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 ELECTRICAL AND ELECTRONICS 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 Electrical And Electronics Engineering

Course Code	Course Title / Name	Course Outcomes
EE301ES	Engineering Mechanics	**At the end of this course, each student should beable to:** **CO1:** Determine resultant of forces acting on a body and analyse equilibrium of a body subjected toa system of forces. **CO2:** Solve problem of bodies subjected to friction. **CO3:** Find the location of centroid and calculatemoment of inertia of a given section. **CO4:** Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion. **CO5:** Solve problems using work energy equations for translation, fixed axis rotation and plane motion and solve problems of vibration.
EE302PC	Electrical Circuit Analysis	**At the end of this course, each student should beable to:** **CO1:** Apply network theorems for the analysis of electrical circuits. **CO2:** Obtain the transient and steady-state responseof electrical circuits. **CO3:** Analyze circuits in the sinusoidal steady-state (single-phase and three-phase). **CO4:** Analyze two port circuit behavior.
EE303PC	Analog Electronics	**At the end of this course, each student should beable to:** **CO1:** Know the characteristics, utilization of various

		components. **CO2:** Understand the biasing techniques **CO3:** Design and analyze various rectifiers, small signal amplifier circuits. **CO4:** Design sinusoidal and non-sinusoidal oscillators. **CO5:** A thorough understanding, functioning of OP-AMP, design OP-AMP based circuits with linear integrated circuits.
EE304PC	Electrical Machines - I	**At the end of this course, each student should beable to:** **CO1:** Identify different parts of a DC machine & understand its operation **CO2:** Carry out different testing methods to predetermine the efficiency of DC machines **CO3:** Understand different excitation and starting methods of DC machines **CO4:** Control the voltage and speed of a DC machines **CO5:** Analyze single phase and three phase transformers circuits.
EE305PC	Electromagnetic Fields	**At the end of this course, each student should beable to:** **CO1:** To understand the basic laws of electromagnetism. **CO2:** To obtain the electric and magnetic fields for simple configurations under static conditions. **CO3:** To analyze time varying electric and magnetic fields. **CO3:** To understand Maxwell's equation in different forms and different media. **CO4:** To understand the propagation of EM waves.
EE306PC	Electrical Machines Lab - I	**At the end of this course, each student should beable to:** **CO1:** Start and control the Different DC Machines. **CO2:** Assess the performance of different machinesusing different testing methods **CO3:** Identify different conditions required to be satisfied for self - excitation of DC Generators. **CO4:** Separate iron losses of DC machines into

		different components
EE307PC	Analog Electronics Lab	**At the end of this course, each student should beable to:** **CO1:** Know the characteristics, utilization of various components. **CO2:** Understand the biasing techniques **CO3:** Design and analyze various rectifiers, small signal amplifier circuits. **CO4:** Design sinusoidal and non-sinusoidal oscillators. **CO5:** A thorough understanding, functioning of OP-AMP, design OP-AMP based circuits with linear integrated circuits.
EE308PC	Electrical Circuits Lab	**At the end of this course, each student should beable to:** **CO1:** Analyze complex DC and AC linear circuits **CO2:** Apply concepts of electrical circuits across engineering **CO3:** Evaluate response in a given network by using theorems
*MC309	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 andlegal 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 to politics 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. II Year II Sem R18 Syllabus Electrical and Electronics 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
EE402PC	Electrical Machines – II	**At the end of this course, each student should beable to:** **CO1:** Understand the concepts of rotating magnetic fields. **CO2:** Understand the operation of ac machines. **CO3:** Analyze performance characteristics of ac machines.
EE403PC	Digital Electronics	**At the end of this course, each student should beable to:** **CO1:** Understand working of logic families and logic gates. **CO2:** Design and implement Combinational and Sequential logic circuits. **CO3:** Understand the process of Analog to Digital conversion and Digital to Analog conversion. **CO4:** Be able to use PLDs to implement the given logical problem.
EE404PC	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 and statespace representations. **CO2:** Understand the concept of stability and its assessment for linear-time invariant systems. **CO3:** Design simple feedback controllers.
EE405PC	Power System - I	**At the end of this course, each student should beable to:** **CO1:** Understand the concepts of power systems. **CO2:** Understand the operation of conventional generating stations and renewable sources of electrical power. **CO3:** Evaluate the power tariff methods. **CO4:** Determine the electrical circuit parameters of transmission lines **CO5:** Understand the layout of substation and underground cables and corona.
EE406PC	Digital Electronics Lab	**At the end of this course, each student should beable to:** **CO1:** Understand working of logic families and logic gates. **CO2:** Design and implement Combinational and Sequential logic circuits. **CO3:** Understand the process of Analog to Digital conversion and Digital to Analog conversion. **CO4:** Be able to use PLDs to implement the given logical problem.
EE407PC	Electrical Machines Lab -II	**At the end of this course, each student should beable to:** **CO1:** Assess the performance of different machinesusing different testing methods **CO2:** To convert the Phase from three phase to two phase and vice versa **CO3:** Compensate the changes in terminal voltages of synchronous generator after estimating the change by different methods **CO4:** Control the active and reactive power flows in synchronous machines **CO5:** Start different machines and control the speed and power factor

EE408PC	Control Systems Lab	**At the end of this course, each student should beable to:** **CO1:** How to improve the system performance by selecting a suitable controller and/or a compensator for a specific application **CO2:** Apply various time domain and frequencydomain techniques to assess the system performance **CO3:** Apply various control strategies to different applications (example: Power systems, electrical drives etc) **CO4:** Test system controllability and observabilityusing state space representation and applications of state space representation to various systems
*MC409	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. III Year I Sem R18 Syllabus Electrical and Electronics Engineering

Course Code	Course Title / Name	Course Outcomes
EE501PE	Power Electronics	**At the end of this course, each student should beable to:** **CO1:** Understand the differences between signal level and power level devices. **CO2:** Analyze controlled rectifier circuits. **CO3:** Analyze the operation of DC-DC choppers. **CO4:** Analyze the operation of voltage source inverters.
EE502PE	Power System-II	**At the end of this course, each student should beable to:** **CO1:** Analyze transmission line performance. **CO2:** Apply load compensation techniques to control reactive power. **CO3:** Understand the application of per unit quantities. **CO4:** Design over voltage protection and insulation Coordination. **CO5:** Determine the fault currents for symmetrical and unbalanced faults.
EE503PE	Measurements and Instrumentation	**At the end of this course, each student should beable to:** **CO1:** Understand different types of measuring instruments, their construction, operation and characteristics **CO2:** Identify the instruments suitable for typical measurements **CO3:** Apply the knowledge about transducers and instrument transformers to use them effectively. **CO4:** Apply the knowledge of smart and digital metering for industrial applications
EE511PE	Professional Elective-I: Computer Architecture	**At the end of this course, each student should beable to:** **CO1:** Understand the concepts of microprocessors, their principles and practices.

		CO2: Write efficient programs in assembly languageof the 8086 family of microprocessors. **CO3:** Organize a modern computer system and be able to relate it to real examples. **CO4:** Develop the programs in assembly language for 80286, 80386 and MIPS processors in real and protected modes. **CO5:** Implement embedded applications using ATOM processor.
EE512PE	Professional Elective-I: High Voltage Engineering	**At the end of this course, each student should beable to:** **CO1:** Understand the basic physics related to various breakdown processes in solid, liquid and gaseous insulating materials. **CO2:** Knowledge of generation and measurement of D. C., A.C., & Impulse voltages. **CO3:** Knowledge of tests on H. V. equipment and on insulating materials, as per the standards. **CO4:** Knowledge of how over-voltages arise in a power system, and protection against these overvoltages.
EE513PE	Professional Elective-I: Electrical Machine Design	**At the end of this course, each student should beable to:** **CO1:** Understand the construction and performance characteristics of electrical machines. **CO2:** Understand the various factors which influencethe design: electrical, magnetic and thermal loading of electrical machines **CO3:** Understand the principles of electrical machine design and carry out a basic design of an ac machine. **CO4:** Use software tools to do design calculations.
SM504MS	Business Economics and 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.
EE505PC	Power System Simulation Lab	**At the end of this course, each student should beable to:** **CO1:** Perform various transmission line calculations**CO2:** Understand Different circuits time constants **CO3:** Analyze the experimental data and draw the conclusions.
EE506PC	Power Electronics Lab	**At the end of this course, each student should beable to:** **CO1:** Understand the operating principles of various power electronic converters. **CO2:** Use power electronic simulation packages& hardware to develop the power converters. **CO3:** Analyze and choose the appropriate converters for various applications
EE507PC	Measurements and Instrumentation Lab	**At the end of this course, each student should beable to:** **CO1:** To choose instruments **CO2:** Test any instrument **CO3:** Find the accuracy of any instrument by performing experiment **CO4:** Calibrate PMMC instrument using D.C potentiometer
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 suggestIPM 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 Electrical And Electronics Engineering

Course Code	Course Title / Name	Course Outcomes
	Open Elective - I	Please Refer to ANNEXURE-I
EE611PE	Professional Elective-II 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.
EE612PE	Professional Elective-II Power Semiconductor Drives	**At the end of this course, each student should beable to:** **CO1:** Identify the drawbacks of speed control of motor by conventional methods. **CO2:** Differentiate Phase controlled and chopper-controlled DC drives speed-torque characteristics merits and demerits **CO3:** Understand Ac motor drive speed–torque characteristics using different control strategies its merits and demerits **CO4:** Describe Slip power recovery schemes
EE613PE	Professional Elective-II Wind and Solar Energy systems	**At the end of this course, each student should beable to:** **CO1:** Understand the energy scenario and the consequent growths of the power generate renewable energy sources. **CO2:** Understand the basic physics of wind and solar power generation. **CO3:** Understand the power electronic interfaces for wind and solar generation. **CO4:** Understand the issues related to the grid-integration of solar and wind energy systems

EE601PC	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
EE602PC	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 to 8086 and 8051 based systems. **CO4:** Understands the internal architecture of ARM processors and basic concepts of advanced ARM processors.
EE603PC	Power System Protection	**At the end of this course, each student should beable to:** **CO1:** Compare and contrast electromagnetic, staticand microprocessor-based relays **CO2:** Apply technology to protect power system components. **CO3:** Select relay settings of over current and distance relays. **CO4:** Analyze quenching mechanisms used in air, oil and vacuum circuit breakers
EE604PC	Power System Operation and Control	**At the end of this course, each student should beable to:** **CO1:** Understand operation and control of power systems. **CO2:** Analyze various functions of Energy Management System (EMS) functions. **CO3:** Analyze whether the machine is in stable or

		unstable position. **CO4:** Understand power system deregulation and restructuring
EE605PC	Power System Lab	**At the end of this course, each student should beable to:** **CO1:** Perform various load flow techniques **CO2:** Understand Different protection methods **CO3:** Analyze the experimental data and draw the conclusions.
EE606PC	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
EE607PC	Signals and Systems Lab	**At the end of this course, each student should beable to:** **CO1:** Understand the concepts of continuous time and discrete time systems. **CO2:** Analyse systems in complex frequency domain. **CO3:** Understand sampling theorem and its implications.
*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 Electrical and Electronics Engineering

Course Code	Course Title / Name	Course Outcomes
EE701PC	Power Semiconductor Drives	**At the end of this course, each student should beable to:** **CO1:** Indentify the drawbacks of speed control ofmotor by conventional methods. **CO2:** Differentiate Phase controlled and chopper controlled DC drives speed-torque. **CO3:** Characteristics merits and demerits. **CO4:** Understand Ac motor drive speed–torque characteristics using different control strategiesits merits and demerits. **CO5:** Describe Slip power recovery schemes.
EE702PC	Power System Operation and control	**At the end of this course, each student should beable to:** **CO1:** Analyze the optimal scheduling of power plants. **CO2:** Analyze the steady state behavior of the power system for voltage and frequency. **CO3:** Fluctuations. **CO4:** Describe reactive power control of a power system. **CO5:** Design suitable controller to dampen the frequency and voltage steady state oscillations.
EE721PE	**Professional Elective– II** Digital Signal Processing	**At the end of this course, each student should beable to:** **CO1:** Perform time, frequency, and Z -transform analysis on signals and systems. **CO2:** Understand the inter-relationship between DFT and various transforms. **CO3:** Understand the significance of various filter structures and effects of round off errors. **CO4:** Design a digital filter for a given specification. **CO5:** Understand the fast computation of DFT and appreciate the FFT processing. **CO6:** Understand the tradeoffs between normal and multi rate DSP techniques and finite length word effects.

EE722PE	**Professional Elective– II** HVDC Transmission	**At the end of this course, each student should beable to:** **CO1:** Compare EHV AC and HVDC system and to describe various types of DC links. **CO2:** Analyze Graetz circuit for rectifier and inverter mode of operation . **CO3:** Describe various methods for the control ofHVDC systems and to perform power flow analysis in AC/DC systems . **CO4:** Describe various protection methods for HVDC systems and classify Harmonics and design different types of filters.
EE723PE	**Professional Elective– II** Switch Mode Power Supplies	**At the end of this course, each student should be able to:** After completion of this course the students are able to understand the concepts and principle of operation of various types of switched mode power supply systems for both D.C. and A.C. outputs.
EE724PE	**Professional Elective– II** 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.
EE731PE	**Professional Elective-III** Digital Control Systems	**At the end of this course, each student should beable to:** **CO1:** Carry map S-plane and Z-plane, do state-space Analysis. **CO2:** Carry stability analysis in S-domain and Z-Domains. **CO3:** Carry stability analysis through bilinear transformation and R-H criteria, **CO4:** Design of discrete-time control systems, design of lag, lead, lead-lag compensators , design of PID controllers and design of state

		feedback controllers and observers. **CO5:** Apply the above concepts to real-world electrical and electronics problems and applications.
EE732PE	**Professional Elective-III** Power Quality	**At the end of this course, each student should beable to:** **CO1:** Know the severity of power quality problemsin distribution system. **CO2:** Understand the concept of voltage sag transformation from up-stream (higher voltages) to down-stream (lower voltage) . **CO3:** Concept of improving the power quality to sensitive load by various mitigating custom power devices.
EE733PE	**Professional Elective-III** Modern Power Electronics	**At the end of this course, each student should beable to:** **CO1:** To understand various Power Electronics devices such as SCR, TRIAC, DIAC, IGBT,GTO. **CO2:** To understand application of aforesaid Power Electronics devices in Choppers, Inverters and Converters etc. **CO3:** To understand control of Electrical Motors through DC-DC converters, AC Converters etc. **CO4:** To understand the use of Inductors and Capacitors in Choppers, Inverters and Converters.
EE734PE	**Professional Electiv - III** 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.

EE741PE	**Professional Elective-IV** Programmable Logic Controllers	**At the end of this course, each student should beable to:** **CO1:** Understand the purpose, functions, andoperations of a PLC. **CO2:** Identify the basic components of the PLC andhow they function. **CO3:** View a directory of processor files using PLC software. **CO4:** Ability to gain knowledge on Programmable Logic Controllers. **CO5:** Will understand different types of Devices to which PLC input and output modules are Connected. **CO6:** To provide the knowledge about understand various types of PLC registers. **CO7:** Able to create ladder diagrams from process control descriptions. **CO8:** Ability to apply PLC timers and counters forthe control of industrial processes. **CO9:** Able to use different types PLC functions, Data Handling Function.
EE742PE	**Professional Elective-IV** EHV AC Transmission Systems	**At the end of this course, each student should beable to:** **CO1:** Understand the basic concepts of EHV AC transmission. **CO2:** Get the Knowledge on EHV transmission line inductance and capacitance. **CO3:** Understand the voltage gradients of conductor **CO4:** Identify corona effects on transmission lines **CO5:** Calculate electrostatic fields of EHVAC linesand its effects. **CO6:** Analyze travelling waves **CO7:** Distinguish various compensators for voltage control.
EE743PE	**Professional Elective-IV** Flexible A.C. Transmission Systems	**At the end of this course, each student should beable to:** **CO1:** Choose proper controller for the specific application based on system requirements . **CO2:** Understand various systems thoroughly and

		their requirements. **CO3:** Understand the control circuits of Shunt Controllers SVC & STATCOM for various functions viz. Transient stability Enhancement, voltage instability prevention and power oscillation damping . **CO4:** Understand the Power and control circuits of Series Controllers GCSC, TSSC and TCSC.
EE744PE	**Professional Elective-IV** Special Machines	**At the end of this course, each student should beable to:** **CO1:** To select different special machines as part of control system components. **CO2:** To use special machines as transducers for converting physical signals into electrical signals. **CO3:** To use micro-processors for controlling different machines. **CO4:** To understand the operation of different special machines.
EE703PC	Electrical Systems Simulation Lab	**At the end of this course, each student should beable to:** **CO1:** Design and Analyze electrical systems in timeand frequency domain. **CO2:** Analyze various transmission lines and perform fault analysis. **CO3:** Model Load frequency control of Power Systems **CO4:** Design various Power Electronic Converters and Drives.
EE704PC	Electrical Workshop	**At the end of this course, each student should beable to:** **CO1:** Get practical knowledge related to electrical. **CO2:** Fabricate basic electrical circuit elements / networks **CO3:** Trouble shoot the electrical circuits . **CO4:** Design filter circuit for application. **CO5:** Get hardware skills such as soldering, winding etc. **CO6:** Get debugging skills.

EE705PC	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.
EE706PC	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 R16 Syllabus Electrical And Electronics Engineering

Course Code	Course Title / Name	Course Outcomes
	Open Elective – III	Please Refer to ANNEXURE-I
EE851PE	**Professional Elective–V** Artificial Neural Networks and Fuzzy Systems	**At the end of this course, each student should beable to:** **CO1:** To understand artificial neural network models and their training algorithms. **CO2:** To understand the concept of fuzzy logic system components, fuzzification and defuzzification. **CO3:** Apply the above concepts to real-world problems and applications.
EE852PE	**Professional Elective–V** Electrical Distribution Systems	**At the end of this course, each student should beable to:** **CO1:** Distinguish between transmission, and distribution line and design the feeders. **CO2:** Power loss and voltage drop of the feeders. **CO3:** Design protection of distribution systems. **CO4:** Understand the importance of voltage controland power factor improvement.
EE853PE	**Professional Elective–V** Wind, Solar and Hybrid Energy Systems	**At the end of this course, each student should beable to:** **CO1:** Understand the energy scenario and the consequent growths of the power generate renewable energy sources. **CO2:** Understand the basic physics of wind andsolar power generation. **CO3:** Understand the power electronic interfacesfor wind and solar generation. **CO4:** Understand the issues related to the grid-integration of solar and wind energy systems.
EE854PE	**Professional Elective–V** High Voltage Engineering	**At the end of this course, each student should beable to:** **CO1:** Acquire knowledge on, basics of high voltage

		engineering **CO2:** Understand break-down phenomenon in different types of dielectrics. **CO3:** Understand generation and measurement of high voltages and currents. **CO4:** Understand the phenomenon of over- voltages, concept of insulation co-ordination. **CO5:** Know testing of various materials and electrical apparatus used in high voltage engineering.
EE861PE	**Professional Elective–VI** 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 designbuilding 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
EE862PE	**Professional Elective–VI** Smart Electric Grid	**At the end of this course, each student should beable to:** **CO1:** Recite the structure of an electricity marketin either regulated or deregulated market conditions. **CO2:** Understand the advantages of DC distribution

		and developing technologies in distribution **CO3:** Discriminate the trade-off between economics and reliability of an electric powersystem, differentiate various investment options (e.g. generation capacities, transmission, renewable, demand-side resources, etc) in electricity markets **CO4:** Analyze the development of smart and intelligent domestic systems
EE863PE	**Professional Elective–VI** Utilization of Electric Power	**At the end of this course, each student should beable to:** **CO1:** Acquire knowledge on, electric drives characteristics and their applicability in industry based on the nature of different types of loads and their characteristics **CO2:** Understands the concepts and methods of electric heating, welding, illumination and electric traction **CO3:** Apply the above concepts to real-world electrical and electronics problems and applications.
EE864PE	**Professional Elective–VI** Electric and Hybrid Vehicles	**At the end of this course, each student should beable to:** **CO1:** Recite the structure of an electricity marketin either regulated or deregulated market conditions. **CO2:** Understand the advantages of DC distributionand developing technologies in distribution. **CO3:** Discriminate the trade-off between economics and reliability of an electric powersystem, differentiate various investment options (e.g. generation capacities, transmission, renewable, demand-side resources, etc) in electricity markets. **CO4:** Analyze the development of smart and intelligent domestic systems.
EE801PC	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