Teerthanker Mahaveer University
Faculty of Engineering

B.Tech. (Electrical Engineering)

Programme Outcome

PO-1	**:**	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO-2	**:**	Problem analysis& Solving: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO-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.
PO-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.
PO-5	**:**	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO-6	**:**	Social Interaction& effective citizenship: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO-7	**:**	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.
PO-8	**:**	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO-9	**:**	Attitude (Individual and team work): Function effectively as an individual, and as member or leader in diverse teams, and in multidisciplinary settings.
PO-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 clean instructions.
PO-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 in multidisciplinary environments.
PO-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.
PO-13	**:**	Entrepreneurship: An Entrepreneurship cut across every sector of human life including the field of engineering, engineering entrepreneurship is the process of harnessing the business opportunities in engineering and turning it into profitable commercially viable innovation.
PO-14	**:**	Interpersonal skills: Interpersonal skills involve the ability to communicate and build relationships with others. Effective interpersonal skills can help the students during the job interview process and can have a positive impact on your career advancement.
PO-15	**:**	Technology savvy/usage: Being technology savvy is essentially one's skill to be smart with technology. This skill reaches far beyond 'understanding' the concepts of how technology works and encompasses the 'utilization' of such modern technology for the purpose of enhancing productivity and efficiency.

Programme Specific Outcome

PSO-1	**:**	Understanding the concepts of basic sciences, humanities and core technical courses of Electronics & Communication Engineering.
PSO-2	**:**	Applying the skills to identify, formulate, design and investigate complex engineering problems of real time projects in the field of electronics and communication engineering in analog, digital and hybrid system domains
PSO-3	**:**	Applying the acquired hardware and software knowledge to research and industrial practices while acquiring soft skills like persistence, proper judgment through these projects-based interactions.
PSO-4	**:**	Analysing the applications of core engineering concepts in the field of communication/networking, signal processing, embedded systems and semiconductor technology.
PSO-5	**:**	Evaluating various electrical, electronics and communication systems consisting of electrical and electronic components through analytical knowledge in Electronics & Communication Engineering with the help of

		modern tools.
PSO-6	**:**	Creating hands on experiences and exposure in the field of Solar System, Microcontroller, PCB Designing and IoT, etc.

Course Outcomes

EHM613	**CO-1**	Understanding the importance of value education in life and method of self-exploration.
	CO-2	Understanding 'Natural Acceptance' and Experiential Validationas the mechanism for self-exploration.
	CO-3	Applying right understanding about relationship and physical facilities.
	CO-4	Analysing harmony in myself, harmony in the family and society, harmony in the nature and existence.
	CO-5	Evaluating human conduct on ethical basis.
EAS116	**CO-1**	Understanding the concepts of eigenvalues and eigenvectors, Optimization & derivatives of functions of several variables, partial and total differentiation, implicit functions.
	CO-2	Understanding the concepts of curl and divergence of vector field.
	CO-3	Understanding of Green's theorem, Gauss Theorem, and Stokes theorem.
	CO-4	Applying the concept of Leibnitz's theorem for successive derivatives.
	CO-5	Analyzing the intangibility of a differential equation to find the optimal solution of first order first degree equations.
	CO-6	Evaluating the double integration and triple integration using Cartesian, polar co-ordinates and the concept of Jacobian of transformation.
EAS112	**CO-1**	Understanding the basic concepts of interference, diffraction and polarisation.
	CO-2	Understanding the concept of bonding in solids and semiconductors.
	CO-3	Understanding the special theory of relativity.
	CO-4	Applying special theory of relativity to explain the phenomenon of length contraction, time dilation, mass-energy equivalence etc.
	CO-5	Applying the concepts of polarized light by the Brewster's and Malus Law
EAS162	**CO-1**	Understanding of the operation of various models of optical devices.
	CO-2	Understanding types of Semiconductors using Hall

		experiments.
	CO-3	Applying the concept of interference, polarization & dispersion in optical devices through Newton's ring, Laser, polarimeter & spectrometer.
	CO-4	Applying the concept of resonance to determine the AC frequency using sonometer &Melde's apparatus.
	CO-5	Applying the concept of resolving & dispersive power by a prism.
EAS113	**CO-1**	Understanding the concept of softening & purification of water.
	CO-2	Understanding calorific value& combustion, analysis of coal, Physical & Chemical properties of hydrocarbons & quality improvements.
	CO-3	Understanding the concept of lubrication, Properties of Refractory & Manufacturing of cements.
	CO-4	Applying the concepts of the mechanism of polymerization reactions, Natural and synthetic rubber& vulcanization.
	CO-5	Applying the concepts of spectroscopic & chromatographic techniques.
EAS163	**CO-1**	Understanding the concepts of Hardness of water.
	CO-2	Analyzing& estimating of various parameters of water.
	CO-3	Analyzing of Calorific value of Solid fuel by Bomb calorimeter & Liquid Fuels by Junkers Gas Calorimeter.
	CO-4	Analyzing of open & closed Flash point of oil by Cleveland &Pensky's Martens apparatus.
	CO-5	Analyzing of viscosity of lubricating oil using Redwood Viscometer.
EEE117	**CO-1**	Understanding the basics of Network, AC Waveform and its characteristics.
	CO-2	Understanding the basic concept of Measuring Instruments, Transformers & three phase Power systems.
	CO-3	Understanding the basic concepts of Transformer.
	CO-4	Understanding the basic concept of power measurement using two wattmeter methods.
	CO-5	Applying the concept of Kirchhoff's laws and Network Theorems to analyze complex electrical circuits.
EEE161	**CO-1**	Understanding the concepts of Kirchoff& Voltage law.
	CO-2	Understanding the concepts of dc network theorem.
	CO-3	Analyzing the energy by a single-phase energy meter.
	CO-4	Analyzing the losses and efficiency of Transformer on different load conditions.
	CO-5	Analyzing the electrical circuits using electrical and electronics components on bread board.

EEC111	**CO-1**	Understanding the concepts of electronic components like diode, BJT & FET.
	CO-2	Understanding the applications of pn junction diode as clipper, clamper, rectifier & regulator whereas BJT & FET as amplifiers
	CO-3	Understanding the functions and applications of operational amplifier-based circuits such as differentiator, integrator, and inverting, non-inverting, summing & differential amplifier.
	CO-4	Understanding the concepts of number system, Boolean algebra and logic gates.
	CO-5	Applying the knowledge of series, parallel and electromagnetic circuits.
EEC161	**CO-1**	Understanding the implementation of diode-based circuits.
	CO-2	Understanding the implementation of Operational amplifier-based circuits.
	CO-3	Analyzing the characteristics of pn junction diode & BJT.
	CO-4	Analyzing the different parameters for characterizing different circuits like rectifiers, regulators using diodes and BJTs.
	CO-5	Analyzing the truth tables through the different type's adders.
TMU101	**CO-1**	Understanding environmental problems arising due to constructional and developmental activities.
	CO-2	Understanding the natural resources and suitable methods for conservation of resources for sustainable development.
	CO-3	Understanding the importance of ecosystem and biodiversity and its conservation for maintaining ecological balance.
	CO-4	Understanding the types and adverse effects of various environmental pollutants and their abatement devices.
	CO-5	Understanding Greenhouse effect, various Environmental laws, impact of human population explosion, environment protection movements, different disasters and their management.
TMUGE101	**CO-1**	Remembering and understanding of the basic of English grammar and vocabulary.
	CO-2	Understanding of the basic Communication process.
	CO-3	Applying correct vocabulary and tenses in sentences construction.
	CO-4	Analyzing communication needs and developing communication strategies using both verbal & non-verbal method.
	CO-5	Drafting applications in correct format for common issues. Developing self-confidence.
EME161	**CO-1**	Understanding the concepts of Engineering Drawing.
	CO-2	Understanding how to draw and represent the shape, size & specifications of physical objects.

	CO-3	Applying the principles of projection and sectioning.
	CO-4	Applying the concepts of development of the lateral surface of a given object.
	CO-5	Creating isometric projection of the given orthographic projection.
EME162	**CO-1**	Understanding the concepts to prepare simple wooden joints using wood working tools.
	CO-2	Applying the techniques to produce fitting jobs of specified dimensions.
	CO-3	Applying the concepts to prepare simple lap, butt, T and corner joints using arc welding equipment.
	CO-4	Applying the concepts of black smithy and lathe machine to produce different jobs.
	CO-5	Creating core and moulds for casting.
EME162	**CO-1**	Understanding the concepts to prepare simple wooden joints using wood working tools.
	CO-2	Applying the techniques to produce fitting jobs of specified dimensions.
	CO-3	Applying the concepts to prepare simple lap, butt, T and corner joints using arc welding equipment.
	CO-4	Applying the concepts of black smithy and lathe machine to produce different jobs.
	CO-5	Creating core and moulds for casting.
EAS211	**CO-1**	Understanding the concepts of the wave, diffusion and Laplace equations & Fourier series.
	CO-2	Understanding the methods of separation of variables.
	CO-3	Understanding the concepts of Fourier series' representation of single variable function.
	CO-4	Applying Laplace transform to determine the complete solutions of linear ODE.
	CO-5	Applying the method of variations of parameters to find solution of equations with variable coefficients.
EAS212	**CO-1**	Understanding the basic concepts of interference, diffraction and polarisation.
	CO-2	Understanding the concept of bonding in solids and semiconductors.
	CO-3	Understanding the special theory of relativity.
	CO-4	Applying special theory of relativity to explain the phenomenon of length contraction, time dilation, mass-energy equivalence etc.
	CO-5	Applying the concepts of polarized light by the Brewster's and Malus Law.
EAS213	**CO-1**	Understanding the concept of softening & purification of

		water.
	CO-2	Understanding calorific value& combustion, analysis of coal, Physical & Chemical properties of hydrocarbons & quality improvements.
	CO-3	Understanding the concept of lubrication, Properties of Refractory & Manufacturing of cements.
	CO-4	Applying the concepts of the mechanism of polymerization reactions, Natural and synthetic rubber& vulcanization.
	CO-5	Applying the concepts of spectroscopic & chromatographic techniques.
EAS263	**CO-1**	Understanding the concepts of Hardness of water.
	CO-2	Analyzing& estimating of various parameters of water.
	CO-3	Analyzing of Calorific value of Solid fuel by Bomb calorimeter & Liquid Fuels by Junkers Gas Calorimeter.
	CO-4	Analyzing of open & closed Flash point of oil by Cleveland &Pensky's Martens apparatus.
	CO-5	Analyzing of viscosity of lubricating oil using Redwood Viscometer.
EEE217	**CO-1**	Understanding the basics of Network, AC Waveform and its characteristics.
	CO-2	Understanding the basic concept of Measuring Instruments, Transformers & three phase Power systems.
	CO-3	Understanding the basic concepts of Transformer.
	CO-4	Understanding the basic concept of power measurement using two wattmeter methods.
	CO-5	Applying the concept of Kirchhoff's laws and Network Theorems to analyze complex electrical circuits.
EEE261	**CO-1**	Understanding the concepts of Kirchoff& Voltage law.
	CO-2	Understanding the concepts of dc network theorem.
	CO-3	Analyzing the energy by a single-phase energy meter.
	CO-4	Analyzing the losses and efficiency of Transformer on different load conditions.
	CO-5	Analyzing the electrical circuits using electrical and electronics components on bread board.
EEC211	**CO-1**	Understanding the concepts of electronic components like diode, BJT & FET.
	CO-2	Understanding the applications of pn junction diode as clipper, clamper, rectifier & regulator whereas BJT & FET as amplifiers
	CO-3	Understanding the functions and applications of operational amplifier-based circuits such as differentiator, integrator, and inverting, non-inverting, summing & differential amplifier.
	CO-4	Understanding the concepts of number system, Boolean algebra and logic gates.

	CO-5	Applying the knowledge of series, parallel and electromagnetic circuits.
EEC261	**CO-1**	Understanding the implementation of diode-based circuits.
	CO-2	Understanding the implementation of Operational amplifier-based circuits.
	CO-3	Analyzing the characteristics of pn junction diode & BJT.
	CO-4	Analyzing the different parameters for characterizing different circuits like rectifiers, regulators using diodes and BJTs.
	CO-5	Analyzing the truth tables through the different type's adders.
ECS212	**CO-1**	Understanding the concept of various components of computer system
	CO-2	Understanding the Object-Oriented Programming Language concepts.
	CO-3	Analyzing basic mathematical problem and their solutions through programming
	CO-4	Applying the concepts of programming solutions for distinct problems
	CO-5	Applying the concepts of scalable solutions through function
ECS262	**CO-1**	Understanding the concepts of execution to programs written in C language.
	CO-2	Applying to prepare programming solutions for specific problems.
	CO-3	Applying to prepare scalable solutions through functions.
	CO-4	Applying basic elements of a C program including arithmetic and logical operators, functions, control structures, and arrays
	CO-5	Analyzing basic mathematical problem and their solutions through programming.
TMUGE201	**CO-1**	Remembering & understanding the basics of English Grammar and Vocabulary.
	CO-2	Understanding the basics of Listening, Speaking & Writing Skills.
	CO-3	Understanding principles of letter drafting and various types of formats.
	CO-4	Applying correct vocabulary and grammar in sentence construction while writing and delivering presentations.
	CO-5	Analyzing different types of listening, role of Audience & Locale in presentation. Drafting Official Letters, E-Mail & Paragraphs in correct format.
EEE311	**CO-1**	Understanding the fundamental principles and classification of electromagnetic machines.
	CO-2	Understanding the working of dc machines as generators and motors.
	CO-3	Understanding the constructional details, principle of

		operation, testing and applications of transformers.
	CO-4	Analyzing the testing and applications of dc machines.
	CO-5	Analyzing the constructional details and principle of operation of dc machines.
EEE361	**CO-1**	Applying the concepts of Load testing on DC Shunt machine and observe the finding.
	CO-2	Applying the concept of no load and full load to find the losses in transformer.
	CO-3	Analyzing the performance indices of machines using standard analytical as well as graphical methods by performing various tests.
	CO-4	Analyzing DC machines performance by performing various tests on them.
	CO-5	Analysing the transformer and obtaining performance indices using standard analytical as well as graphical methods.
EEE312	**CO-1**	Understanding the concept of linear systems and to apply Kirchhoff's laws in Circuit problems.
	CO-2	Understanding the concepts of power measurements in 3-phase circuits.
	CO-3	Understanding the concept of Self and mutual inductance in Circuits.
	CO-4	Applying the concept of network theorems to solve DC and AC circuit problems.
	CO-5	Evaluating and model first and second order electric systems involving capacitors and inductors
EEC311	**CO-1**	Understanding EM wave propagation in free space and in dielectric medium.
	CO-2	Understanding the power flow mechanism in guiding structures and in unbounded medium.
	CO-3	Analyzing electromagnetic wave propagation in guiding structures under various matching conditions.
	CO-4	Analyzing power transmission lines in Electromagnetic Field Theory.
	CO-5	Evaluating Maxwell's equations using vector calculus in three standard coordinate systems.
EEC312	**CO-1**	Remembering the various number systems and its application in digital design.
	CO-2	Understanding of the fundamental concepts and techniques used in digital electronics.
	CO-3	Applying the concepts of digital logic in various digital circuits including counter, timers, etc.
	CO-4	Analyzing the design process of the various combinational and sequential circuits.

	CO-5	Evaluating the basic requirements for a design application and propose a cost-effective solution
EEC361	**CO-1**	Understanding the basics of gates.
	CO-2	Applying the design procedures to design basic sequential circuits.
	CO-3	Analyzing the basic combinational circuits and verifying their functionalities.
	CO-4	Creating the circuits of the counters and shift registers.
	CO-5	Creating the basic digital circuits and verifying their operation.
EEC315	**CO-1**	Remembering the process of system implementation and characterization.
	CO-2	Understanding the knowledge of test signals, inner product, norm and orthogonal basis to signals.
	CO-3	Applying the spectral characteristics of continuous-time periodic and a periodic signals using time invariant analysis.
	CO-4	Analyzing the systems based on their properties and determine the response of LTI system using Laplace transform.
	CO-5	Evaluating the system properties based on impulse response and Fourier transforms.
	CO-6	Creating & solving the real time problems based on Laplace transform and Z- transform for continuous-time and discrete-time signals and systems.
TMUGE301	**CO-1**	Understanding knowledge of grammar to face competitive exams.
	CO-2	Understanding advance English language by using variety of words i.e. idioms and phrase in variety of sentences in functional context.
	CO-3	Understanding listening for effective communication.
	CO-4	Applying their English grammar knowledge in day to day context.
	CO-5	Applying writing and comprehensive skills in English.
	CO-6	Analyzing Comprehending & enriching their vocabulary through prescribed text.
TMUGA-301	**CO-1**	Solving complex problems using Criss cross method, base method and square techniques.
	CO-2	Applying the arithmetical concepts of Average, Mixture and Allegation.
	CO-3	Evaluating the different possibilities of various reasoning based problems in series, Blood relation and Direction.
	CO-4	Operationalizing the inter-related concept of Percentage in Profit Loss and Discount, Si/CI and Mixture/Allegation.
EEE411	**CO-1**	Understanding the working of synchronous machines as generators and motors.

	CO-2	Understanding the testing and applications of synchronous machines.
	CO-3	Understanding the construction features and method of operation of stepper motor and designing the drive amplifier and transistor logic for stepper motor.
	CO-4	Understanding the basic principles and classification of servo motors.
	CO-5	Analysing the process of testing and applications of induction motors.
EEE461	**CO-1**	Applying the concepts of Load testing on Induction motor and observe the output
	CO-2	Analyzing AC machines performance by performing various tests on them.
	CO-3	Analyzing the performance indices of machines using standard analytical as well as graphical methods by performing various tests.
	CO-4	Analyzing the starting methods of AC machines.
	CO-5	Analyzing the Voltage regulation of alternator at different slip.
EEE412	**CO-1**	Understanding different types of meters their work and their construction.
	CO-2	Understanding the working of various instruments and equipment used for the measurement of various electrical engineering parameters like voltage, current, power etc. Understanding about instrument transformers.
	CO-3	Applying the innovative ideas to improve the existing technology in the field of measurements in terms of accuracy, cost, durability and user friendliness.
	CO-4	Analysing the methods of solving the varieties of problems and issues coming up in the vast field of electrical measurements.
	CO-5	Analysing and controlling any physical system.
EEE462	**CO-1**	Applying the principles of Electrical Measurements and Instrumentation Engineering through laboratory experimental work.
	CO-2	Applying the various methods to measure unknown résistance, inductance & capacitance.
	CO-3	Analysing calibrated meter readings with standard meters.
	CO-4	Analysing transient response of electrical circuits on CRO
	CO-5	Creating the circuit to perform experiments, measure, analyse the observed data to come to a conclusion.
EEE413	**CO-1**	Understanding the circuit matrices of linear graphs and analyzing basic electrical networks using graph theory.
	CO-2	Applying the network theorems for simplification of the electrical circuits.

	CO-3	Analyzing the two-port parameters with their inter-relationships and gaining the ability to solve with series, parallel and cascade connections
	CO-4	Evaluating the network functions, poles and zeroes from a given network and analyzing the network stability.
	CO-5	Creating the two element network, using passive elements through Foster and Cauer forms. Understanding the basics of filter design.
EEE463	**CO-1**	Understanding and verifying the network theorems like Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem, Tellegen's theorem etc. using trainer kits.
	CO-2	Applying the network theorems to electrical circuits with AC and DC sources.
	CO-3	Analyzing the pole zero plot of network functions for subsequent stability analysis.
	CO-4	Analyzing the frequency response of active and passive filters as well as RLC circuits.
	CO-5	Evaluating the transient responses of two element electrical circuits to standard input signals.
ECS412	**CO-1**	Understanding classes, objects, members of a class and relationships among them needed for a specific problem.
	CO-2	Understanding Java application programs using OOP principles and proper program structuring.
	CO-3	Applying the concepts of polymorphism and inheritance.
	CO-4	Creating Java programs to implement error handling techniques using exception handling, AWT Packages, Swing Package.
	CO-5	Creating Java programs to implement database connectivity using JDBC.
ECS461	**CO-1**	Applying the object-oriented approach in programming and analysing and designing a computer program to solve real world problems based on object-oriented principles.
	CO-2	Applying the basic approach of graphical user interface design using Abstract window toolkit, Applet and swing packages, creating some application that are based upon some real world scenario.
	CO-3	Analysing the concept of database handling and creating application that are able to communicate with various database.
	CO-4	Analysing the Client server architecture, Understanding the Socket programming architecture and creating basic application using Socket programming.

	CO-5	Analysing real world problems and Creating GUI based application that is able to solve those real world problems.
TMUGA-401	**CO-1**	Applying the arithmetical concepts in Ratio Proportion Variation.
	CO-2	Employing the techniques of Percentage; Ratios and Average in inter related concepts of Time and Work, Time Speed and Distance.
	CO-3	Identifying different possibilities of reasoning based problems of Syllogisms and Venn diagram.
	CO-4	Examining the optimized approach to solve logs and Surds.
EEE511	**CO-1**	Understanding, demonstrating and understanding the fundamentals of (feedback) control systems.
	CO-2	Applying Solving the system equations in state-variable form (state variable models).
	CO-3	Analysing, determining the time and frequency-domain responses of first and second-order systems to step and sinusoidal (and to some extent, ramp) inputs.
	CO-4	Evaluating, determining the (absolute) stability of a closed-loop control system.
	CO-5	Creating, applying root-locus technique to analyse and design control systems.
EEE561	**CO-1**	Applying the principles of control system engineering through laboratory experiment.
	CO-2	Applying the Electrical equipment, evaluating their functioning and assessing their Performance.
	CO-3	Analyzing the report based on performed experiments (journals) with effective demonstration.
	CO-4	Analyzing and connecting the circuit, measuring observed data and summarize.
	CO-5	Evaluating Root Locus and bode plot by using MATLAB software.
EEE512	**CO-1**	Understanding the basics of Power Electronics components characteristics.
	CO-2	Understanding of the power semiconductor switches (Construction, Characteristics and operation).
	CO-3	Understanding the working of various types of phase converters.
	CO-4	Analysing the converters and deciding components of them, under various load types.
	CO-5	Evaluating and Controlling of various Inverter circuits.
EEE562	**CO-1**	Understanding the basic operation of various power semiconductor devices and passive components.
	CO-2	Analyzing power electronics circuits

	CO-3	Applying power electronic circuits for different loads
	CO-4	Evaluating various single phase and three phase power converter circuits and understand their applications.
	CO-5	Creating basic requirements for power electronics-based design application.
EEE513	**CO-1**	Understanding the real time electrical transmission system with respect to various electrical parameters considering environmental and economic obligations.
	CO-2	Applying the basic mathematical, physical and electrical principles to formulate significant electrical hazards.
	CO-3	Analysing appropriate safety equipment's for design of electrical power system with enhancing the efficiency of the transmission and distribution system with environment friendly technology.
	CO-4	Evaluating suitability of installing overhead and underground power transmission strategies considering electrical, mechanical, environmental, performance, safety and economic constraints.
	CO-5	Creating the need to continuously follow the advancements in technology and incorporating them in the present system to improve efficiency, study of neutral grounding and Insulators.
TMUGE501	**CO-1**	Remembering adequate knowledge of grammar and vocabulary through prescribed text to address competitive exams.
	CO-2	Understanding the value of listening to understand the basic content.
	CO-3	Understanding the usage of English grammar in day to day context.
	CO-4	Understating about the skills required in corporate world.
	CO-5	Applying writing and comprehensive skills in English.
	CO-6	Creating a simple proposal and report.
EEC511	**CO-1**	Remembering the basic concept of digital fundamentals to Microprocessor based personal computer system.
	CO-2	Understanding the detailed s/w & h/w structure of the Microprocessor.
	CO-3	Applying the different peripherals (8255, 8253 etc.) are interfaced with Microprocessor.
	CO-4	Analyzing the properties of Microprocessors & Microcontrollers.
	CO-5	Evaluating the data transfer attributes through serial & parallel ports.
	CO-6	Creating practical modules based on assembly language programming for microprocessor.

EEC561	**CO-1**	Remembering the basic concept of digital fundamentals to Microprocessor based personal computer system.
	CO-2	Understanding the detailed s/w & h/w structure of the Microprocessor.
	CO-3	Applying the different peripherals (8255, 8253 etc.) are interfaced with Microprocessor.
	CO-4	Analyzing the properties of Microprocessors & Microcontrollers.
	CO-5	Evaluating the data transfer attributes through serial & parallel ports.
	CO-6	Creating practical modules based on assembly language programming for microprocessor.
EEC561	**CO-1**	Remembering the basic concept of digital fundamentals to Microprocessor based personal computer system.
	CO-2	Understanding the detailed s/w & h/w structure of the Microprocessor.
	CO-3	Applying the different peripherals (8255, 8253 etc.) are interfaced with Microprocessor.
	CO-4	Analyzing the properties of Microprocessors & Microcontrollers.
	CO-5	Evaluating the data transfer attributes through serial & parallel ports.
	CO-6	Creating practical modules based on assembly language programming for microprocessor.
TMUGA-501	**CO-1**	Applying the concepts of modern mathematics Divisibility rule, Remainder Theorem, HCF /LCM in Number System.
	CO-2	Relating the rules of permutation and combination, Fundamental Principle of Counting to find the probability.
	CO-3	Applying calculative and arithmetical concepts of ratio, Average and Percentage to analyze and interpret data.
	CO-4	Applying the concepts of modern mathematics Divisibility rule, Remainder Theorem, HCF /LCM in Number System.
TMUGS-501	**CO-1**	Utilizing effective verbal and non-verbal communication techniques in formal and informal settings
	CO-2	Understanding and analyzing self and devising a strategy for self growth and development.
	CO-3	Adapting a positive mindset conducive for growth through optimism and constructive thinking.
	CO-4	Utilizing time in the most effective manner and avoiding procrastination.
	CO-5	Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree.
	CO-6	Formulating strategies of avoiding time wasters and preparing

		to-do list to manage priorities and achieve SMART goals.
EEE611	**CO-1**	Understanding the concept of starting, Motoring and Braking in Electrical Motors.
	CO-2	Applying solid state drives for speed control of DC and AC machines.
	CO-3	Analysing the role of power electronics devices in control of speed, torque and other components.
	CO-4	Evaluating, Operating and maintaining solid state drives for speed control of 3 phase induction motor.
	CO-5	Creating the advantages and applications of various drive systems.
EEE611	**CO-1**	Understanding the concept of starting, Motoring and Braking in Electrical Motors.
	CO-2	Applying solid state drives for speed control of DC and AC machines.
	CO-3	Analysing the role of power electronics devices in control of speed, torque and other components.
	CO-4	Evaluating, Operating and maintaining solid state drives for speed control of 3 phase induction motor.
	CO-5	Creating the advantages and applications of various drive systems.
EEE661	**CO-1**	Understanding the concept of working of AC motors to get speed torque characteristics at various operating points.
	CO-2	Applying the speed control of dc motors using dc chopper/ Single phase converters/Three phase converters.
	CO-3	Analysing and exploring the field-weakening capabilities of the synchronous machine at higher speeds.
	CO-4	Evaluating the speed control of Single/ Three-phase induction motor using ac regulator.
	CO-5	Creating a set up of control strategies to synthesize the voltages in dc and ac motor drives.
EEE612	**CO-1**	Understanding positive sequence, negative & zero sequence system and fault analysis.
	CO-2	Applying power system operation and stability control.
	CO-3	Analysing a power system network under Symmetrical Conditions.
	CO-4	Evaluating load flow computations and analysing the load flow results.
	CO-5	Creating computational models for analysing of power systems and understanding per unit system
EEC619	**CO-1**	Understanding basic elements of a communication system.
	CO-2	Applying various angle modulation and demodulation techniques.

	CO-3	Analysing baseband signals in Amplitude modulation.
	CO-4	Evaluating the performance of modulation and demodulation techniques in various pulse modulation techniques.
	CO-5	Creating noise figure synchronisation in communication systems.
EHM613	**CO-1**	Understanding the importance of value education in life and method of self-exploration.
	CO-2	Understanding 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration.
	CO-3	Applying right understanding about relationship and physical facilities.
	CO-4	Analysing harmony in myself, harmony in the family and society, harmony in the nature and existence.
	CO-5	Evaluating human conduct on ethical basis.
EEE665	**CO-1**	Understanding the MATLAB and Simulink environments.
	CO-2	Applying the available commands and toolboxes in understanding other courses of electrical engineering.
	CO-3	Analysing complex mathematical formulations using MATLAB software.
	CO-4	Evaluating different system responses through their plot and simulation results.
	CO-5	Creating state space, transfer function and block diagram models of dynamical systems and to simulate these models in MATLAB.
EEC612	**CO-1**	Understanding hardware and software design requirements of embedded systems.
	CO-2	Understanding the data types used in the programming of embedded system.
	CO-3	Understanding embedded systems related software architectures and tool chain.
	CO-4	Analysing the embedded system and develop software programs.
	CO-5	Evaluating the requirements of programming embedded systems.
EEC617	**CO-1**	Remembering the concept of data types and programming syntax used in arduino.
	CO-2	Understanding the Microcontroller internal architecture and its operation within the area of controlling hardware using software.
	CO-3	Applying programming skills to design electrical circuitry to the Microcontroller I/O ports in order to interface the processor to external devices.
	CO-4	Analyzing the interfacing of a microcontroller system to user

		controls and other electronic systems.
	CO-5	Creating small projects using different sensor modules.
EEE621	**CO-1**	Understanding non-linear system behavior by phase plane and describing function methods.
	CO-2	Applying discrete-time mathematical models in both time domain (difference equations, state equations) and z domain (transfer function using z-transform).
	CO-3	Analyzing the stability analysis of nonlinear systems by Lyapunov method develops design skills in optimal control problems.
	CO-4	Evaluating, Predicting and analyzing transient and steady-state responses and stability and sensitivity of both open-loop and closed-loop linear, time-invariant, discrete-time control systems.
	CO-5	Creating state space and state feedback in modern control systems, pole placement, design of state observers and output feedback controllers.
ECS611	**CO-1**	Understanding the concept of Database Management System
	CO-2	Applying the commercial relational database system (Oracle).
	CO-3	Applying the relational algebra expressions for queries.
	CO-4	Applying the basic database storage structures and access techniques: file and page organizations, indexing methods including B-tree, and hashing.
	CO-5	Analysing the issues of transaction processing and concurrency control.
EEE 620	**CO-1**	Understanding the concepts of Artificial Intelligence and Neural Network.
	CO-2	Understanding the concepts of different types Layer Feed Forward Neural Networks
	CO-3	Applying Biological and Artificial Neuron Models, and various Learning strategies.
	CO-4	Analyzing Perceptron Models and Training Algorithms.
	CO-5	Evaluating problems through BAM Training Algorithms: Storage and Recall Algorithm
ECS 631	**CO-1**	Understanding the most common type of cryptographic algorithms used to provide confidentiality, integrity and authenticity.
	CO-2	Understanding different types of cryptosystems.
	CO-3	Applying different approaches of Network security.
	CO-4	Analyzing modes of operation for block ciphers.
	CO-5	Evaluating different hash functions in Information Security.
	CO-6	Creating mechanisms for electronic mail security.
TMUGA-601	**CO-1**	Recognizing the rules of Crypt-arithmetic and relate them to

		find out the solutions.
	CO-2	Illustrating the different concepts of Height and Distance and Functions.
	CO-3	Employing the concept of higher level reasoning in Clocks, Calendars and Puzzle Problems.
	CO-4	Correlating the various arithmetic and reasoning concepts in checking sufficiency of data.
TMUGS-601	**CO-1**	Communicating effectively in a variety of public and interpersonal settings.
	CO-2	Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of Change.
	CO-3	Analyzing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships.
	CO-4	Functioning in a team and enabling other people to act while encouraging growth and creating mutual respect and trust.
	CO-5	Handling difficult situations with grace, style, and professionalism.
EEE711	**CO-1**	Understanding the working of different types of switchgear equipment's like circuit breakers and relays.
	CO-2	Applying fundamental engineering knowledge to obtain solutions associated with relay operation
	CO-3	Analysing with over current, differential, and Distance protection devices and their application in a coordinated protection scheme.
	CO-4	Evaluating and analysis the over current.
	CO-5	Creating models of various protection schemes and predict its performance.
EEE761	**CO-1**	Applying gathered knowledge to assemble the circuit connections required to perform the Experiment, taking observations and analyzing the data to make valid conclusions.
	CO-2	Applying and verifying the principles of Switchgear & Protection through Laboratory Experimental Work.
	CO-3	Analyzing & Demonstrating the magnetization characteristics of current transformer and identify the problems associated with CT saturation.
	CO-4	Creating and Elucidate various protection schemes of various power system components like transformers.
	CO-5	Creating the operation of rewritable Fuse, Biased Differential Relay & Earth fault sensing Relay.
EEE712	**CO-1**	Understanding about non-conventional sources of energy technologies.

	CO-2	Applying knowledge for development based upon different energy resources.
	CO-3	Analysing the various concepts behind renewable energy resources.
	CO-4	Evaluating the need of different renewable energy sources and their importance
	CO-5	Creating awareness about the major environmental issues based on Non-Conventional Energy Resources for a sustainable development.
EEC761	**CO-1**	Analysing the working of lab equipment and characteristics of basic components of electronic circuits.
	CO-2	Analysing the circuits using PN Junction diode.
	CO-3	Analysing input-output characteristics and frequency response of circuits using BJT & FET.
	CO-4	Analysing circuits of the amplifiers and oscillators.
	CO-5	Creating mini projects based on concept of electronics circuit.
EEC762	**CO-1**	Understanding basics of solar energy.
	CO-2	Applying methods Risk Management and to ensure safety and performance.
	CO-3	Analysing everything on Solar Modules, Optimizers (DC/DC converters), Junction Boxes, Inverters, Solar Meters, Learn all the fundamentals of Solar PV energy, Applications of Solar PV Systems, Advantages and Disadvantages of Solar photovoltaic energy.
	CO-4	Analysing Grid-Tie PV System, Calculating Solar Array size, Installing, Maintaining and Servicing of solar power plant.
	CO-5	Analysing the Power concepts & Units.
EEE713	**CO-1**	Understanding the knowledge of necessity and methods of testing various apparatus in power system.
	CO-2	Applying the knowledge of various circuits for generating high voltages for testing various apparatus and their measurement method.
	CO-3	Analysing the breakdown phenomenon in gases, liquids and solid insulators.
	CO-4	Analysing the knowledge of the various reasons of overvoltage in power system and protection methods against them.
	CO-5	Evaluating the knowledge of insulation coordination and design of insulation levels of various parts of power system.
EEE714	**CO-1**	Understanding the electrical power plant operation and control with respect to its economic aspect.
	CO-2	Applying gathered knowledge to determine the significance of various components of the power generation plants.
	CO-3	Analysing different types of tariff, consumers and different

		types of power generation plants.
	CO-4	Evaluating the importance of interconnected operation of different power generation systems.
	CO-5	Creating a Plan for appropriate scheduling of electric power to satisfy the demand constraint.
EEE720	**CO-1**	Understanding working of Electric Vehicles and recent trends.
	CO-2	Applying knowledge to develop the electric propulsion unit and its control for application of electric vehicles.
	CO-3	Analyzing different power converter topology used for electric vehicle application.
	CO-4	Evaluating different configurations of electric vehicles and its components
	CO-5	Creating an understating for different energy storage technologies used for hybrid electric vehicles and their control.
EHM 731	**CO-1**	Understanding the concept, evolution and current trends of management.
	CO-2	Applying managerial functions like planning, organizing, staffing, leading & controlling in decision making.
	CO-3	Applying theories of motivation and leadership in organizational settings.
	CO-4	Analyzing techniques and methods of HR planning, recruitment, selection, training and development, performance management.
	CO-5	Evaluating controlling techniques- budgetary and non-budgetary, and productivity problems in management.
EHM735	**CO-1**	Understanding the concepts of sociology, trace its historical development, and social impact of industrialization.
	CO-2	Understanding the nature of modern societies, significance of the current service sector, and importance of work experience in Industry
	CO-3	Understanding the concepts related the industrial work.
	CO-4	Analyzing the problems of business Ethics.
	CO-5	Creating corporate culture, reputation and ethical leadership in organizational settings.
EHM 733	**CO-1**	Understanding the concept, nature, characteristics and models of organizational behaviour.
	CO-2	Understanding the process of perception, theories of personality shaping, and theories of learning.
	CO-3	Applying the theories of motivation for motivating the workforce.
	CO-4	Analyzing different leadership styles and theories.
	CO-5	Evaluating strategies of emotional intelligence, resistance to change, conflict management, and stress management.

EHM 734	**CO-1**	Understanding the role of managerial economics in engineering perspective.
	CO-2	Understanding different market structures and price determination in different market conditions.
	CO-3	Understanding the concepts of national income, inflation, and business cycles.
	CO-4	Applying the concepts of demand analysis.
	CO-5	Evaluating fixed cost, variable cost, average cost, marginal cost, Opportunity cost.
EEE811	**CO-1**	Understanding the concept of Load flow in interconnected power system and role of SCADA for complex power system.
	CO-2	Applying the concept of power system optimization and optimal power flow condition.
	CO-3	Analysing the concept of Load frequency control in power system.
	CO-4	Evaluating the concept of voltage control by Reactive power compensation.
	CO-5	Creating mathematical models of power system for dynamic studies.
EEE812	**CO-1**	Understanding the concept of semi-conductor devices and its application as FACTS Controllers.
	CO-2	Applying gathered knowledge & select the controllers for different Contingencies.
	CO-3	Analysing real network problems with FACTS controllers.
	CO-4	Evaluating the control of power system parameters effectively and appropriately using FACTS Controllers
	CO-5	Creating an understanding the recent trend in FACTS controllers and coordination of FACTS controllers.
EEC814	**CO-1**	Understanding the concepts for the designing of the Amplifiers and Oscillators.
	CO-2	Applying the functioning of operational amplifiers and its applications in details.
	CO-3	Analysing the functioning of 555 Timer & 565 PLL Circuits (Block Diagram, Characteristics and Applications).
	CO-4	Analysing of the different types electronic circuits.
	CO-5	Evaluating the concept and applications of Integrated Circuits.
EEE821	**CO-1**	Understanding qualitative comparison of AC and DC transmission system with all aspects.
	CO-2	Understanding the need of EHV AC transmission and various issues related with it.
	CO-3	Applying Reactive power management, Stability of AC and DC systems.
	CO-4	Analysing In depth converter analysis, faults, protections,

		harmonic considerations, grounding system.
	CO-5	Evaluating the Journey from conventional HVDC control to modern HVDC control schemes.
EEE831	**CO-1**	Understanding concepts of machine learning and data analytics like bagging and boosting, clustering.
	CO-2	Understanding Bayesian learning and Bayesian Network.
	CO-3	Applying Kmeans Clustering and Agglomerative Hierarchical Clustering
	CO-4	Applying decision trees for problem solving.
	CO-5	Analysing a variety of learning algorithms.
EEE832	**CO-1**	Understanding basic and modern concepts of quality and TQM.
	CO-2	Understanding importance of human factor in quality
	CO-3	Understanding the concept of TPM and six sigma along with the applications.
	CO-4	Applying quality control techniques like control charts, 7 QC & 7 New QC tools.
	CO-5	Analysing quality related costs.
EEE835	**CO-1**	Understanding the concepts and skills needed to run a business successfully.
	CO-2	Applying the steps of project formulation and market research.
	CO-3	Analyzing the techno economic feasibility of a project.
	CO-4	Analyzing various growth strategies in small scale industry.
	CO-5	Evaluating breakeven point, working capital requirements, and taxes.
EEE861	**CO-1**	Applying the various power system simulation commands
	CO-2	Analysing the load power flow by NR and Gauss Elimination method.
	CO-3	Analysing the symmetrical and Unsymmetrical faults using MATLAB.
	CO-4	Creating the concept of load frequency control in various areas using MATLAB
	CO-5	Creating the model to control voltage level in a power system using MATLAB.
EEC864	**CO-1**	Applying relevant information to supplement to the Electronic Circuit EC (EEC864) course.
	CO-2	Analysing and verifying the working of different types of Operational Amplifiers, ICs and the procedure of doing the experiment.
	CO-3	Creating the circuits, analyzing the circuits and troubleshoot the designed circuits.
	CO-4	Creating and recording the experimental data, analyzing the results, and preparing a formal laboratory report.

	CO-5	Creating the circuits with basic semiconductor devices (active & passive elements), measuring instruments & power supplies that serves many practical purposes.