AURORA'S TECHNOLOGICAL AND RESEARCH INSTITUTE
(Approved by AICTE and Affiliated to JNTUH) (Accredited by NAAC with 'A' Grade)
Parvathapur, Uppal, Medipally (M), Medchal (D), Telangana, Hyderabad - 500 098

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE OUTCOMES (COs)
B.Tech. 1st Year I Sem Syllabus (w.e.f AY 2018-19) Common for EEE, CSE & IT

Course Code	Course Title / Name	Course Outcomes
MA101BS	Mathematics - I	**At the end of this course, each student should beable to:** **CO1:** Write the matrix representation of a set of linear equations and to analyse the solutionof the system of equations. **CO2:** Find the Eigen values and Eigen vectors. **CO3:** Reduce the quadratic form to canonical formusing orthogonal transformations. **CO4:** Analyse the nature of sequence and series. **CO5:** Solve the applications on the mean valuetheorems. **CO6:** Evaluate the improper integrals using Betaand Gamma functions. **CO7:** Find the extreme values of functions of two variables with/ without constraints.
CH102BS	Chemistry	**At the end of this course, each student should beable to:** **CO1:** The knowledge of atomic, molecular and electronic changes, band theory related toconductivity. **CO2:** The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its

		treatments. **CO3:** The required skills to get clear concepts on basic spectroscopy and application to medicaland other fields. **CO4:** The knowledge of configurationally and conformational analysis of molecules and reaction mechanisms.
EE103ES	Basic Electrical Engineering	**At the end of this course, each student should beable to:** **CO1:** To analyze and solve electrical circuits using network laws and theorems. **CO2:** To understand and analyze basic Electric and Magnetic circuits. **CO3:** To study the working principles of Electrical Machines. **CO4:** To introduce components of Low Voltage Electrical Installations .
ME105ES	Engineering Workshop	**At the end of this course, each student should beable to:** **CO1:** Study and practice on machine tools and their operations . **CO2:** Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding. **CO3:** Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling. **CO4:** Apply basic electrical engineering knowledge for house wiring practice.
EN105HS	English	**At the end of this course, each student should beable to:** **CO1:** Use English Language effectively in spokenand written forms. **CO2:** Comprehend the given texts and respond appropriately. **CO3:** Communicate confidently in various contexts and different cultures.

		CO4: Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.
CH106BS	Engineering Chemistry Lab	**At the end of this course, each student should beable to:** **CO1:** Determination of parameters like hardnessand chloride content in water. **CO2:** Estimation of rate constant of a reaction from concentration – time relationships. **CO3:** Determination of physical properties like adsorption and viscosity. **CO4:** Calculation of Rf values of some organic molecules by TLC technique.
EN107HS	English Language and Communication Skills Lab	**At the end of this course, each student should beable to:** **CO1:** Better understanding of nuances of English language through audio- visual experience and group activities . **CO2:** Neutralization of accent for intelligibility. **CO3:** Speaking skills with clarity and confidence which in turn enhances their employability skills.
EE108ES	Basic Electrical Engineering Lab	**At the end of this course, each student should beable to:** **CO1:** Get an exposure to basic electrical laws. **CO2:** Understand the response of different types of electrical circuits to different excitations. **CO3:** Understand the measurement, calculation and relation between the basic electrical parameters. **CO4:** Understand the basic characteristics of transformers and electrical machines.

B.Tech. 1st Year II Sem Syllabus (w.e.f AY 2018-19) Common for EEE, CSE & IT

Course Code	Course Title / Name	Course Outcomes
MA201BS	Mathematics - II	**At the end of this course, each student should beable to:** **CO1:** Identify whether the given differential equation of first order is exact or not. **CO2:** Solve higher differential equation and apply the concept of differential equation to real world problems . **CO3:** Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and Gravity for cubes, sphere and rectangular parallelepiped. **CO4:** Evaluate the line, surface and volume integrals and converting them from one to another.
AP202BS	Applied Physics	**At the end of this course, each student should beable to:** **CO1:** The student would be able to learn the fundamental concepts on Quantum behaviour of matter in its micro state. **CO2:** The knowledge of fundamentals of Semiconductor physics, Optoelectronics, Lasers and fibre optics enable the students to apply to various systems like communications ,solar cell, photo cells and so on. **CO3:** Design, characterization and study of properties of material help the students toprepare new materials for various engineering applications. **CO4:** The course also helps the students to be exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials.
CS203ES	Programming For Problem Solving	**At the end of this course, each student should beable to:** **CO1:** To write algorithms and to draw flowcharts

		for solving problems. **CO2:** To convert the algorithms/flowcharts to C programs. **CO3:** To code and test a given logic in C programming language. **CO4:** To decompose a problem into functions andto develop modular reusable code. **CO5:** To use arrays, pointers, strings and structuresto write C programs. **CO6:** Searching and sorting problems.
ME204ES	Engineering Graphics	**At the end of this course, each student should beable to:** **CO1:** Preparing working drawings to communicatethe ideas and information. **CO2:** Read, understand and interpret engineering drawings.
AP205BS	Applied Physics Lab	**At the end of this course, each student should beable to:** **CO1 :** Apply the various procedures and techniquesfor the experiments. **CO2 :** Use the different measuring devices and meters to record the data with precision. **CO3 :** Apply the mathematical concepts/equationsto obtain quantitative results. **CO4 :** Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.
CS206ES	Programming For Problem Solving Lab	**At the end of this course, each student should beable to:** **CO1:** Formulate the algorithms for simple Problems. **CO2:** Translate given algorithms to a working andcorrect program. **CO3:** Correct syntax errors as reported by the compilers . **CO4:** Identify and correct logical errors encountered during execution. **CO5:** Represent and manipulate data with arrays, strings and structures.

		CO6: Use pointers of different types . **CO7:** Create, read and write to and from simple textand binary files. **CO8:** Modularize the code with functions so that they can be reused.
*MC209ES	Environmental Science	**At the end of this course, each student should beable to:** Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

B.Tech. II Year I Sem R18 Syllabus Electronics And Communication Engineering

Course Code	Course Title / Name	Course Outcomes
EC301PC	Electronic Devices and Circuits	**At the end of this course, each student should beable to:** **CO1:** Know the characteristics of various components. **CO2:** Understand the utilization of components. **CO3:** Understand the biasing techniques **CO4:** Design and analyze small signal amplifier circuits.
EC302PC	Network Analysis and Transmission Lines	**At the end of this course, each student should beable to:** **CO1:** Gain the knowledge on basic RLC circuits behavior. **CO2:** Analyze the Steady state and transient analysis of RLC Circuits. **CO3:** Know the characteristics of two port network parameters. **CO4:** Analyze the transmission line parameters and configurations.
EC303PC	Digital System Design	**At the end of this course, each student should beable to:** **CO1:** Understand the numerical information in different forms and Boolean Algebra theorems **CO2:** Postulates of Boolean algebra and to minimize combinational functions **CO3:** Design and analyze combinational and

		sequential circuits **CO4:** Known about the logic families and realization of logic gates.
EC304PC	Signals and Systems	**At the end of this course, each student should beable to:** **CO1:** Differentiate various signal functions. **CO2:** Represent any arbitrary signal in time and frequency domain. **CO3:** Understand the characteristics of linear time invariant systems. **CO4:** Analyze the signals with different transform technique
EC305ES	Probability Theory and Stochastic Processes	**At the end of this course, each student should beable to:** **CO1:** Understand the concepts of Random Process and its Characteristics. **CO2:** Understand the response of linear time Invariant system for a Random Processes. **CO3:** Determine the Spectral and temporal characteristics of Random Signals. **CO4:** Understand the concepts of Noise in Communication systems.
EC306PC	Electronic Devices and Circuits Lab	**At the end of this course, each student should beable to:** **CO1:** Analyze circuits in different biasing modes. **CO2:** Identify the suitable devices based on characteristics and operating conditions **CO3:** Design circuits based on specifications. **CO4:** Distinguish various devices and operate safely within the limit of operation. **CO5:** Understand the functioning of various electronic circuits.
MC309	Constitution of India	**At the end of this course, each student should beable to:** **CO1 :** Able to understand historical background of the constitutional making and its importance for building a democratic India, the structureof Indian government, the structure of state government, the local Administration.

		CO2: Able to apply the knowledge on directive principle of state policy, the knowledge in strengthening of the constitutional institutions like CAG, Election Commissionand UPSC for sustaining democracy. **CO3:** Able to analyze the History, features of Indian constitution, the role Governor and Chief Minister, role of state election commission, the decentralization of power between central, state and local self-government. **CO4:** Able to evaluate Preamble, Fundamental Rights and Duties, Zilla Panchayat, block level organization, various commissions of viz SC/ST/OBC and women.

B.Tech. II Year II Sem R18 Syllabus Electronics And Communication Engineering

Course Code	Course Title / Name	Course Outcomes
MA401BS	Laplace Transforms, Numerical Methods & Complex Variables	**At the end of this course, each student should beable to:** **CO1:** Use the Laplace transforms techniques forsolving ODE's **CO2:** Find the root of a given equation. **CO3:** Estimate the value for the given data using interpolation **CO4:** Find the numerical solutions for a given ODE's **CO5:** Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems. **CO6:** Taylor's and Laurent's series expansions of complex Function
EC402PC	Electromagnetic Fields and Waves	**At the end of this course, each student should beable to:** **CO1:** Get the knowledge of Basic Laws, Concepts and proofs related to Electrostatic Fields and Magnetostatic Fields. **CO2:** Distinguish between the static and time-varying fields, establish the corresponding sets of Maxwell's Equations and Boundary Conditions. **CO3:** Analyze the Wave Equations for good conductors, good dielectrics and evaluate the UPW Characteristics for several practical media of interest. **CO4:** To analyze completely the rectangular waveguides, their mode characteristics, and design waveguides for solving practical problems.
EC403PC	Analog and Digital Communications	**At the end of this course, each student should beable to:** **CO1:** Analyze and design of various continuous

		wave and angle modulation and demodulation techniques **CO2:** Understand the effect of noise present in continuous wave and angle modulation techniques. **CO3:** Attain the knowledge about AM , FM Transmitters and Receivers **CO4:** Analyze and design the various Pulse Modulation Techniques. **CO5:** Understand the concepts of Digital Modulation Techniques and Baseband transmission.
EC404PC	Linear IC Applications	**At the end of this course, each student should beable to:** **CO1:** A thorough understanding of operational amplifiers with linear integrated circuits. **CO2:** Attain the knowledge of functional diagrams and applications of IC 555 and IC 565 **CO3:** Acquire the knowledge about the Data converters.
EC405PC	Electronic Circuit Analysis	**At the end of this course, each student should beable to:** **CO1:** Design the multistage amplifiers and understand the concepts of High Frequency Analysis of Transistors. **CO2:** Utilize the Concepts of negative feedback to improve the stability of amplifiers and positive feedback to generate sustained oscillations . **CO3:** Design and realize different classes of Power Amplifiers and tuned amplifiers useable for audio and Radio applications. **CO4:** Design Multivibrators and sweep circuits for various applications.
EC406PC	Analog and Digital Communications Lab	**At the end of this course, each student should beable to:** **CO1:** Understand basic elements of a communication system **CO2:** Conduct analysis of baseband signals in time domain and in frequency domain

		CO3: Demonstrate understanding of various analogand digital modulation and demodulation techniques techniques. **CO4:** Analyse the performance of modulation and demodulation techniques in various transmission environments **CO5:** Appreciate the importance of synchronisation in communication systems
EC407PC	IC Applications Lab	**At the end of this course, each student should beable to:** **CO1:** Students will have a thorough understandingof operational amplifier(741) . **CO2:** Students will be able to design circuits using operational amplifiers for various applications. **CO3:** Students will be able to design various combinational circuits using various Digital Integrated IC's. **CO4:** They can know the differences between Linear and Digital Integrated IC's. **CO5:** Students will demonstrate their knowledge by designing analog circuits & digital circuits.
EC408PC	Electronic Circuit Analysis Lab	**At the end of this course, each student should beable to:** **CO1:** Comprehend the fundaments of multistage amplifiers, feedback, power amplifiers and oscillator circuits **CO2:** Analyze the circuit design process and simulate the common base, common emitter and common collector amplifier circuits **CO3:** Know the origin of failure of a circuit when itis in an application **CO4:** Acquaint with the design and simulate the RC coupled and Cascade amplifier circuits **CO5:** Discriminate the design and simulate various oscillator circuits **CO6:** Interpret to design and simulate Darlingtonpair, **CO7:** Create the design and simulate the cascade,

		class A power amplifier circuits, and single tuned voltage amplifier circuits
*MC409	Gender Sensitization Lab	**At the end of this course, each student should beable to:** **CO1:** Students will have developed a better understanding of important issues related to gender in contemporary India. **CO2:** Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film. **CO3:** Students will attain a finer grasp of how gender discrimination works in our society and how to counter it. **CO4:** Students will acquire insight into the gendered division of labour and its relation topolitics and economics. **CO5:** Men and women students and professionals will be better equipped to work and live together as equals. CO6: Students will develop a sense of appreciationof women in all walks of life. CO7: Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

B.Tech. III Year I Sem R18 Syllabus Electronics And Communication Engineering

Course Code	Course Title / Name	Course Outcomes
EC501PC	Microprocessors & Microcontrollers	**At the end of this course, each student should beable to:** **CO1:** Understands the internal architecture, organization and assembly language programming of 8086 processors. **CO2:** Understands the internal architecture, organization and assembly language programming of 8051/controllers **CO3:** Understands the interfacing techniques to8086 and 8051 based systems. **CO4:** Understands the internal architecture of ARM processors and basic concepts of advancedARM processors.
EC502PC	Data Communications and Networks	**At the end of this course, each student should beable to:** **CO1:** Know the Categories and functions of variousData communication Networks **CO2:** Design and analyze various error detection techniques. **CO3:** Demonstrate the mechanism of routing thedata in network layer **CO4:** Know the significance of various Flow control and Congestion control Mechanisms **CO5:** Know the Functioning of various Application layer Protocols.
EC503PC	Control Systems	**At the end of this course, each student should beable to:** **CO1:** Understand the modeling of linear-time- invariant systems using transfer function andstate space representations. **CO2:** Understand the concept of stability and its assessment for linear-time invariant systems. **CO3:** Design simple feedback controllers.

SM504MS	Business Economics & Financial Analysis	**At the end of this course, each student should beable to:** The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company.
EC511PE	Professional Elective – I : Computer Organization & Operating Systems	**At the end of this course, each student should beable to:** **CO1:** Able to visualize the organization of differentblocks in a computer. **CO2:** Able to use micro-level operations to control different units in a computer. **CO3:** Able to use Operating systems in a computer.
EC512PE	Professional Elective – I : Error Correcting Codes	**At the end of this course, each student should beable to:** **CO1:** Able to transmit and store reliable data and detect errors in data through coding. **CO2:** Able to understand the designing of various codes like block codes, cyclic codes, convolution codes, turbo codes and space codes.
EC513PE	Professional Elective – I : Electronic Measurements and Instrumentation	**At the end of this course, each student should beable to:** **CO1:** Measure electrical parameters with different meters and understand the basic definition of measuring parameters. **CO2:** Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals. **CO3:** Operate an Oscilloscope to measure varioussignals. **CO4:** Measure various physical parameters by appropriately selecting the transducers.
EC505PC	Microprocessors & Microcontrollers Lab	**At the end of this course, each student should beable to:** **CO1:** Demonstrate ability to handle arithmetic operations using assembly language

		programming in TASM and training boards **CO2:** Demonstrate ability to handle logical operations using assembly language programming in TASM **CO3:** Demonstrate ability to handle string instructions using assembly language programming in TASM **CO4:** Demonstrate ability to handle sorting operations and using assembly language programming in TASM
EC506PC	Data Communications and Networks Lab	**At the end of this course, each student should beable to:** **CO1:** Understand the rudiments of how computers communicate. **CO2:** Be familiar with the architecture of a numberof different networks. **CO3:** Understand the principles of protocol layering. **CO4:** Be familiar with modern communication systems. **CO5:** Understand the basic aspects of packet-based protocol design and implementation.
EN508HS	Advanced Communication Skills Lab	**At the end of this course, each student should beable to:** **CO1:** To improve fluency in English through a well developed vocabulary and enable them to listen at normal conservational speed by educated English speakers and respond appropriately in different socio cultural and professional context **CO2:** Further, they would be required to communicate their ideas relevantly and coherently in writing **CO3:** To prepare all the students for their placements **CO4:** Learn to overcome stage fear and make presentations with ease **CO5:** Learn how to pronounce words using the rules they have been taught

*MC510	Intellectual Property Rights	**At the end of this course, each student should beable to:** **CO1:** Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP. **CO2:** Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development. **CO3:** Identify activities and constitute IP infringements and the remedies available to the IP owner and describe the precautious steps to be taken to prevent infringement of proprietary rights in products and technologydevelopment. **CO4:** Be familiar with the processes of Intellectual Property Management (IPM) and various approaches for IPM and conducting IP and IPM auditing and explain how IP can be managed as a strategic resource and suggest IPM strategy. **CO5:** Be able to anticipate and subject to critical analysis arguments relating to the development and reform of intellectual property right institutions and their likely impact on creativity and innovation. **CO6:** Be able to demonstrate a capacity to identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing;

B.Tech. III Year II Sem R18 Syllabus Electronics And Communication Engineering

Course Code	Course Title / Name	Course Outcomes
EC601PC	Antennas And Propagation	**At the end of this course, each student should beable to:** **CO1:** Characterize the antennas based on frequency, configure the geometry and establish the radiation patterns of VHF, UHF and Microwave antennas and also antenna arrays. **CO2:** Specify the requirements for microwave measurements and arrange a setup to carry out the antenna far zone pattern and gain measurements in the laboratory. **CO3:** Classify the different wave propagation mechanisms, determine the characteristicfeatures of different wave propagations, and estimate the parameters involved.
EC602PC	Digital Signal Processing	**At the end of this course, each student should beable to:** **CO1:** Understand the LTI system characteristics and Multirate signal processing. **CO2:** Understand the inter-relationship betweenDFT and various transforms. **CO3:** Design a digital filter for a given specification. **CO4:** Understand the significance of various filter structures and effects of round off errors.
EC603PC	VLSI DESIGN	**At the end of this course, each student should beable to:** **CO1:** Acquire qualitative knowledge about the fabrication process of integrated circuits using MOS transistors. **CO2:** Draw the layout of any logic circuit which helps to understand and estimate parasiticeffect of any logic circuit **CO3:** Design building blocks of data path systems, memories and simple logic circuits using PLA, PAL, FPGA and CPLD. **CO4:** Understand different types of faults that can

		occur in a system and learn the concept of testing and adding extra hardware to improve testability of system.
EC611PE	Professional Elective – II: Object Oriented Programming through Java	**At the end of this course, each student should beable to:** **CO1:** Develop Applications for Range of Problems Using Object-Oriented Programming Techniques **CO2:** Design Simple Graphical User Interface Applications.
EC612PE	Professional Elective – II: Mobile Communications and Networks	**At the end of this course, each student should beable to:** **CO1:** Known the evolution of cellular and mobile communication system. **CO2:** The student will be able to understand Co-Channel and Non-Co-Channel interferences. **CO3:** Understand impairments due to multipath fading channel and how to overcome the different fading effects. **CO4:** Familiar with cell coverage for signal and traffic, diversity, techniques, frequency management, Channel assignment and types of handoff. **CO5:** Know the difference between cellular and Adhoc Networks and design goals of MAC Layer protocol.
EC613PE	Professional Elective – II: Embedded System Design	**At the end of this course, each student should beable to:** **CO1:** To understand the selection procedure of Processors in the embedded domain. **CO2:** Design Procedure for Embedded Firmware. **CO3:** To visualize the role of Real time OperatingSystems in Embedded Systems. **CO4:** To evaluate the Correlation between task synchronization and latency issues
	Open Elective – I	Please Refer to ANNEXURE-I
EC604PC	Digital Signal Processing Lab	**At the end of this course, each student should beable to:** **CO1:** Understand the handling of discrete/digital

		signals using MATLAB **CO2:** Understand the basic operations of Signal processing **CO3:** Analyse the spectral parameter of window functions **CO4:** Design IIR, and FIR filters for band pass, bandstop, low pass and high pass filters. **CO5:** Design the signal processing algorithm using MATLAB & VLAB.
EC605PC	e – CAD Lab	**At the end of this course, each student should beable to:** **CO1:** Demonstrate basic concepts of the AutoCAD software **CO2:** Apply basic concepts to develop construction (drawing) techniques **CO3:** Ability to manipulate drawings through editing and plotting techniques **CO4:** Understand geometric construction **CO5:** Produce template drawings **CO6:** Produce 2D Orthographic Projections **CO7:** Understand and demonstrate dimensioning concepts and techniques **CO8:** Understand Section and Auxiliary Views **CO9:** Become familiar with the use of Blocks, Design Center, and Tool Palettes **CO10:** Become familiar with Solid Modeling concepts and techniques.
EC606PC	Scripting Languages Lab	**At the end of this course, each student should beable to:** **CO1:** Ability to understand the differences between Scripting languages and programming languages **CO2:** Able to gain some fluency programming in Ruby, Perl, TCL
*MC609	Environmental Science	**At the end of this course, each student should beable to:** Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental

		regulations which in turn helps in sustainable development

B.Tech. IV Year I Sem R18 Syllabus Electronics And Communication Engineering

Course Code	Course Title / Name	Course Outcomes
EC701PC	Microwave Engineering	**At the end of this course, each student should beable to:** **CO1:** To analyze completely the rectangular waveguides, their mode characteristics, and design waveguides for solving practical microwave transmission line problems. **CO2:** To distinguish between the different types of waveguide and ferrite components,explain their functioning and select proper components for engineering applications. **CO3:** To distinguish between the methods of power generation at microwave frequencies, derive the performance characteristics of 2-Cavity and Relfex Klystrons, Magnetrons, TWTs and estimate their efficiency levels, and solve related numerical problems **CO4:** To realize the need for solid state microwave sources, understand the concepts of TEDs, RWH Theory and explain the salient featuresof Gunn Diodes and ATT Devices. **CO5:** To establish the properties of Scattering Matrix, formulate the S-Matrix for variousmicrowave junctions, and understand theutility of S-parameters in microwave component design. **CO6:** To set up a microwave bench, establish the measurement procedure and conduct the experiments in microwave lab for measurement of various microwave parameters.
EC721PE	**Professional Elective – II** Computer Networks	**At the end of this course, each student should beable to:** **CO1:** Students should understand and explore the basics of Computer Networks and Various

		Protocols. He/ She will be in a position to understand the World Wide Web concepts. **CO2:** Students will be in a position to administratea network and flow of information further he/she can understand easily the concepts of network security, Mobile and ad hoc networks.
EC722PE	**Professional Elective – II** FPGA Programming	**At the end of this course, each student should beable to:** **CO1:** Demonstrate various architectures and device technologies of PLDs and CPLDs **CO2:** llustrate aspects of FPGA Architectures. **CO3:** Explain SRAM Programmable FPGAs **CO4:** Explain Anti-Fuse Programmed FPGAs **CO5:** Analyze System level Design and their application for Combinational and Sequential Circuits
EC723PE	**Professional Elective – II** Coding Theory and Techniques	**At the end of this course, each student should beable to:** **CO1:** Learn measurement of information and errors. **CO2:** Obtain knowledge in designing various source codes and channel codes. **CO3:** Design encoders and decoders for block andcyclic codes. **CO4:** Understand the significance of codes in various applications.
EC724PE	**Professional Elective – II** Soft Computing Techniques	**At the end of this course, each student should beable to:** **CO1:** Identify and employ suitable soft computing techniques in classification and optimization problems. **CO2:** Design hybrid systems to suit a given real – life problem.
EC731PE	**Professional Elective– III** Wireless Communications and Networks	**At the end of this course, each student should beable to:** **CO1:** Understand cellular system design concepts. **CO2:** Analyze various multiple access schemes used in wireless communication.

		CO3: Demonstrate wireless Local and Wide area networks and their specifications. **CO4:** Familiar with some of the existing and emerging wireless standards. **CO5:** Understand the concept of orthogonal frequency division multiplexing.
EC732PE	**Professional Elective– III** Internet of Things	**At the end of this course, each student should beable to:** **CO1:** Interpret the impact and challenges posed byIoT networks leading to new architectural models. **CO2:** Compare and contrast the deployment of smart objects and the technologies to connectthem to network. **CO3:** Appraise the role of IoT protocols for efficient network communication. **CO4:** Elaborate the need for Data Analytics andSecurity in IoT. **CO5:** Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.
EC733PE	**Professional Elective– III** Radar Systems	**At the end of this course, each student should beable to:** **CO1:** Derive the complete radar range equation. **CO2:** Understand the need and functioning of CW, FM-CW and MTI radars **CO3:** Known various Tracking methods. **CO4:** Derive the matched filter response characteristics for radar receivers.
EC734PE	**Professional Elective– III** Embedded Sytem Design	**At the end of this course, each student should beable to:** **CO1:** Expected to understand the selection procedure of Processors in the embedded domain. **CO2:** Design Procedure for Embedded Firmware. **CO3:** Expected to visualize the role of Real time Operating Systems in Embedded Systems. **CO4:** Expected to evaluate the Correlation between task synchronization and latency issues

EC741PE	**Professional Elective– IV** Optimization Techniques	**At the end of this course, each student should beable to:** **CO1:** Explain the need of optimization of engineering systems **CO2:** Understand optimization of electrical and electronics engineering problems **CO3**: Apply classical optimization techniques, linear programming, simplex algorithm, transportation problem **CO4:** Apply unconstrained optimization and constrained non-linear programming and dynamic programming **CO5:** Formulate optimization problems.
EC742PE	**Professional Elective– IV** Object Oriented Programming	**At the end of this course, each student should beable to:** **CO1:** Able to solve real world problems using OOP techniques. **CO2:** Able to understand the use of abstract classes. **CO3:** Able to solve problems using java collection framework and I/o classes. **CO4:** Able to develop multithreaded applicationswith synchronization. **CO5:** Able to develop applets for web applications. **CO6:** Able to design GUI based applications
EC743PE	**Professional Elective– IV** Electronic Measurements and Instrumentation	**At the end of this course, each student should beable to:** **CO1:** Identify the various electronic instruments based on their specifications for carrying outa particular task of measurement. **CO2:** Measure various physical parameters by appropriately selecting the transducers. **CO3:** Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.
EC744PE	**Professional Elective– IV** Artificial Intelligence	**At the end of this course, each student should beable to:** **CO1:** Ability to formulate an efficient problem

		space for a problem expressed in natural language. **CO2:** Select a search algorithm for a problem and estimaate its time and space complexities. **CO3:** Possess the skill for representing knowledgeusing the appropriate technique for a given problem. **CO4:** Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.
EC702PC	VLSI Design	**At the end of this course, each student should beable to:** **CO1:** Acquire qualitative knowledge about the fabrication process of integrated circuit usingMOS transistors. **CO2:** Choose an appropriate inverter depending on specifications required for a circuit **CO3:** Draw the layout of any logic circuit which helps to understand and estimate parasitic ofany logic circuit **CO4:** Design different types of logic gates using CMOS inverter and analyze their transfer characteristics **CO5:** Provide design concepts required to design building blocks of data path using gates. **CO6:** Design simple memories using MOS transistors and can understand design of large memories. **CO7:** Design simple logic circuit using PLA, PAL,FPGA and CPLD. **CO8:** Understand different types of faults that can occur in a system and learn the concept of testing and adding extra hardware to improve testability of system
EC703PC	VLSI and E-CAD Lab	**At the end of this course, each student should beable to:** **CO1:** To learn the HDL programming language. **CO2:** To learn the simulation of basic gates usingthe basic programming language.

		CO3: To learn the simulation of combinational circuits using programming language. **CO4:** To learn the simulation of sequential circuitsusing programming language. **CO5:** To learn the synthesis and layouts of analog and digital CMOS circuits. **CO6:** To develop an ability to simulate and synthesize various digital circuits
EC704PC	Microwave Engineering Lab	**At the end of this course, each student should beable to:** **CO1:** Design test bench for measurement of various microwave parameters. **CO2:** Analyze various characteristics of microwave junctions and design of microwave communication links. **CO3:** Integrating a wide range of Microwave components into one design oriented frame work **CO4:** Design and solve real world problems **CO5:** Use a microwave test bench in analyzing various types of microwave measurements. **CO6:** Measure the various parameters in microwave engineering. **CO7:** Design & analyze the micro wave integrated circuits.
EC705PC	Industry Oriented Mini Project	**At the end of this course, each student should beable to:** **CO1:** Formulate a real world problem and developits requirements **CO2:** Student will be exposed to industrial awareness **CO3:** Self learning technologies, methods and/or techniques that contribute to the software solution of the project.
EC706PC	Seminar	**At the end of this course, each student should beable to:** **CO1:** Ability to work in actual working environment. **CO2:** Ability to utilize technical resources

		CO3: Ability to write technical documents and giveoral presentations related to the work completed.

B.Tech. IV Year II Sem R18 Syllabus Electronics and Communication Engineering

Course Code	Course Title / Name	Course Outcomes
	Open Elective – III	Please Refer to ANNEXURE-I
EC851PE	**Professional Elective –V** Network Security and Cryptography	**At the end of this course, each student should beable to:** **CO1:** Describe network security fundamental concepts and principles **CO2:** Encrypt and decrypt messages using block ciphers and network security technology and protocols **CO3:** Analyze key agreement algorithms to identifytheir weaknesses **CO4:** Identify and assess different types of threats, malware, spyware, viruses, vulnerabilities
EC853PE	**Professional Elective –V** Optical Communications	**At the end of this course, each student should beable to:** **CO1:** Understand and analyze the constructional parameters of optical fibres. **CO2:** Be able to design an optical system. **CO3:** Estimate the losses due to attenuation,absorption, scattering and bending. **CO4:** Compare various optical detectors and choose suitable one for different applications.
EC854PE	**Professional Elective –V** Machine Learning	**At the end of this course, each student should beable to:** **CO1:** Understand the concepts of computational intelligence like machine learning **CO2:** Ability to get the skill to apply machine learning techniques to address the real time problems in different areas **CO3:** Understand the Neural Networks and its usage in machine learning application.
EC861PE	**Professional Elective –VI** Actuators and Robot Systems	**At the end of this course, each student should beable to:** **CO1:** Undertake kinematics analysis of robot manipulators.

		CO2: Understand the importance of robot dynamics. **CO3:** Have an understanding of the functionalityand limitations of robot actuators and sensors.
EC862PE	**Professional Elective –VI** Analog CMOS IC Design	**At the end of this course, each student should beable to:** **CO1:** Design basic building blocks of CMOS analog ICs. **CO2:** Carry out the design of single and two stage operational amplifiers and voltage references. **CO3:** Determine the device dimensions of each MOSFETs involved. **CO4:** Design various amplifiers like differential, current and operational amplifiers.
EC863PE	**Professional Elective –VI** Global Positioning System	**At the end of this course, each student should beable to:** **CO1:** Identify GPS components and their functions **CO2:** Select GPS survey method **CO3:** Interpret the navigational message and signals received by the GPS satellite **CO4:** Identify error sources in GPS observations, and apply the corrections for accurate positioning **CO5:** Map the geospatial features
EC864PE	**Professional Elective –VI** Computer Vision	**At the end of this course, each student should beable to:** **CO1:** Implement fundamental image processing techniques required for computer vision. **CO2:** Perform shape analysis. **CO3:** Implement boundary tracking techniques. **CO4:** Apply chain codes and other region descriptors. **CO5:** Apply Hough Transform for line, circle, andellipse detections. **CO6:** Apply 3D vision techniques. **CO7:** Implement motion-related techniques. **CO8:** Develop applications using computer vision

		techniques.
EC801PC	Major Project	**At the end of this course, each student should beable to:** **CO1:** Ability to implement and execute well defined objective **CO2:** Ability to work in team at component leveland system level **CO3:** Ability to troubleshoot.

Annexure-I

Open Elective –I

(Common for EEE, ECE, CSE, IT, ME)

Course Code	Course Title / Name	Course Outcomes
CE600OE	**Open Elective –I** Disaster Preparedness &Planning Management	**At the end of this course, each student should beable to:** **CO1:**The application of Disaster Concepts to Management **CO2:**Analyzing Relationship between Development and Disasters. **CO3:**Ability to understand Categories of Disasters **CO4:**Realization of the responsibilities to society
CS600OE	**Open Elective –I** Entrepreneurship	**At the end of this course, each student should beable to:** It enables students to learn the basics of Entrepreneurship and entrepreneurial development which will help them to provide vision for their own Start-up.
CS601OE	**Open Elective –I** Fundamentals of Management for Engineers	**At the end of this course, each student should beable to:** The students understand the significance of Management in their Profession. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area.
CS602OE	**Open Elective –I** Cyber Law & Ethics	**At the end of this course, each student should beable to:** **CO1:**The students will understand the importance of professional practice, Law and Ethics in their personal lives and professional careers. **CO2:**The students will learn the rights and responsibilities as an employee, team member and a global citizen
EC600OE	**Open Elective –I** Fundamentals of Internet of Things	**At the end of this course, each student should beable to:** **CO1:** Known basic protocols in sensor networks. **CO2:**Program and configure Arduino boards for various designs.

		CO3: Python programming and interfacing for Raspberry Pi. **CO4:** Design IoT applications in different domains
EE600OE	**Open Elective –I** Reliability Engineering	**At the end of this course, each student should beable to:** **CO1:**Model various systems applying reliability networks **CO2:**Evaluate the reliability of simple and complex systems **CO3:**Estimate the limiting state probabilities of repairable systems **CO4:**Apply various mathematical models for evaluating reliability of irreparable systems
EE601OE	**Open Elective –I** Renewable Energy Sources	**At the end of this course, each student should beable to:** **CO1:**Understand the principles of wind power and solar photovoltaic power generation, fuel cells. **CO2:**Assess the cost of generation for conventional and renewable energy plants **CO3:**Design suitable power controller for wind and solar applications **CO4:**Analyze the issues involved in the integration of renewable energy sources to the grid
ME600OE	**Open Elective –I** Quantitative Analysis for Business Decisions	**At the end of this course, each student should beable to:** **CO1:**Familiar with issues that would crop up in business **CO2:**Able to formulate Mathematical Model to resolve the issue **CO3:**Able to select technique for solving the formulated Mathematical Model **CO4:**Able to analyze the results obtained through the selected technique for implementation.

Open Elective –II

(Common for EEE, ECE, CSE, IT, ME)

Course Code	Course Title / Name	Course Outcomes
CS700OE	**Open Elective –II** Data Structures	**At the end of this course, each student should beable to:** **CO1:**Ability to select the data structures that efficiently model the information in a problem. **CO2:**Ability to assess efficiency trade-offs among different data structure implementations or combinations. **CO3:**Implement and know the application of algorithms for sorting and pattern matching. **CO4:**Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.
CS701OE	**Open Elective –II** Artificial Intelligence	**At the end of this course, each student should beable to:** **CO1:**Ability to formulate an efficient problem space for a problem expressed in natural language. **CO2:**Select a search algorithm for a problem and estimate its time and space complexities. **CO3:**Possess the skill for representing knowledge using the appropriate technique for a given problem. **CO4:**Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.
CS702OE	**Open Elective –II** Python Programming	**At the end of this course, each student should beable to:** **CO1:**Examine Python syntax and semantics and be fluent in the use of Python flow control and functions. **CO2:**Demonstrate proficiency in handling Strings and File Systems. **CO3:**Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions. **CO4:**Interpret the concepts of Object-Oriented

		Programming as used in Python. **CO5:**Implement exemplary applications related to Network Programming, Web Services and Databases in Python.
CS703OE	**Open Elective –II** Java Programming	**At the end of this course, each student should beable to:** **CO1:**Develop Programs with reusability Develop programs to handle multitasking **CO2:**Develop programs to handle exceptions **CO3:**Develop applications for a range of problems using object-oriented programming techniques **CO4:**Design simple Graphical User Interface Applications
EC700OE	**Open Elective –II** Electronic Sensors	**At the end of this course, each student should beable to:** **CO1:**Learn about sensor Principle, Classification and Characterization. **CO2:**Explore the working of Electromechanical, Thermal, Magnetic, radiation and Electro analytic sensors Understand the basic concepts of Smart Sensors **CO3:**Design a system with sensors **CO4:**UNIT - I Sensors / Transducers: Principles, Classification, Parameters, Characteristics, Environ
EE700OE	**Open Elective –II** Utilization Of Electrical Energy	**At the end of this course, each student should beable to:** **CO1:**Understand basic principles of electric heating and welding. **CO2:**Determine the lighting requirements for flood lighting, household and industrial needs. **CO3:**Calculate heat developed in induction furnace. **CO4:**Evaluate speed time curves for traction
EE701OE	**Open Elective –II** Electric Drives And Control	**At the end of this course, each student should beable to:** **CO1:**Understand the various drive mechanisms and methods for energy conservation. **CO2:**Apply power electronic converters to control the speed of DC motors and induction motors. **CO3:**Evaluate the motor and power converter for a

		specific application. **CO4:**Develop closed loop control strategies of drives
ME700OE	**Open Elective –II** Basic Mechanical Engineering	**At the end of this course, each student should beable to:** **CO1:** To understand the mechanical equipment for usage at engineering systems. **CO2:**To familiarize with the general principles and requirements for refrigeration, manufacturing, **C03:** To realize the techniques employed to engineering systems.

Open Elective –III

(Common for EEE, ECE, CSE, IT, ME)

Course Code	Course Title / Name	Course Outcomes
CE800OE	**Open Elective – III** Environmental Impact Assessment	**At the end of this course, each student should beable to:** **CO1:**Identify the environmental attributes to be considered for the EIA study **CO2:**Formulate objectives of the EIA studies **CO3:**Identify the methodology to prepare rapid EIA **CO4:**Prepare EIA reports and environmental management plans
CS800OE	**Open Elective – III** Machine Learning	**At the end of this course, each student should beable to:** **CO1:**Understand the concepts of computational intelligence like machine learning **CO2:**Ability to get the skill to apply machine learning techniques to address the real time problems in different areas **CO3:**Understand the Neural Networks and its usage in machine learning application.
CS801OE	**Open Elective – III** Mobile Application Development	**At the end of this course, each student should beable to:** **CO1:**Student understands the working of Android OS Practically. **CO2:**Student will be able to develop Android user interfaces **CO3:**Student will be able to develop, deploy and maintain the Android Applications.

CS802OE	**Open Elective – III** Scripting Languages	**At the end of this course, each student should beable to:** **CO1:**Comprehend the differences between typical scripting languages and typical system and application programming languages. **CO2:**Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem. **CO3:**Acquire programming skills in scripting language
CS803OE	**Open Elective – III** Database Management Systems	**At the end of this course, each student should beable to:** **CO1:**Gain knowledge of fundamentals of DBMS, database design and normal forms **CO2:**Master the basics of SQL for retrieval and management of data. **CO3:**Be acquainted with the basics of transaction processing and concurrency control. **CO4:**Familiarity with database storage structures and access technique
EC800OE	**Open Elective – III** Measuring Instruments	**At the end of this course, each student should beable to:** **CO1:**Able to identify suitable sensors and transducers for real time applications. **CO2:**Able to translate theoretical concepts into working models. Able to understand the basic of measuring device and use them in relevant situation.
EE800OE	**Open Elective – III** Basics Of Power Plant Engineering	Upon completion of the course, the students can understand the principles of operation for different power plants and their economics

EE801OE	**Open Elective – III** Energy Sources And Applications	**At the end of this course, each student should beable to:** **CO1:**List and generally explain the main sources of energy and their primary applications nationally and internationally Understand the energy sources and scientific concepts/principles behind them **CO2:**Understand effect of using these sources on the environment and climate **CO3:**Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment. **CO4:**List and describe the primary renewable energy resources and technologies. **CO5:**To quantify energy demands and make comparisons among energy uses, resources, and technologies. **CO6:**Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation. **CO7:**Understand the Engineering involved in projects utilizing these sources
ME800OE	**Open Elective – III** Non-Conventional Sources Of Energy	**At the end of this course, each student should beable to:** **CO1:**Identify renewable energy sources and their utilization. Understand the basic concepts of solar radiation and analyze the working of solar and thermal systems. Understand principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, biogas and hydrogen. **CO2:**Understand the concepts and applications of fuel cells, thermoelectric convertor and MHD generator. **CO3:**Identify methods of energy storage for specific Applications