

**SEMESTER - III**

**Second Year of E & Tc Engineering (2019 Course)**

**207005**

**Engineering Mathematics - III**

**Course Outcomes: On completion of the course, learner will be able to –**

- CO1:** Solve higher order linear differential equation using appropriate techniques for modelling, analyzing of electrical circuits and control systems.
- CO2:** Apply concept of Fourier transform & Z-transform and its applications to continuous & discrete systems, signal & image processing and communication systems.
- CO3:** Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing.
- CO4:** Perform vector differentiation & integration, analyze the vector fields and apply to electro- magnetic fields & wave theory.
- CO5:** Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital filters, signal and image processing.

**204181**

**Electronic Circuits**

**Course Outcomes: On completion of the course, learner will be able to –**

- CO1:** Assimilate the physics, characteristics and parameters of MOSFET towards its application as amplifier.
- CO2:** Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.
- CO3:** Analyze and assess the performance of linear and switching regulators, with their variants, towards applications in regulated power supplies.
- CO4:** Explain internal schematic of Op-Amp and define its performance parameters.
- CO5:** Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications.
- CO6:** Understand and compare the principles of various data conversion techniques and PLL with their applications.

204182	<b>Digital Circuits</b>
<p><b>Course Outcomes: On completion of the course, learner will be able to –</b></p> <p><b>CO1:</b> Identify and prevent various hazards and timing problems in a digital design.</p> <p><b>CO2:</b> Use the basic logic gates and various reduction techniques of digital logic circuit.</p> <p><b>CO3:</b> Analyze, design and implement combinational logic circuits.</p> <p><b>CO4:</b> Analyze, design and implement sequential circuits.</p> <p><b>CO5:</b> Differentiate between Mealy and Moore machines.</p> <p><b>CO6:</b> Analyze digital system design using PLD.</p>	
204183	<b>Electrical Circuits</b>
<p><b>Course Outcomes: On completion of the course, learner will be able to –</b></p> <p><b>CO1:</b> Analyze the simple DC and AC circuit with circuit simplification techniques.</p> <p><b>CO2:</b> Formulate and analyze driven and source free RL and RC circuits.</p> <p><b>CO3:</b> Formulate &amp; determine network parameters for given network and analyze the given network using Laplace Transform to find the network transfer function.</p> <p><b>CO4:</b> Explain construction, working and applications of DC Machines / Single Phase &amp; Three Phase AC Motors.</p> <p><b>CO5:</b> Explain construction, working and applications of special purpose motors &amp; understand motors used in electrical vehicles.</p> <p><b>CO6:</b> Analyze and select a suitable motor for different applications.</p>	
204184	<b>Data Structures</b>
<p><b>Course Outcomes: On completion of the course, learner will be able to –</b></p> <p><b>CO1:</b> Solve mathematical problems using C programming language.</p> <p><b>CO2:</b> Implement sorting and searching algorithms and calculate their complexity.</p> <p><b>CO3:</b> Develop applications of stack and queue using array.</p> <p><b>CO4:</b> Demonstrate applicability of Linked List</p> <p><b>CO5:</b> Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity.</p> <p><b>CO6:</b> Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm.</p>	

**SEMESTER - IV**

**Second Year of E & Tc Engineering (2019 Course)**

**204191**

**Signal & Systems**

**Course Outcomes: On completion of the course, learner will be able to –**

**CO1:** Identify, classify basic signals and perform operations on signals.

**CO2:** Identify, Classify the systems based on their properties in terms of input output relation and in terms of impulse response and will be able to determine the convolution between to signals.

**CO3:** Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.

**CO4:** Resolve the signals in complex frequency domain using Laplace Transform, and will be able to apply and analyze the LTI systems using Laplace Transforms.

**CO5:** Define and Describe the probability, random variables and random signals. Compute the probability of a given event, model, compute the CDF and PDF.

**CO6:** Compute the mean, mean square, variance and standard deviation for given random variables using PDF.

**204192**

**Control Systems**

**Course Outcomes: On completion of the course, learner will be able to –**

**CO1:** Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.

**CO2:** Determine the (absolute) stability of a closed-loop control system.

**CO3:** Perform time domain analysis of control systems required for stability analysis.

**CO4:** Perform frequency domain analysis of control systems required for stability analysis.

**CO5:** Apply root-locus, Frequency Plots technique to analyze control systems.

**CO6:** Express and solve system equations in state variable form.

**CO7:** Differentiate between various digital controllers and understand the role of the controllers in Industrial automation.

**204193**

**Principles of Communication Systems**

**Course Outcomes: On completion of the course, learner will be able to –**

**CO1:** To compute & compare the bandwidth and transmission power requirements by analyzing time and frequency domain spectra of signal required for modulation schemes under study.

**CO2:** Describe and analyze the techniques of generation, transmission and reception of Amplitude Modulation Systems.

**CO3:** Explain generation and detection of FM systems and compare with AM systems.

**CO4:** Exhibit the importance of Sampling Theorem and correlate with Pulse Modulation technique (PAM, PWM, and PPM).

**CO5:** Characterize the quantization process and elaborate digital representation techniques (PCM, DPCM, DM and ADM).

**CO6:** Illustrate waveform coding, multiplexing and synchronization techniques and articulate their importance in baseband digital transmission.

**204194**

**Object Oriented Programming**

**Course Outcomes: On completion of the course, learner will be able to –**

**CO1:** Describe the principles of object oriented programming.

**CO2:** Apply the concepts of data encapsulation, inheritance in C++.

**CO3:** Understand Operator overloading and friend functions in C++.

**CO4:** Apply the concepts of classes, methods inheritance and polymorphism to write programs C++.

**CO5:** Apply Templates, Namespaces and Exception Handling concepts to write programs in C++.

**CO6:** Describe and use of File handling in C++.

**204199**

**Employability Skills Development**

**Course Outcomes: On completion of the course, learner will be able to –**

**CO1:** Define personal and career goals using introspective skills and SWOC assessment. Outline and evaluate short-term and long-term goals.

**CO2:** Develop effective communication skills (listening, reading, writing, and speaking), self-management attributes, problem solving abilities and team working & building capabilities in order to fetch employment opportunities and further succeed in the workplace.

**CO3:** Be a part of a multi-cultural professional environment and work effectively by enhancing inter-personal relationships, conflict management and leadership skills.

**CO4:** Comprehend the importance of professional ethics, etiquettes & morals and demonstrate sensitivity towards it throughout certified career.

**CO5:** Develop practically deployable skill set involving critical thinking, effective presentations and leadership qualities to hone the opportunities of employability and excel in the professional environment.

204200	<b>Project Based Learning</b>
<p><b>Course Outcomes: On completion of the course, learner will be able to –</b></p> <p><b>CO1:</b> Identify the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aim and objectives.</p> <p><b>CO2:</b> Contribute to society through proposed solution by strictly following professional ethics and safety measures.</p> <p><b>CO3:</b> Propose a suitable solution based on the fundamentals of electronics and communication engineering by possibly the integration of previously acquired knowledge.</p> <p><b>CO4:</b> Analyze the results and arrive at valid conclusion.</p> <p><b>CO5:</b> Use of technology in proposed work and demonstrate learning in oral and written form.</p> <p><b>CO6:</b> Develop ability to work as an individual and as a team member.</p>	
<b>SEMESTER - V</b>	
<b>Third Year of E &amp; Tc Engineering (2019 Course)</b>	
304181	<b>Digital Communication</b>
<p><b>Course Outcomes: On completion of the course, learner will be able to –</b></p> <p><b>CO1:</b> Apply the statistical theory for describing various signals in a communication system.</p> <p><b>CO2:</b> Understand and explain various digital modulation techniques used in digital communication systems and analyze their performance in presence of AWGN noise.</p> <p><b>CO3:</b> Describe and analyze the digital communication system with spread spectrum modulation.</p> <p><b>CO4:</b> Analyze a communication system using information theoretic approach.</p> <p><b>CO5:</b> Use error control coding techniques to improve performance of a digital communication system.</p>	
304182	<b>Electromagnetic Field Theory</b>
<p><b>Course Outcomes: On completion of the course, learner will be able to –</b></p> <p><b>CO1:</b> Apply the basic electromagnetic principles and determine the fields (E &amp; H) due to the given source.</p> <p><b>CO2:</b> Apply boundary conditions to the boundaries between various media to interpret behavior of the fields on either sides.</p> <p><b>CO3:</b> State, Identify and Apply Maxwell's equations (integral and differential forms) in both the forms (Static, time-varying or Time-harmonic field) for various sources, Calculate the time average power density using Poynting Theorem, Retarded magnetic vector potential.</p> <p><b>CO4:</b> Formulate, Interpret and solve simple uniform plane wave (Helmholtz Equations) equations, and analyze the incident/reflected/transmitted waves at normal incidence.</p>	

**CO5:** Interpret and Apply the transmission line equation to transmission line problems with load impedance to determine input and output voltage/current at any point on the Transmission line, Find input/load impedance, input/load admittance, reflection coefficient, SWR,  $V_{max}/V_{min}$ , length of transmission line using Smith Chart.

**CO6:** Carry out a detailed study, interpret the relevance and applications of Electromagnetics.

**304183**

**Database Management**

**Course Outcomes: On completion of the course, learner will be able to –**

**CO1:** Ability to implement the underlying concepts of a database system.

**CO2:** Design and implement a database schema for a given problem-domain using data model.

**CO3:** Formulate, using SQL/DML/DDDL commands, solutions to a wide range of query and update problems.

**CO4:** Implement transactions, concurrency control, and be able to do Database recovery.

**CO5:** Able to understand various Parallel Database Architectures and its applications.

**CO6:** Able to understand various Distributed Databases and its applications.

**304184**

**Microcontroller**

**Course Outcomes: On completion of the course, learner will be able to –**

**CO1:** Understand the fundamentals of microcontroller and programming.

**CO2:** Interface various electronic components with microcontrollers.

**CO3:** Analyze the features of PIC 18F XXXX.

**CO4:** Describe the programming details in peripheral support.

**CO5:** Develop interfacing models according to applications.

**CO6:** Evaluate the serial communication details and interfaces.

**304185 (C)**

**Fundamentals of JAVA Programming (Elective -I)**

**Course Outcomes: On completion of the course, learner will be able to –**

**CO1:** Understand the basic principles of Java programming language.

**CO2:** Apply the concepts of classes and objects to write programs in Java.

**CO3:** Demonstrate the concepts of methods & Inheritance.

**CO4:** Use the concepts of interfaces & packages for program implementation.

**CO5:** Understand multithreading and Exception handling in Java to develop robust programs.

<b>CO6:</b> Use Graphics class, AWT packages and manage input and output files in Java.	
<b>304190</b>	<b>Skill Development</b>
<b>Course Outcome: After Successfully completing the course-</b>	
<b>CO1:</b> Student should recognize the need to engage in independent and life-long learning in required skill sets	
<b>CO2:</b> Student needs to experience the impact of industries on society by visiting different industries and understand the importance of industrial products for analog and digital circuits and systems.	
<b>CO3:</b> Student has to make use of the modern electronic and IT Engineering Tools and Technologies for solving electronic engineering problems.	
<b>CO4:</b> Student would be able to communicate effectively at different technical and administrative levels.	
<b>CO5:</b> Student will exhibit leadership skills both as an individual and as a member in a team in multidisciplinary environment.	
<b>SEMESTER - VI</b>	
<b>Third Year of E &amp; Tc Engineering (2019 Course)</b>	
<b>304192</b>	<b>Cellular Networks</b>
<b>Course Outcomes: On completion of the course, learner will be able to –</b>	
<b>CO1:</b> Understand fundamentals of wireless communications.	
<b>CO2:</b> Discuss and study OFDM and MIMO concepts.	
<b>CO3:</b> Elaborate fundamentals mobile communication.	
<b>CO4:</b> Describes aspects of wireless system planning.	
<b>CO5:</b> Understand of modern and futuristic wireless networks architecture.	
<b>CO6:</b> Summarize different issues in performance analysis.	
<b>304193</b>	<b>Project Management</b>
<b>Course Outcomes: On completion of the course, learner will be able to –</b>	
<b>CO1:</b> Apply the fundamental knowledge of project management for effectively handling the projects.	
<b>CO2:</b> Identify and select the appropriate project based on feasibility study and undertake its effective planning.	
<b>CO3:</b> Assimilate effectively within the organizational structure of project and handle project management related issues in an efficient manner.	

- CO4:** Apply the project scheduling techniques to create a Project Schedule Plan and accordingly utilize the resources to meet the project deadline.
- CO5:** Identify and assess the project risks and manage finances in line with Project Financial Management Process.
- CO6:** Develop new products assessing their commercial viability and develop skillsets for becoming successful entrepreneurs while being fully aware of the legal issues related to Product development and Entrepreneurship.

**304194**

**Power Devices & Circuits**

**Course Outcomes: On completion of the course, learner will be able –**

- CO1:** To differentiate based on the characteristic parameters among SCR, GTO, MOSFET & IGBT and identify suitability of the power device for certain applications and understand the significance of device ratings.
- CO2:** To design triggering / driver circuits for various power devices.
- CO3:** To evaluate and analyze various performance parameters of the different converters and its topologies.
- CO4:** To understand significance and design of various protections circuits for power devices.
- CO5:** To evaluate the performance of uninterruptible power supplies, switch mode power supplies and battery.
- CO6:** To understand case studies of power electronics in applications like electric vehicles, solar systems. etc....

**304195 (E)**

**Network Security (Elective-II)**

**Course Outcomes: On completion of the course, learner will be able to –**

- CO1:** Analyze attacks on computers and computer security.
- CO2:** Demonstrate knowledge of cryptography techniques.
- CO3:** Illustrate various Symmetric and Asymmetric keys for Ciphers.
- CO4:** Evaluate different Message Authentication Algorithms and Hash Functions.
- CO5:** Get acquainted with various aspects of E-Mail Security.
- CO6:** Assimilate various aspects of Web Security.



304199	<b>Internship</b>
<p><b>Course Outcomes: On completion of the internship, learner will be able to –</b></p> <p><b>CO1:</b> To develop professional competence through internship.</p> <p><b>CO2:</b> To apply academic knowledge in a personal and professional environment.</p> <p><b>CO3:</b> To build the professional network and expose students to future employees.</p> <p><b>CO4:</b> Apply professional and societal ethics in their day to day life.</p> <p><b>CO5:</b> To become a responsible professional having social, economic and administrative considerations.</p> <p><b>CO6:</b> To make own career goals and personal aspirations.</p>	
304200	<b>Mini Project</b>
<p><b>Course Outcome: On completion of the course, student will be able to –</b></p> <p><b>CO1:</b> Understand, plan and execute a Mini Project with team.</p> <p><b>CO2:</b> Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.</p> <p><b>CO3:</b> Prepare a technical report based on the Mini project.</p> <p><b>CO 4:</b> Deliver technical seminar based on the Mini Project work carried out.</p>	
<b>SEMESTER - VII</b>	
<b>Final Year of E &amp; Tc Engineering (2019 Course)</b>	
404181	<b>Radiation and Microwave Theory</b>
<p><b>Course Outcomes: On completion of the course, learner will be able to</b></p> <p><b>CO1:</b> Apply the fundamentals of electromagnetic to derive free space propagation equation and distinguish various performance parameters of antenna.</p> <p><b>CO2:</b> Identify various modes in the waveguide. Compare: coaxial line, rectangular waveguides &amp; Strip lines and identify applications of the same.</p> <p><b>CO3:</b> Explore construction and working of principles passive microwave devices/components.</p> <p><b>CO4:</b> Explore construction and working of principles active microwave devices/components.</p> <p><b>CO5:</b> Analyze the structure, characteristics, operation, equivalent circuits and applications of various microwave solid state active devices.</p> <p><b>CO6:</b> Know the various microwave systems, device set ups of microwave measurement devices and Identify the effect of radiations on environmental sustainability.</p>	

404182	<b>VLSI Design and Technology</b>
<p><b>Course Outcomes: On completion of the course, learner will be able to</b></p> <p><b>CO1:</b> Develop effective HDL codes for digital design.</p> <p><b>CO2:</b> Apply knowledge of real time issues in digital design.</p> <p><b>CO3:</b> Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.</p> <p><b>CO4:</b> Design CMOS circuits for specified applications.</p> <p><b>CO5:</b> Analyze various issues and constraints in design of an ASIC.</p> <p><b>CO6:</b> Apply knowledge of testability in design and Build In Self Test (BIST) circuit.</p>	
404183	<b>Cloud Computing</b>
<p><b>Course Outcomes: On completion of the course, learner will be able to</b></p> <p><b>CO1:</b> Understand the basic concepts of Cloud Computing.</p> <p><b>CO2:</b> Describe the underlying principles of different Cloud Service Models.</p> <p><b>CO3:</b> Classify the types of Virtualization.</p> <p><b>CO4:</b> Examine the Cloud Architecture and understand the importance of Cloud Security.</p> <p><b>CO5:</b> Develop applications on Cloud Platforms.</p> <p><b>CO6:</b> Evaluate distributed computing and the Internet of Things.</p>	
404184 (E)	<b>Modernized IoT (Elective - III)</b>
<p><b>Course Outcomes: On completion of the course, learner will be able to –</b></p> <p><b>CO1:</b> Comprehend and analyze concepts of sensors, actuators, IoT and IoE.</p> <p><b>CO2:</b> Interpret IoT Architecture Design Aspects.</p> <p><b>CO3:</b> Comprehend the operation of IoT protocols.</p> <p><b>CO4:</b> Describe various IoT boards, interfacing, and programming for IoT.</p> <p><b>CO5:</b> Illustrate the technologies, Catalysts, and precursors of IIoT using suitable use cases.</p> <p><b>CO6:</b> Provide suitable solution for domain specific applications of IoT.</p>	

404185 (B)	<b>Electronics Product Design (Elective - IV)</b>
<p><b>Course Outcomes: On completion of the course, learner will be able to-</b></p> <p><b>CO1:</b> Understand and explain design flow of design of electronics product.</p> <p><b>CO2:</b> Associate with various circuit design issues and testing.</p> <p><b>CO3:</b> Inferring different software designing aspects and the Importance of product test &amp; test specifications.</p> <p><b>CO4:</b> Summarizing printed circuit boards and different parameters.</p> <p><b>CO5:</b> Estimating assorted product design aspects.</p> <p><b>CO6:</b> Exemplifying special design considerations and importance of documentation.</p>	
404188	<b>Project Phase – I</b>
<p><b>Course Outcomes:</b></p> <p><b>CO1:</b> Demonstrate a sound technical knowledge in field of E&amp;TC in the form of project.</p> <p><b>CO2:</b> Undertake real life problem identification, formulation and solution.</p> <p><b>CO3:</b> Design engineering solutions to complex problems utilizing a systematic approach.</p> <p><b>CO4:</b> Demonstrate the knowledge, effective communication skills and attitudes as professional engineer.</p>	
<b>SEMESTER - VIII</b>	
<b>Final Year of E &amp; Tc Engineering (2019 Course)</b>	
404190	<b>Fiber Optic Communication</b>
<p><b>Course Outcomes: On completion of the course, the learner will be able to -</b></p> <p><b>CO1:</b> Explain the working of components and measurement equipments in optical fiber networks.</p> <p><b>CO2:</b> Calculate the important parameters associated with optical components used in fiber optic telecommunication systems.</p> <p><b>CO3:</b> Compare and contrast the performance of major components in optical links.</p> <p><b>CO4:</b> Evaluate the performance viability of optical links using the power and rise time budget analysis.</p> <p><b>CO5:</b> Design digital optical link by proper selection of components and check its viability using simulation tools.</p> <p><b>CO6:</b> Compile technical information related to state of art components, standards, simulation tools and current technological trends by accessing the online resources to update their domain knowledge.</p>	

<b>404191 (E)</b>	<b>Mobile Computing (Elective - V)</b>
<p><b>Course Outcomes: On completion of the course, learner will be able to –</b></p> <p><b>CO1:</b> Understand concepts of Mobile Communication.</p> <p><b>CO2:</b> Analyze next generation Mobile Communication System.</p> <p><b>CO3:</b> Understand network layers of Mobile Communication.</p> <p><b>CO4:</b> Understand IP and Transport layers of Mobile Communication.</p> <p><b>CO5:</b> Study of different mathematical models. <b>CO6:</b> Understand different mobile applications.</p>	
<b>404192 (C)</b>	<b>Remote Sensing (Elective - VI)</b>
<p><b>Course Outcomes: On completion of the course, learner will be able to-</b></p> <p><b>CO1:</b> Describe the concepts of remote sensing and electromagnetic radiation interaction.</p> <p><b>CO2:</b> Explain the sensors characteristics and analyze its resolution.</p> <p><b>CO3:</b> Classify different types of satellite data products and design various color composites.</p> <p><b>CO4:</b> Describe the fundamentals of microwave remote sensing.</p> <p><b>CO5:</b> Analyze GNSS signal structure and augmentation systems. <b>CO6:</b> Demonstrate and describe real life applications of remote sensing.</p>	
<b>404194</b>	<b>Digital Business Management</b>
<p><b>Course Outcomes: On completion of the course, learner will be able to –</b></p> <p><b>CO1:</b> Analyze attacks on computers and computer security.</p> <p><b>CO2:</b> Demonstrate knowledge of cryptography techniques.</p> <p><b>CO3:</b> Illustrate various Symmetric and Asymmetric keys for Ciphers.</p> <p><b>CO4:</b> Evaluate different Message Authentication Algorithms and Hash Functions.</p> <p><b>CO5:</b> Get acquainted with various aspects of E-Mail Security.</p> <p><b>CO6:</b> Assimilate various aspects of Web Security.</p>	