Teerthanker Mahaveer University
Faculty of Engineering

B.Tech. (Electronic & Communication Engineering)

Programme Outcomes (POs)

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 assesssocietal, 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:Communicateeffectivelyoncomplexengineeringactivitieswitht he 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 Outcomes (PSOs)

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	Analysingtheapplicationsofcoreengineeringconceptsinthefieldofcommunication/ networking, signal processing, embedded systems and semi conductor 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 (CO's)

EAS112	CO1.	Understanding the basic concepts of interference, diffraction and polarisation.
	CO2.	Understanding the concept of bonding in solids and semiconductors.
	CO3.	Understanding the special theory of relativity.
	CO4.	Applying special theory of relativity to explain the phenomenon of length contraction, time dilation, mass-energy equivalence etc.
	CO5.	Applying the concepts of polarized light by the Brewster's and Malus Law
EAS162	CO1.	Understanding of the operation of various models of optical devices.
	CO2.	Understanding types of Semiconductors using Hall experiments.
	CO3.	Applying the concept of interference, polarization & dispersion in optical devices through Newton's ring, Laser, polarimeter & spectrometer.
	CO4.	Applying the concept of resonance to determine the AC frequency using sonometer & Melde's apparatus.
	CO5.	Applying the concept of resolving & dispersive power by a prism.
EAS113	CO1.	Understanding the concept of softening & purification of water.
	CO2.	Understanding calorific value & combustion, analysis of coal, Physical & Chemical properties of hydrocarbons & quality improvements.
	CO3.	Understanding the concept of lubrication, Properties of Refractory & Manufacturing of cements.
	CO4.	Applying the concepts of the mechanism of polymerization reactions, Natural and synthetic rubber& vulcanization.
	CO5.	Applying the concepts of spectroscopic & chromatographic techniques.
EAS163	CO1.	Understanding the concepts of Hardness of water.
	CO2.	Analyzing & estimating of various parameters of water.
	CO3.	Analyzing of Calorific value of Solid fuel by Bomb calorimeter & Liquid Fuels by Junkers Gas Calorimeter.
	CO4.	Analyzing of open & closed Flash point of oil by Cleveland & Pensky's Martens apparatus.
	CO5.	Analyzing of viscosity of lubricating oil using Redwood Viscometer.
EEE117	CO1.	Understanding the basics of Network, AC Waveform and its characteristics.

	CO2.	Understanding the basic concept of Measuring Instruments, Transformers & three phase Power systems.
	CO3.	Understanding the basic concepts of Transformer.
	CO4.	Understanding the basic concept of power measurement using two wattmeter methods.
	CO5.	Applying the concept of Kirchhoff's laws and Network Theorems to analyze complex electrical circuits.
EEE161	**CO1.**	Understanding the concepts of Kirchoff & Voltage law.
	CO2.	Understanding the concepts of dc network theorem.
	CO3.	Analyzing the energy by a single-phase energy meter.
	CO4.	Analyzing the losses and efficiency of Transformer on different load conditions.
	CO5.	Analyzing the electrical circuits using electrical and electronics components on bread board.
EEC111	**CO1.**	Understanding the concepts of electronic components like diode, BJT & FET.
	CO2.	Understanding the applications of pn junction diode as clipper, clamper, rectifier & regulator whereas BJT & FET as amplifiers
	CO3.	Understanding the functions and applications of operational amplifier-based circuits such as differentiator, integrator, and inverting, non-inverting, summing & differential amplifier.
	CO4.	Understanding the concepts of number system, Boolean algebra and logic gates.
	CO5.	Applying the knowledge of series, parallel and electromagnetic circuits.
EEC161	**CO1.**	Understanding the implementation of diode-based circuits.
	CO2.	Understanding the implementation of Operational amplifier-based circuits.
	CO3.	Analyzing the characteristics of pn junction diode & BJT.
	CO4.	Analyzing the different parameters for characterizing different circuits like rectifiers, regulators using diodes and BJTs.
	CO5.	Analyzing the truth tables through the different type's adders.
TMU101	**CO1.**	Understanding environmental problems arising due to constructional and developmental activities.
	CO2.	Understanding the natural resources and suitable methods for conservation of resources for sustainable development.
	CO3.	Understanding the importance of ecosystem and biodiversity and its conservation for maintaining ecological balance.
	CO4.	Understanding the types and adverse effects of various environmental pollutants and their abatement devices.

	CO5.	Understanding Greenhouse effect, various Environmental laws, impact of human population explosion, environment protection movements, different disasters and their management.
TMUGE101	CO1.	Remembering and understanding of the basic of English grammar and vocabulary.
	CO2.	Understanding of the basic Communication process.
	CO3.	Applying correct vocabulary and tenses in sentences construction.
	CO4.	Analyzing communication needs and developing communication strategies using both verbal & non-verbal method.
	CO5.	Drafting applications in correct format for common issues.
	CO6.	Developing self-confidence.
EME161	CO1.	Understanding the concepts of Engineering Drawing.
	CO2.	Understanding how to draw and represent the shape, size & specifications of physical objects.
	CO3.	Applying the principles of projection and sectioning.
	CO4.	Applying the concepts of development of the lateral surface of a given object.
	CO5.	Creating isometric projection of the given orthographic projection.
EME162	CO1.	Understanding the concepts to prepare simple wooden joints using wood working tools.
	CO2.	Applying the techniques to produce fitting jobs of specified dimensions.
	CO3.	Applying the concepts to prepare simple lap, butt, T and corner joints using arc welding equipment.
	CO4.	Applying the concepts of black smithy and lathe machine to produce different jobs.
	CO5.	Creating core and moulds for casting.
EAS211	CO1.	Understanding the concepts of the wave, diffusion and Laplace equations & Fourier series.
	CO2.	Understanding the methods of separation of variables.
	CO3.	Understanding the concepts of Fourier series' representation of single variable function.
	CO4.	Applying Laplace transform to determine the complete solutions of linear ODE.
	CO5.	Applying the method of variations of parameters to find solution of equations with variable coefficients.
EAS212	CO1.	Understanding the basic concepts of interference, diffraction and polarization.
	CO2.	Understanding the concept of bonding in solids and

		semiconductors.
	CO3.	Understanding the special theory of relativity.
	CO4.	Applying special theory of relativity to explain the phenomenon of length contraction, time dilation, mass-energy equivalence etc.
	CO5.	Applying the concepts of polarized light by the Brewster's and Malus Law.
EAS262	CO1.	Understanding of the operation of various models of optical devices.
	CO2.	Understanding types of Semiconductors using Hall experiments.
	CO3.	Applying the concept of interference, polarization & dispersion in optical devices through Newton's ring, Laser, polarimeter & spectrometer.
	CO4.	Applying the concept of resonance to determine the AC frequency using sonometer & Melde's apparatus.
	CO5.	Applying the concept of resolving & dispersive power by a prism.
EAS213	CO1.	Understanding the concept of softening & purification of water.
	CO2.	Understanding calorific value& combustion, analysis of coal, Physical & Chemical properties of hydrocarbons & quality improvements.
	CO3.	Understanding the concept of lubrication, Properties of Refractory & Manufacturing of cements.
	CO4.	Applying the concepts of the mechanism of polymerization reactions, Natural and synthetic rubber& vulcanization.
	CO5.	Applying the concepts of spectroscopic & chromatographic techniques.
EAS263	CO1.	Understanding the concepts of Hardness of water.
	CO2.	Analyzing & estimating of various parameters of water.
	CO3.	Analyzing of Calorific value of Solid fuel by Bomb calorimeter & Liquid Fuels by Junkers Gas Calorimeter.
	CO4.	Analyzing of open & closed Flash point of oil by Cleveland & Pensky's Martens apparatus.
	CO5.	Analyzing of viscosity of lubricating oil using Redwood Viscometer.
EEE217	CO1.	Understanding the basics of Network, AC Waveform and its characteristics.
	CO2.	Understanding the basic concept of Measuring Instruments, Transformers & three phase Power systems.
	CO3.	Understanding the basic concepts of Transformer.
	CO4.	Understanding the basic concept of power measurement using two wattmeter methods.

	CO5.	Applying the concept of Kirchhoff's laws and Network Theorems to analyze complex electrical circuits.
EEE261	CO1.	Understanding the concepts of Kirchoff & Voltage law.
	CO2.	Understanding the concepts of dc network theorem.
	CO3.	Analyzing the energy by a single-phase energy meter.
	CO4.	Analyzing the losses and efficiency of Transformer on different loadconditions.
	CO5.	Analyzing the electrical circuits using electrical and electronics components on bread board.
EEC211	CO1.	Understanding the concepts of electronic components like diode, BJT & FET.
	CO2.	Understanding the applications of pn junction diode as clipper, clamper, rectifier & regulator whereas BJT & FET as amplifiers
	CO3.	Understanding the functions and applications of operational amplifier-based circuits such as differentiator, integrator, and inverting, non-inverting, summing & differential amplifier.
	CO4.	Understanding the concepts of number system, Boolean algebra and logic gates.
	CO5.	Applying the knowledge of series, parallel and electromagnetic circuits.
EEC261	CO1.	Understanding the implementation of diode-based circuits.
	CO2.	Understanding the implementation of Operational amplifier-based circuits.
	CO3.	Analyzing the characteristics of pn junction diode & BJT.
	CO4.	Analyzing the different parameters for characterizing different circuits like rectifiers, regulators using diodes and BJTs.
TMUGE201	CO1.	Remembering & understanding the basics of English Grammar and Vocabulary.
	CO2.	Understanding the basics of Listening, Speaking & Writing Skills.
	CO3.	Understanding principles of letter drafting and various types of formats.
	CO4.	Applying correct vocabulary and grammar in sentence construction while writing and delivering presentations.
	CO5.	Analyzing different types of listening, role of Audience & Locale in presentation.
	CO6.	Drafting Official Letters, E-Mail & Paragraphs in correct format.
EME261	CO1.	Understanding the concepts of Engineering Drawing.
	CO2.	Understanding how to draw and represent the shape, size & specifications of physical objects.
	CO3.	Applying the principles of projection and sectioning.

	CO4.	Applying the concepts of development of the lateral surface of a given object.
EEC311	CO1.	Understanding EM wave propagation in free space and in dielectric medium.
	CO2.	Understanding the power flow mechanism in guiding structures and in unbounded medium.
	CO3.	Analyzing electromagnetic wave propagation in guiding structures under various matching conditions.
	CO4.	Analyzing power transmission lines in Electromagnetic Field Theory.
	CO5.	Evaluating Maxwell's equations using vector calculus in three standard coordinate systems.
EEC312	CO1.	Remembering the various number systems and its application in digital design.
	CO2.	Understanding of the fundamental concepts and techniques used in digital electronics.
	CO3.	Applying the concepts of digital logic in various digital circuits including counter, timers, etc.
	CO4.	Analyzing the design process of the various combinational and sequential circuits.
	CO5.	Evaluating the basic requirements for a design application and propose a cost-effective solution
EEC361	CO1.	Understanding the basics of gates.
	CO2.	Applying the design procedures to design basic sequential circuits.
	CO3.	Analyzing the basic combinational circuits and verifying their functionalities.
	CO4.	Creating the circuits of the counters and shift registers.
	CO5.	Creating the basic digital circuits and verifying their operation.
EEC313	CO1.	Remembering the different methods to measure resistance, inductance, capacitance and potential.
	CO2.	Understanding the characteristic & classification of instruments.
	CO3.	Understanding the different types of voltmeter, ammeter and watt meter.
	CO4.	Understanding the potential transformer and current transformer.
	CO5.	Applying the CRO, multimeter and frequency meter.
EEC362	CO1.	Applying various types of electrical bridges for inductance measurement.
	CO2.	Applying various types of electrical bridges for resistance measurement.

	CO3.	Applying various types of electrical bridges for capacitance measurement.
	CO4.	Analysing of RLC series and parallel circuit.
	CO5.	Evaluating ammeters and voltmeters.
EEC315	CO1.	Remembering the process of system implementation and characterization.
	CO2.	Understanding the knowledge of test signals, inner product, norm and orthogonal basis to signals.
	CO3.	Applying the spectral characteristics of continuous-time periodic and a periodic signals using time invariant analysis.
	CO4.	Analyzing the systems based on their properties and determine the response of LTI system using Laplace transform.
	CO5.	Evaluating the system properties based on impulse response and Fourier transforms.
	CO6.	Creating& solving the real time problems based on Laplace transform and Z- transform for continuous-time and discrete-time signals and systems.
ECS312	CO1.	Understanding classes, objects, members of a class and relationships among them needed for a specific problem.
	CO2.	Understanding Java application programs using OOP principles and proper program structuring.
	CO3.	Applying the concepts of polymorphism and inheritance.
	CO4.	Creating Java programs to implement error handling techniques using exception handling, AWT Packages, Swing Package.
	CO5.	Creating Java programs to implement database connectivity using JDBC.
ECS361	CO1.	Applying the object-oriented approach in programming and analysing and designing a computer program to solve real world problems based on object-oriented principles.
	CO2.	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.
	CO3.	Analysing the concept of database handling and creating application that are able to communicate with various database.
	CO4.	Analysing the Client server architecture, Understanding the Socket programming architecture and creating basic application using Socket programming.
	CO5.	Analysing real world problems and Creating GUI based application that is able to solve those real world problems.

TMUGE301	**CO1.**	Understanding knowledge of grammar to face competitive exams.
	CO2.	Understanding advance English language by using variety of words i.e. idioms and phrase in variety of sentences in functional context.
	CO3.	Understanding listening for effective communication.
	CO4.	Applying their English grammar knowledge in day to day context.
	CO5.	Applying writing and comprehensive skills in English.
	CO6.	Analyzing Comprehending & enriching their vocabulary through prescribed text.
TMUGA-301	**CO1.**	Solving complex problems using Criss cross method, base method and square techniques.
	CO2.	Applying the arithmetical concepts of Average, Mixture and Allegation.
	CO3.	Evaluating the different possibilities of various reasoning based problems in series, Blood relation and Direction.
	CO4.	Operationalizing the inter-related concept of Percentage in Profit Loss and Discount, Si/CI and Mixture/Allegation.
EEC461	**CO1.**	Understanding the analog modulation circuits as amplitude and frequency modulation.
	CO2.	Understanding the various pulse modulation techniques as PAM, PPM, PWM.
	CO3.	Analyzing the circuit to sample an analog signal.
	CO4.	Applying and simulating modulation and demodulation circuits such as AM, DSB-SC, FM.
	CO5.	Creating the pre-emphasis and de-emphasis at the transmitter and receiver respectively
	CO6.	Creating model of diode detector and AGC circuit that are necessary for good reception of the signal
EEC412	**CO1.**	Understanding the concepts of basics of electronics.
	CO2.	Analyzing dc circuits and relates ac models of semiconductor devices with their physical operation.
	CO3.	Analyzing &Designing of the amplifiers & Oscillators circuits.
	CO4.	Analyzing small and large signals for electronic circuits of various practical applications.
	CO5.	Creating mini projects based on concept of electronics circuit.
EEC462	**CO1.**	Analyzing the working of lab equipment and characteristics of basic components of electronic circuits.
	CO2.	Applying the skills of circuits designing using PN Junction diode.
	CO3.	Creating circuits and analyzing input-output characteristics and frequency response of circuits using BJT & FET.

	CO4.	Creating circuits of amplifiers and oscillators.
	CO5.	Creating mini projects based on concept of electronic circuit.
EEE413	**CO1.**	Understanding the circuit matrices of linear graphs and analyzing basic electrical networks using graph theory.
	CO2.	Applying the network theorems for simplification of the electrical circuits.
	CO3.	Analyzing the two-port parameters with their inter-relationships and gaining the ability to solve with series, parallel and cascade connections
	CO4.	Evaluating the network functions, polesandzeroesfroma given network and analyzing the network stability.
	CO5.	Creating the two element network, using passive elements through Foster and Cauer forms. Understanding the basics of filter design.
EEE463	**CO1.**	Understanding and verifying the network theorems like Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem, Tellegen's theorem etc. using trainer kits.
	CO2.	Applying the network theorems to electrical circuits with AC and DC sources.
	CO3.	Analyzing the pole zero plot of network functions for subsequent stability analysis.
	CO4.	Analyzing the frequency response of active and passive filters as well as RLC circuits.
	CO5.	Evaluating the transient responses of two element electrical circuits to standard input signals.
EEE414	**CO1.**	Understanding the basics of Power Electronics components characteristics.
	CO2.	Understanding control of various Inverter circuits.
	CO3.	Understanding the working of various types of phase converters.
	CO4.	Analysing of converters and identifying components for them, under various load types.
	CO5.	Analysing the details of power semiconductor switches (Construction, Characteristics and operation).
EEE464	**CO1.**	Understanding the basic operation of various power semiconductor devices and passive components.
	CO2.	Analyzing power electronics circuits.
	CO3.	Applying power electronic circuits for different loads.
	CO4.	Evaluating various single phase and three phase power converter circuits and understand their applications.
	CO5.	Creating basic requirements for power electronics-based design

		application.
ECS411	**CO1.**	Understanding the concept of Database Management System
	CO2.	Applying the commercial relational database system (Oracle).
	CO3.	Applying the relational algebra expressions for queries.
	CO4.	Applying the basic database storage structures and access techniques: file and page organizations, indexing methods including B-tree, and hashing.
	CO5.	Analysing the issues of transaction processing and concurrency control.
TMUGA-401	**CO1.**	Applying the arithmetical concepts in Ratio Proportion Variation.
	CO2.	Employing the techniques of Percentage; Ratios and Average in inter related concepts of Time and Work, Time Speed and Distance.
	CO3.	Identifying different possibilities of reasoning based problems of Syllogisms and Venn diagram.
	CO4.	Examining the optimized approach to solve logs and Surds.
EEC511	**CO1.**	Remembering the basic concept of digital fundamentals to Microprocessor based personal computer system.
	CO2.	Understanding the detailed s/w & h/w structure of the Microprocessor.
	CO3.	Applying the different peripherals (8255, 8253 etc.) are interfaced with Microprocessor.
	CO4.	Analyzing the properties of Microprocessors & Microcontrollers.
	CO5.	Evaluating the data transfer attributes through serial & parallel ports.
	CO6.	Creating practical modules based on assembly language programming for microprocessor.
EEC561	**CO1.**	Remembering the basic concept of digital fundamentals to Microprocessor based personal computer system.
	CO2.	Understanding the detailed s/w & h/w structure of the Microprocessor.
	CO3.	Applying the different peripherals (8255, 8253 etc.) are interfaced with Microprocessor.
	CO4.	Analyzing the properties of Microprocessors & Microcontrollers.
	CO5.	Evaluating the data transfer attributes through serial & parallel ports.
	CO6.	Creating practical modules based on assembly language programming for microprocessor.
EEC512	**CO1.**	Understanding the performance of specialized microwave tubes such as klystron, reflex klystron, and magnetron and travelling

		wave tube.
	CO2.	Understanding the operation of passive waveguide components.
	CO3.	Understanding the limitations and application of solid state devices at microwave
	CO4.	Understanding the concept of ferromagnetic microwave devices.
	CO5.	Analysing microwave circuits using scattering parameters.
EEC562	CO1.	Understanding microwave components and equipment's
	CO2.	Understanding the working of Microwave Power meter.
	CO3.	Analyzing characteristics of Microwave oscillator.
	CO4.	Analyzing the parameters of Microwave Tees.
	CO5.	Analyzing rectangular waveguide parameters.
EEC513	CO1.	Understanding coding techniques of information.
	CO2.	Understanding various digital modulation techniques
	CO3.	Understanding multiplexing schemes used in digital communication
	CO4.	Understanding different line coding schemes
	CO5.	Applying encoder and decoder schemes for error control.
EEC563	CO1.	Understanding PCM transmitter and receiver.
	CO2.	Applying PCM, delta modulation and adaptive delta modulation.
	CO3.	Applying ASK, FSK and PSK modulation techniques.
	CO4.	Applying different coding techniques.
	CO5.	Applying sampling theorem.
EEE511	CO1.	Understanding, demonstrating and understanding the fundamentals of (feedback) control systems.
	CO2.	Applying Solving the system equations in state-variable form (state variable models).
	CO3.	Analysing, determining the time and frequency-domain responses of first and second-order systems to step and sinusoidal (and to some extent, ramp) inputs.
	CO4.	Evaluating, determining the (absolute) stability of a closed-loop control system.
	CO5.	Creating, applying root-locus technique to analyse and design control systems.
TMUGE501	CO1.	Remembering adequate knowledge of grammar and vocabulary through prescribed text to address competitive exams.
	CO2.	Understanding the value of listening to understand the basic content.
	CO3.	Understanding the usage of English grammar in day to day context.

	CO4.	Understating about the skills required in corporate world.
	CO5.	Applying writing and comprehensive skills in English.
	CO6.	Creating a simple proposal and report.
TMUGA-501	**CO1.**	Applying the concepts of modern mathematics Divisibility rule, Remainder Theorem, HCF /LCM in Number System.
	CO2.	Relating the rules of permutation and combination, Fundamental Principle of Counting to find the probability.
	CO3.	Applying calculative and arithmetical concepts of ratio, Average and Percentage to analyze and interpret data.
	CO4.	Correlating the various arithmetic concepts to check sufficiency of data
TMUGS-501	**CO1.**	Utilizing effective verbal and non-verbal communication techniques in formal and informal settings
	CO2.	Understanding and analyzing self and devising a strategy for self growth and development.
	CO3.	Adapting a positive mindset conducive for growth through optimism and constructive thinking.
	CO4.	Utilizing time in the most effective manner and avoiding procrastination.
	CO5.	Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree.
	CO6.	Formulating strategies of avoiding time wasters and preparing to-do list to manage priorities and achieve SMART goals.
EEC613	**CO1.**	Understanding the frequency response of op amp and different types of multi vibrator using op amp.
	CO2.	Understanding about the 555 timer and applications of 555 timer.
	CO3.	Understanding the low pass, high pass, band pass and band reject filters using op amp.
	CO4.	Analyzing various circuits using op amp like rectifier, sample and hold circuit.
	CO5.	Creating the different types of converters using op amp.
EEC661	**CO1.**	Analyzing the characteristics of operational amplifier.
	CO2.	Evaluating with various application circuits using 555 timer.
	CO3.	Evaluating and demonstrating with various application circuits using op-amp.
	CO4.	Evaluating and demonstrating amplifier using bipolar junction transistor.
	CO5.	Evaluating and demonstrating with various waveform generator and filters.
EEC614	**CO1.**	Understanding the concept of radiation through mathematical

		formulation.
	CO2.	Understanding the performance characteristics of array antennas.
	CO3.	Understanding the behaviour of nature on wave propagation.
	CO4.	Analyzing the characteristics of reflector, broadband and planar antennas.
	CO5.	Evaluating the antenna parameters.
EEC662	CO1.	Understanding the different types microwave kits and instruments required to install antenna at different sites.
	CO2.	Analyzing onsite power pattern required as per the line of site communication.
	CO3.	Analyzing the right antenna as per their power pattern for different sites.
	CO4.	Analyzing polarization of microwave which helps in interfacing two antennas.
	CO5.	Creating the power pattern direction as per the customer population density.
EEC615	CO1.	Understanding the characteristics of the telephone systems.
	CO2.	Understanding the network synchronization and management.
	CO3.	Understanding telecom switching systems.
	CO4.	Applying the telecom traffic and blocking performance of the switches.
	CO5.	Applying the concepts of digital network and protocols.
EEC616	CO1.	Remembering and understanding the cellular radio concepts, cellular interference as well as methods of improving coverage and capacity.
	CO2.	Understanding the classification of multiple access techniques in mobile communication.
	CO3.	Analyzing the GSM system including its features, architecture, frame structure and channels used for mobile communication.
	CO4.	Applying the various propagation effects and associated losses on small- scale(fading) and large scale propagation models.
	CO5.	Evaluating the need of the emerging wireless networks including Bluetooth technology, Intelligent networks and WSNs.
EHM613	CO1.	Understanding the importance of value education in life and method of self-exploration.
	CO2.	Understanding 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration.
	CO3.	Applying right understanding about relationship and physical facilities.
	CO4.	Analysing harmony in myself, harmony in the family and society,

		harmony in the nature and existence.
	CO5.	Evaluating human conduct on ethical basis.
TMUGA-601	CO1.	Recognizing the rules of Crypt-arithmetic and relate them to find out the solutions.
	CO2.	Illustrating the different concepts of Height and Distance and Functions.
	CO3.	Employing the concept of higher level reasoning in Clocks, Calendars and Puzzle Problems.
	CO4.	Correlating the various arithmetic and reasoning concepts in checking sufficiency of data.
TMUGS-601	CO1.	Communicating effectively in a variety of public and interpersonal Settings.
	CO2.	Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of Change.
	CO3.	Analyzing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships.
	CO4.	Functioning in a team and enabling other people to act while encouraging growth and creating mutual respect and trust.
	CO5.	Handling difficult situations with grace, style, and professionalism.
EEC617	CO1.	Remembering the concept of data types and programming syntax used in arduino.
	CO2.	Understanding the Microcontroller internal architecture and its operation within the area of controlling hardware using software.
	CO3.	Applying programming skills to design electrical circuitry to the Microcontroller I/O ports in order to interface the processor to external devices.
	CO4.	Analyzing the interfacing of a microcontroller system to user controls and other electronic systems.
	CO5.	Creating small projects using different sensor modules.
EEC711	CO1.	Understanding the fundamental properties of various discrete time systems
	CO2.	Understanding the frequency domain analysis of discrete time systems
	CO3.	Understanding properties and concept of digital filters like FIR & HR filters
	CO4.	Understanding stable analog filters and stable digital filters
	CO5.	Creating low pass, high pass, band pass and band reject FIR filters.
EEC763	CO1.	Understanding the basic signal generation and handling

		discrete/digital signals using MATLAB.
	CO2.	Understanding basic concepts of DSP and its applications using DSP toolkit in MATLAB.
	CO3.	Applying quantization and Phase Modulation Technique.
	CO4.	Applying digital signal processing algorithms in MATLAB, including the design, implementation, and real-time operation of digital filters, and applications of the fast Fourier transform.
	CO5.	Applying BER performance of communication systems using MATLAB.
EEC764	CO1.	Understanding of concepts about step down transformer.
	CO2.	Understanding of regulated dc power supply fabrication and energy-meter.
	CO3.	Understanding of PCB layout using printing and photo technology.
	CO4.	Applying operations on PCB as artwork, printing, etching, drilling, soldering shop etc.
	CO5.	Creating PCB layout using SPRINT software.
EEC762	CO1.	Understanding basics of solar energy.
	CO2.	Applying methods Risk Management and to ensure safety and performance.
	CO3.	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.
	CO4.	Analysing Grid-Tie PV System, Calculating Solar Array size, Installing, Maintaining and Servicing of solar power plant.
	CO5.	Analysing the Power concepts & Units.
EHM731	CO1.	Understanding the concept, evolution and current trends of management.
	CO2.	Applying managerial functions like planning, organizing, staffing, leading & controlling in decision making.
	CO3.	Applying theories of motivation and leadership in organizational settings.
	CO4.	Analyzing techniques and methods of HR planning, recruitment, selection, training and development, performance management.
	CO5.	Evaluating controlling techniques- budgetary and non-budgetary, and productivity problems in management.
EHM735	CO1.	Understanding the concepts of sociology, trace its historical development, and social impact of industrialization.
	CO2.	Understanding the nature of modern societies, significance of the

		current service sector, and importance of work experience in Industry
	CO3.	Understanding the concepts related the industrial work.
	CO4.	Analyzing the problems of business Ethics.
	CO5.	Creating corporate culture, reputation and ethical leadership in organizational settings.
EHM733	CO1.	Understanding the concept, nature, characteristics and models of organizational behaviour.
	CO2.	Understanding the process of perception, theories of personality shaping, and theories of learning.
	CO3.	Applying the theories of motivation for motivating the workforce.
	CO4.	Analyzing different leadership styles and theories.
	CO5.	Evaluating strategies of emotional intelligence, resistance to change, conflict management, and stress management.
EEC731	CO1.	Understanding origin of robotics and types of robotics.
	CO2.	Understanding sensors used in robotics.
	CO3.	Understanding actuators and grippers.
	CO4.	Understanding path planning and programming techniques.
	CO5.	Creating of robot cell and machine interface.
EEC732	CO1.	Understanding concepts of machine learning and data analytics like bagging and boosting, clustering.
	CO2.	Understanding Bayesian learning and Bayesian Network.
	CO3.	Applying Kmeans Clustering and Agglomerative Hierarchical Clustering
	CO4.	Applying decision trees for problem solving.
	CO5.	Analysing a variety of learning algorithms.
EEC811	CO1.	Understanding the concepts of basic building blocks.
	CO2.	Understanding the working of MOS structures and MOSFET.
	CO3.	Understanding properties of different logic family.
	CO4.	Applying software skills like SPICE for circuit simulation and computer aided design technology.
	CO5.	Applying principles of programmable logic devices and VLSI testing.
EEC862	CO1.	Understanding Tanner EDA tool.
	CO2.	Applying the skills of coding and simulation of all logic gates using HDL.
	CO3.	Applying the skills of coding and simulation of encoder, decoder, shift register, flip-flops using Xilinx tool.
	CO4.	Applying Xilinx tool for programming.

	CO5.	Analysing of CMOS inverter, CMOS NAND & CMOS NOR gates and their comparison using Tanner EDA tool.
EEC812	CO1.	Understanding different components of an Optical Fiber Communication link.
	CO2.	Understanding optical source and optical detector operational parameters.
	CO3.	Understanding various losses in fibers.
	CO4.	Understanding WDM, Optical Amplifiers, Optical Switching and networking technology concepts.
	CO5.	Analysing modulation techniques used in optical communication systems.
EEC863	CO1.	Understanding the working principle of OTDR.
	CO2.	Analyzing the characteristics of LED and LASER diode.
	CO3.	Analyzing the characteristics of photodiode and LDR.
	CO4.	Analyzing the characteristics of phototransistor.
	CO5.	Evaluating the attenuation of optical cable.
EHM832	CO1.	Understanding basic and modern concepts of quality and TQM.
	CO2.	Understanding importance of human factor in quality
	CO3.	Understanding the concept of TPM and six sigma along with the applications.
	CO4.	Applying quality control techniques like control charts, 7 QC & 7 New QC tools.
	CO5.	Analysing quality related costs.
EHM833	CO1.	Understanding the concepts and skills needed to run a business successfully.
	CO2.	Applying the steps of project formulation and market research.
	CO3.	Analyzing the techno economic feasibility of a project.
	CO4.	Analyzing various growth strategies in small scale industry.
	CO5.	Evaluating breakeven point, working capital requirements, and taxes.
EEC831	CO1.	Understanding the concepts of Artificial Intelligence and Neural Network.
	CO2.	Understanding the concepts of different types Layer Feed Forward Neural Networks
	CO3.	Applying Biological and Artificial Neuron Models, and various Learning strategies.
	CO4.	Analyzing Perceptron Models and Training Algorithms.
	CO5.	Evaluating problems through BAM Training Algorithms: Storage and Recall Algorithm

EEC815	CO1.	Understanding basic knowledge of Information theory and various coding techniques.
	CO2.	Understanding the coding techniques used for error detection and correction.
	CO3.	Understanding cyclic code and generator polynomials.
	CO4.	Applying error correcting codes.
ECS832	CO1.	Understanding the most common type of cryptographic algorithms used to provide confidentiality, integrity and authenticity.
	CO2.	Understanding different types of cryptosystems.
	CO3.	Applying different approaches of Network security.
	CO4.	Analyzing modes of operation for block ciphers.
	CO5.	Evaluating different hash functions in Information Security.
	CO6.	Creating mechanisms for electronic mail security.