choose an appropriate transform for the given signal.
			CO2:	Choose appropriate decimation and interpolation factors for high performance filters.
			CO3:	Model and design an AR system.
			CO4:	Implement filter algorithms on a given DSP processor platform.
65	BTEEOE705B	Bioeconomics	**CO1:**	Students will be able to understand basic concept of Bioeconomics, challenges, opportunities& regulations.
			CO2:	Students will be able to understand development and innovation in terms of bioeconomy towards sustainable development.
			CO3:	Students will be able to understand Inter- and transdisciplinarity in bioeconomy &research approaches.
			CO4:	Students will be able to explain biobased resources ,value chain, innovative use of biomass and biological knowledge to provide food, feed, industrial products.
66	BTEEOE705C	Design Thinking	**CO1:**	Develop a strong understanding of the design process and apply it in a variety of business settings.
			CO2:	Analyze self, culture, teamwork to work in a multidisciplinary environment and exhibit empathetic behavior.
			CO3:	Formulate specific problem statements of real time issues and generate innovative ideas using design tools.
			CO4:	Apply critical thinking skills in order to arrive at the root cause from a set of likely causes.
			CO5:	Demonstrate an enhanced ability to apply design thinking skills for evaluation of claims and arguments.
67	BTEEOE705E	Quality Management	**CO1:**	Realize the importance of significance of quality.
			CO2:	Manage quality improvement teams.
			CO3:	Identify requirements of quality improvement programs.

			CO4:	Identify improvement areas based on cost of poor quality.
			CO5:	Organize for quality and development of quality culture through small group activities.
68	BTEEOE705F	Modeling of Field Effects Nano Devices	**CO1:**	Study the MOS devices used below 10nm and beyond with an eye on the future.
			CO2:	Understand and study the physics behind the operation of multi-gate systems.
			CO3:	Design circuits using nano-scaled MOS transistors with the physical insight of their functionalcharacteristics.
			CO4:	Understand and study the physics behind the Radiation effects in SOI MOSFETs.
			CO5:	Understand the impact of device performance on digital circuits.
69	BTEEOE705G	Computerized Process Control	**CO1:**	Understand the Role of computers in process control, Elements of a computer aided Process control System, Classification of a Computer.
			CO2:	Design Phase Locked Local Loop, Mixers. Time Division Multiplexed System – TDM/PAM system.
			CO3:	Realize Process model, Physical model, Control Model. Modelling Procedure.
			CO4:	Formulate of Cascade Control, Predictive control, Adaptive Control, Inferential control, Intelligent Control, Statistical control.
			CO5:	Design Electric Oven Temperature Control, Reheat Furnace Temperature control.