JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

Kakinada-533003, Andhra Pradesh, India

B.Tech in Electrical & Electronics Engineering

Vision

To be in the forefront in advanced research in emerging areas of Electrical & Electronics Engineering, be proactive with industry in technology development and moulding the department into a center of academic excellence.

Mission

- To produce high quality Electrical and Electronics Engineering graduates with the requisite theoretical and practical knowledge.
- To undertake research & development and extension activities in the field of Electrical and Electronics Engineering in the area of relevance for immediate application as well as for establishing and strengthening the fundamental knowledge.
- To create social awareness and ethical values in the graduates so as to contribute in the progress of the society.

PROGRAM EDUCATIONAL OBJECTIVES

PEO1 Provide necessary domain knowledge in the field of electrical and electronics engineering to deal with their challenges solve engineering problems, pursue higher education and research.

PEO2 Able to apply theoretical and practical engineering knowledge

- Towards innovation and entrepreneurship that caters the needs of industry and society.
- To inculcate an attitude of lifelong learning.

PEO3 Act as team member and team leader and work effectively to develop and design multidisciplinary projects.

PEO4 Able to acquire social responsibility and ethical values towards the growth and development of society.

PROGRAM OUTCOMES: At the end of the program the student will be able to:

PO1 **Engineering knowledge:** Apply the knowledge of mathematics, science, engineeringfundamentals,andanengineeringspecializationtothesolutionofcomplexeng ineeringproblems

PO2 **Problemanalysis:**Identify,formulate,reviewresearchliterature,andanalyzecomplexen gineeringproblemsreachingsubstantiatedconclusionsusingfirstprinciplesofmathemati cs,natural sciences,and engineering sciences

PO3 **Design/developmentofsolutions:**Designsolutionsforcomplexengineeringproblemsa nddesignsystemcomponentsorprocessesthatmeetthespecifiedneedswithappropriateco nsiderationforthepublichealthandsafety,andthecultural,societal,andenvironmentalcon siderations

PO4 **Conduct investigations of complex problems:** Use research-based knowledge andresearch methods including design of experiments, analysis and interpretation of data,andsynthesis of theinformation to provide valid conclusions.

PO5 **Modern tool usage:** Create, select, and apply appropriate techniques, resources, andmodernengineeringandITtoolsincludingpredictionandmodelingtocomplexengineeringactivities with an understanding ofthelimitations

PO6 **The engineer and society:** Apply reasoning informed by the contextual knowledge toassesssocietal,health,safety,legalandculturalissuesandtheconsequentresponsibilitiesrelevant to theprofessional engineering practice

PO7 **Environmentandsustainability:**Understandtheimpactoftheprofessionalengineering solutions in societal and environmental contexts, and demonstrate theknowledgeof,and needfor sustainable development.

PO8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilitiesandnorms of the engineering practice

PO9 **Individualandteamwork:**Functioneffectivelyasanindividual,andasamemberorleaderin diverseteams,and in multidisciplinarysettings

PO10 **Communication:**Communicateeffectivelyoncomplexengineeringactivitieswiththeengineering community and with society at large, such as, being able to comprehendandwriteeffectivereportsanddesigndocumentation,makeeffectivepresentations,andgiveand receiveclear instructions

PO11 **Project management and finance:** Demonstrate knowledge and understanding of theengineering and management principles and apply these to one's own work, as amemberandleaderinateam,tomanageprojectsandinmultidisciplinaryenvironments

PO12 **Life-long learning:** Recognize the need for, and have the preparation and ability toengage in independent and life-long learning in the broadest context of technologicalchange.

PROGRAM SPECIFIC OUTCOMES:

PSO1 Able to apply the knowledge gained from Mathematics, stochastic, foundational computing and sciences to formulate practical problems of industry relevance with research focus

PSO2 Able to apply technical knowledge and usage of modern hardware & software tools related to Electrical &Electronics engineering for solving problems of social relevance

PSO3 Able to analyze, comprehend, design, develop innovative applications for demonstrating professional expertise, entrepreneurship and develop intellectual property for nation building

Course Code	Mathematics - I
BS11T01	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Utilize mean value theorem to real life problems
CO2 Solve the differential equations related to various engineering fields
CO3 Familiarize with functions of several variables which is useful in optimization.
CO4 Apply double integration techniques in evaluating areas bounded by region.
CO5 Students will become familiar with 2-dimensional and 3-dimensional coordinate systems.
CO6 Conclude the use of special function in multiple integrals.

Course Code	**FUNDAMENTALS OF COMPUTERS**
ES11T06	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Understand the functioning and programming of computers.
CO2 Convert numbers from one type of system to other type of system
CO3 Distinguish between different types of memories and learn the mapping of I/O devices
CO4 Demonstrated the internal organization of digital computer
CO5 Apply digital computers for storing electrical engineering problems

Course Code	Applied Chemistry Lab
BS11P03	

COURSEOUTCOMES

After completion of course, students would be ableto:

The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis;redox titrations with different indicators; EDTA titrations then they are exposed to some instrumental methods of chemical analysis. Thus at the end of the course student is exposed to different methods of chemical analysis and use of some employed instruments. They thus acquire some experimental skills.

Course Code	IT Workshop
ES11P05	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Understand the components of DBMS and file management methods
CO2 Apply the concepts of SQL and its use to manage the databases
CO3 Understand the data models and data structures used for spatial data

CO4 Perform Geospatial Topology analysis
CO5 Design a geodatabase for various Remote Sensing & GIS applications

Course Code	Electrical Engineering Workshop
ES11P01	

COURSEOUTCOMES
After completion of course, students would be ableto:
CO1 Explain the limitations, tolerance, safety aspects of electrical systems and wiring
CO2 Select wires/cables and other accessories used in different types of wiring.
CO3 Make simple lighting and power circuits.
CO4 Measure current, voltage and power in a circuit.

Course Code	Mathematics - II
BS12T01	

COURSEOUTCOMES
After completion of course, students would be ableto:
CO1 Develop the use of matrix algebra techniques that is needed by engineers for practical applications.
CO2 Solve system of linear algebraic equations using gauss elimination, gauss Jordan, gauss seidel
CO3 Evaluate approximating the roots of polynomial and transcendental equations by different algorithms.
CO4 Apply newtons forward and backward interpolation and legranges formulae for equal and unequal intervals.
CO5 Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations.

Course Code	Mathematics - III
BS12T02	

COURSEOUTCOMES
After completion of course, students would be ableto:
CO1 Interpret the physical meaning of different operators such as gradient, curl, divergence.
CO2 Estimate the work done against the field, circulation and flux using vector calculus.
CO3 Apply the laplace transform for solving differential equations.
CO4 Find or compute the fourier series of the periodic signals.
CO5 Know and be able to apply integral expressions for the forward and inverse fouriertransform to a range of non periodic waveforms.
CO6 Identify solution methods for partial differential equations that model physical processes.

Course Code	

BS12T03	Applied Physics

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Understand the principles such as interference and diffraction to design and enhance the resolving power of different optical instruments.
CO2 Learn the fundamental concepts of Quantum behaviour of matter.
CO3 Identify the solids based on the energy band structure.
CO4 Identify the type of semiconductors using Hall effect.
CO5 Study the magnetic and dielectric materials to enhance utility aspects of materials.

Course Code	Problem Solving and Programming using C
ES12T07	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1	Conduct advanced spatial analyses using GIS tools
CO2	Study GIS data with complex geospatial models
CO3	Solve the geospatial problems using programming tools
CO4	Develop models in GIS using appropriate GIS software
CO5	Analyse GIS data and generate applications

Course Code	Electrical Circuit Analysis - I
ES12T02	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Various electrical networks in presence of active and passive elements and Electrical networks with network topology concepts
CO2 Any magnetic circuit with various dot conventions
CO3 Any R, L, C network with sinusoidal excitation.
CO4 Any R, L, network with variation of any one of the parameters i.e R, L, C and f
CO5 Electrical networks by using principles of network theorems.

Course Code	Constitution of India
MC12T02	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Understand historical background of the constitution making and its importance for building a democratic India
CO2 Understand the functioning of 3 wings of the government ie., executive, legislative and judiciary.

Course Code	

PC2104T01	Electronic Devices and Circuits

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Apply the basic concepts of semiconductor physics
CO2 Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
CO3 Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
CO4 Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations
CO5 Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions
CO6 Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.

Course Code	Thermal and Hydro Prime Movers
ES2102T01	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Air standard cycles, constructional & operational details of I.C Engines.
CO2 Properties of steam, Rankine cycle, principle and working of steam turbines.
CO3 Fundamentals, governing cycle, working and efficiency of gas turbines.
CO4 Working principle of pumps and hydraulic turbines.
CO5 Details and working of Hydro electric power plants and various loads.

Course Code	Digital Electronics
ES2102T02	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Classify different number systems and apply to generate various codes.
CO2 Use the concept of Boolean algebra in minimization of switching functions
CO3 Design different types of combinational logic circuits.
CO4 Apply knowledge of flip-flops in designing of Registers and counters
CO5 The operation and design methodology for synchronous sequential circuits and algorithmic state machines.
CO6 Produce innovative designs by modifying the traditional design techniques.

Course Code	

PC2102T01	Electrical Circuit Analysis - II

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Solve three- phase circuits under balanced and unbalanced condition
CO2 Find the transient response of electrical networks for different types of excitations
CO3 Find parameters for different types of network
CO4 Realize electrical equivalent network for a given network transfer function

Course Code	
PC2102T02	Electrical Machines-I

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Mitigate the ill-effects of armature reaction and improve commutation in dc machines.
CO2 Understand the torque production mechanism and control the speed of dc motors.
CO3 Analyze the performance of single phase transformers.
CO4 Predetermine regulation, losses and efficiency of single phase transformers.
CO5 Parallel transformers, control voltages with tap changing methods and achieve threephase to two-phase transformation.

Course Code	
PC2102T03	Electro Magnetic Fields

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Determine electric fields and potentials using Guass‘s law or solving Laplace‘s or Possion‘s equations, for various electric charge distributions.
CO2 Calculate and design capacitance, energy stored in dielectrics.
CO3 Calculate the magnetic field intensity due to current, the application of Ampere‘s law and the Maxwell‘s second and third equations and determine the magnetic forces and torque produced by currents in magnetic field.
CO4 Determine self and mutual inductances and the energy stored in the magnetic field.
CO5 Calculate induced EMF, understand the concepts of displacement current and Poynting vector.

Course Code	
PC2102T04	Power System-I

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Identify the different components of thermal power plants.
CO2 Identify the different components of nuclear Power plants.
CO3 Identify the different components of air and gas insulated substations.
CO4 Identify single core and three core cables with different insulating materials.
CO5 Analyse the different economic factors of power generation and tariffs.

Course Code	
PC2102P01	Electrical Circuits Lab

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 The Student should be able to apply various theorems, determination of self and mutual inductances, two port parameters of a given electric circuits.

CO2 Able to draw locus diagrams, waveforms and phasor diagrams for lagging and leading networks

Course Code	
MC2100T01	Essence of Indian Traditional Knowledge

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 understand the concept of traditional knowledge and its importance.

CO2 Know the need and importance of practicing traditional knowledge.

CO3 Know various enactments related to the protection of the traditional knowledge.

CO4 Understand the concepts of Intellectual property to protect the traditional knowledge.

Course Code	
ES2202T01	Signals and Systems

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Differentiate the various classifications of signals and systems

CO2 Analyze the frequency domain representation of signals using Fourier concepts

CO3 Classify the systems based on their properties and determine the response of LTI Systems

CO4 Know the sampling process and various types of sampling techniques.

CO5 Apply Laplace and z-transforms to analyze signals and Systems (continuous & discrete).

Course Code	
HS2200T01	Managerial Economics & Financial Analysis

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 The learner is equipped with the knowledge of estimating the demand elasticites for a product and understand the knowledge of understanding the knowledge of input-output-cost relationships and estimation of the least cost combination of the inputs.

CO2 One is also ready to understand the nature of different markets and priceoutput determination under various market conditions and also to have the knowledge of different business units.

CO3 The learner is able to prepare financial statements and the usage of various accounting tools for analysis and to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

Course Code	
PC2202T01	Electrical Machines-II

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Explain the operation and performance of three phase induction motor
- CO2 Analyze the torque-speed relation, performance of induction motor and induction generator
- CO3 Implement the starting of single phase induction motors.
- CO4 Develop winding design and predetermine the regulation of synchronous generators.
- CO5 Explain hunting phenomenon, implement methods of staring and correction of power factor with synchronous motor.

Course Code	
PC2202T02	Control Systems

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Critically compare open loop and closed loop systems with reference to the effects of feedback; Derive the transfer function of physical systems; Determine the overall transfer function using block diagram algebra and signal flow graphs.
- CO2 Determine time response specifications of first and second order systems, analyze the effects of P,PI and PID controls on system performance.
- CO3 Investigate the stability of LTI systems using Routh‘s stability criterion and the root locus method.
- CO4 Analyze the relative stability and assess the stability margins of LTI systems using frequency response methods.
- CO5 Develop state models for physical systems and determine the time response through solution of state equations; test and assess the controllability and observability of systems.

Course Code	
PC3102P03	Electrical Measurements and Instrumentation

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Choose right type of instrument for measurement of ac and dc Electrical quantities.
- CO2 Choose right type of instrument for measurement of power and power factor
- CO3 Select right type for measurement of R,L,C
- CO4 Understand the effectiveness of transducer.
- CO5 Able to understand digital meter.

Course Code	

PC2202P01	Electrical Machines Lab -I

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Determine and predetermine the performance of DC machines and Transformers.
CO2 Control the speed of DC motor
CO3 Obtain three phase to two phase transformation.

Course Code	
PC2202P02	Electrical Simulation Lab

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Simulate Electrical network theorems
CO2 Simulate speed control of DC Motor
CO3 Simulate and analyze electrical and electronic circuits.
CO4 Model, simulate and analyze the performance of DC Machines.

Course Code	
PC3102T01	Power Systems-II

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Understand parameters of various types of transmission lines during different operating conditions.
CO2 Understand the performance of short and medium transmission lines.
CO3 Understand travelling waves on transmission lines.
CO4 Understand various factors related to charged transmission lines.
CO5 Understand sag/tension of transmission lines and performance of line insulators.

Course Code	
PC3102T02	Power Electronics

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Explain the characteristics of various power semiconductor devices and analyze the static and dynamic characteristics of SCR‘s.
CO2 Design firing circuits for SCR.
CO3 Explain the operation of single phase full–wave converters and analyze harmonics in the input current.
CO4 Explain the operation of three phase full–wave converters.
CO5 Analyze the operation of different types of DC-DC converters.
CO6 Explain the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
CO7 Analyze the operation of AC-AC regulators.

Course Code	Linear IC Applications
ES3102T01	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Design circuits using operational amplifiers for various applications.
CO2 Analyse and design amplifiers and active filters using Op-amp
CO3 Diagnose and trouble-shoot linear electronic circuits.
CO4 Understand the gain-bandwidth concept and frequency response of the amplifier configurations.
CO5 Understand thoroughly the operational amplifiers with linear integrated circuits

Course Code	Digital Signal Processing
PC3102T03	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Understand the concepts of signal processing& transforms.
CO2 Appraise the Fast Fourier algorithm.
CO3 Design FIR and IIR filters
CO4 Appreciate the concepts of multirate signal processing.

Course Code	Program Elective -I (Python programming)
PC3102T04A	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Develop essential programming skills in computer programming concepts like data types, containers
CO2 Apply the basics of programming in the Python language Solve coding tasks related conditional execution, loops
CO3 Solve coding tasks related to the fundamental notions and techniques used in object- oriented programming

Course Code	Program Elective -I (Data structures)

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Data structures concepts with arrays, stacks, queues
CO2 Linked lists for stacks, queues and for other applications.
CO3 Traversal methods in the Trees and different sorting methods.
CO4 Various algorithms available for the graphs.
CO5 Sorting and searching in the data ret retrival applications

Course Code	Program Elective -I (OOPS THROUGH JAVA)
PC3102T04B	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Understand Java programming concepts and utilize Java Graphical User Interface in Program writing.
CO2 Write, compile, execute and troubleshoot Java programming for networking concepts.
CO3 Build Java Application for distributed environment
CO4 Design and Develop multi-tier applications.
CO5 Identify and Analyze Enterprise applications.

Course Code	Program Elective -I (OPERATING SYSTEMS)
PC2205T02	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Design various Scheduling algorithms.
CO2 Apply the principles of concurrency.
CO3 Design deadlock, prevention and avoidance algorithms.
CO4 Compare and contrast various memory management schemes.
CO5 Design and Implement a prototype file systems.
CO6 Perform administrative tasks on Linux Servers
CO7 Introduction to Android Operating System Internals

Course Code	Electrical Machines –II Laboratory
PC3102P01	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Assess the performance of single phase and three phase induction motors.
CO2 Control the speed of three phase induction motor
CO3 Predetermine the regulation of three–phase alternator by various methods.
CO4 Find the Xd/ Xq ratio of alternator and asses the performance of three–phase synchronous motor.
CO5 Determine the performance single phase AC series motor

Course Code	

PC3102P02	Control Systems Laboratory

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Analyze the performance and working Magnetic amplifier, D.C and A.C. servo motors and synchros.
CO2 Design P,PI,PD and PID controllers
CO3 Design lag, lead and lag–lead compensators
CO4 Control the temperature using PID controller
CO5 Determine the transfer function of D.C Motor
CO6 Control the performance of D.C and A.C Servo Motor
CO7 Test the controllability and observability
CO8 Judge the stability in time and frequency domain.

Course Code	Electrical Measurements and Instrumentation Laboratory
PC3102P03	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Measure the electrical parameters voltage, current, power, energy and electrical characteristics of resistance, inductance and capacitance.
CO2 Known the characteristics of transducers.
CO3 Measure the strains, frequency and phase difference.

Course Code	Electric Drives
R193201	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Explain the fundamentals of electric drive and different electric braking methods.
CO2 Analyze the operation of three phase converter fed dc motors and four quadrant operations of dc motors using dual converters.
CO3 describe the converter control of dc motors in various quadrants of operation
CO4 Know the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters.
CO5 Differentiate the stator side control and rotor side control of three phase induction motor, explain the speed control mechanism of synchronous motors.

Course Code	

R193202	Power System Analysis

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Draw impedance diagram for a power system network and to understand per unit quantities.
- CO2 Form Ybus and Zbus for a power system networks.
- CO3 Understand the load flow solution of a power system using different methods
- CO4 Find the fault currents for all types faults to provide data for the design of protective devices.
- CO5 Find the sequence components of currents for unbalanced power system network.
- CO6 Analyze the steady state, transient and dynamic stability concepts of a power system.

Course Code	
R193203	Microprocessors and Microcontrollers

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Understand the Microprocessor capability in general and explore the evaluation of microprocessors.
- CO2 Understand the addressing modes of Microprocessors
- CO3 Understand the Microcontroller capability
- CO4 Program Microprocessors and Microcontrollers.
- CO5 Interface Microprocessors and Microcontrollers with other electronic devices
- CO6 Develop cyber physical systems

Course Code	
R193204a	Open Elective-I (RENEWABLE ENERGY SOURCES)

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Analyze solar radiation data, extraterrestrial radiation, radiation on earth‘s surface and solar Energy Storage
- CO2 Design the of Wind Energy Systems
- CO3 Design of biomass digesters, Geothermal plants and its working characteristics
- CO4 Know the Energy production from OTEC, Tidal and Waves.
- CO5 Evaluate the concept and working of Fuel cells & MHD power generation.

Course Code	

R193204b	Open Elective-I (ENERGY AUDITING, CONSERVATION AND MANAGEMENT)

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Understand the principles of energy audit along with various Energy related terminologies
- CO2 Understand the role of Energy Manager and Energy Management program.
- CO3 Recommend energy efficient motors and design a good lighting system
- CO4 Understand the process to improve the power factor and identify the energy instruments for various real time applications.
- CO5 Evaluate the computational techniques with regard to economic aspects.

Course Code R193204c	Open Elective-I (OPTIMIZATION TECHNIQUES)

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.
- CO2 Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.
- CO3 Formulate a mathematical model and apply linear programming technique by using Simplex method. Also extend the concept of dual Simplex method for optimal solutions.
- CO4 Solve transportation and assignment problem by using Linear programming Simplex method.
- CO5 Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions.
- CO6 Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.

Course Code R193205a	Program Elective –II (ENERGY AUDITING, CONSERVATION AND MANAGEMENT)

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Understand the principles of energy audit along with various Energy related terminologies.
- CO2 Understand the role of Energy Manager and Energy Management program
- CO3 Recommend energy efficient motors and design a good lighting system.
- CO4 Understand the process to improve the power factor and identify the energy instruments for various real time applications.
- CO5 Evaluate the computational techniques with regard to economic aspects.

Course Code	Program Elective –II (ELECTRICAL DISTRIBUTION SYSTEMS)
R193205b	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Understand various factors of distribution system
CO2 Design the substation and feeders.
CO3 Determine the voltage drop and power loss
CO4 Understand the protection and its coordination
CO5 Understand the effect of compensation for p.f improvement.
CO6 Understand the effect of voltage control.

Course Code	Program Elective –II (RENEWABLE ENERGY TECHNOLOGIES)
R193205c	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Analyze solar radiation data, extraterrestrial radiation, radiation on earth‘s surface and types of solar energy collectors and design solar thermal collections.
CO2 Understand the I-V & P-V characteristics of PV systems and develop maximum power point techniques.
CO3 Analyze the significance of Hydro & Tidal power systems.
CO4 Analyze wind systems by understanding the patterns of wind, types of turbines, selection of generators and tracking of maximum power from it.
CO5 Understand the importance of bomass and geothermal aspects.

Course Code	Program Elective –II (SPECIAL ELECTRIC MACHINES)
R193205d	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Distinguish between brush dc motor and brush less dc motor.
CO2 Explain the performance and control of stepper motors, and their applications.
CO3 Explain theory of operation and control of switched reluctance motor.
CO4 Explain the theory of travelling magnetic field and applications of linear motors.
CO5 Understand the significance of electrical motors for traction drives

Course Code	

R193206a	Program Elective –III (IOT APPLICATIONS IN ELECTRICAL ENGINEERING)

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Know the various fundamentals, architectures and technologies of Internet of Things
- CO2 Understand various communication technologies used in the Internet of Things
- CO3 Understand the various device connectivity methods using web and internet in the IoT environment.
- CO4 Understand various data acquisition methods, data handling using cloud for IoT applications.
- CO5 Know the implementation of IoT from the case studies like Smart Home, Smart city, etc.

Course Code R193206b	Program Elective –III (DATA BASE MANAGEMENT SYSTEMS)

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Describe a relational database and object-oriented database.
- CO2 Create, maintain and manipulate a relational database using SQL
- CO3 Describe ER model and normalization for database design.
- CO4 Examine issues in data storage and query processing and can formulate appropriate solutions
- CO5 Understand the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage.
- CO6 Design and build database system for a given real world problem

Course Code R193206c	Program Elective –III (DATA ANALYTICS WITH PYTHON)

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Describe what Data Analysis is and the skill sets needed to be a data scientist
- CO2 Explain in basic terms what Statistical Inference means.
- CO3 Identify probability distributions commonly used as foundations for statistical modelling, Fit a model to data
- CO4 Use Python to carry out basic statistical modeling and analysis
- CO5 Apply basic tools (plots, graphs, summary statistics) to carry out Data Analysis

Course Code	

R193206d	Program Elective –III (CLOUD COMPUTING)

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Understanding the key dimensions of the challenge of Cloud Computing
- CO2 Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization
- CO3 Assessing the financial, technological, and organizational capacity of employer‘s for actively initiating and installing cloud-based applications
- CO4 Assessment of own organizations needs for capacity building and training in cloud computing-related IT areas

Course Code	Power Electronics Laboratory
R193207	

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Study the characteristics of various power electronic devices
- CO2 Analyze the performance of single–phase and three–phase full–wave bridge converters with both resistive and inductive loads
- CO3 Understand the operation of single phase AC voltage regulator with resistive and inductive loads.
- CO4 Understand the working of Buck converter, Boost converter, single–phase square wave inverter and PWM inverter.

Course Code	Switchgear and Protection
R194101	

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Understand the principles of arc interruption for application to high voltage circuit breakers of air, oil, vacuum, SF6 gas type.
- CO2 Understand the working principle and operation of different types of electromagnetic protective relays
- CO3 Students acquire knowledge of faults and protective schemes for high power generator and transformers.
- CO4 Improves the ability to understand various types of protective schemes used for feeders and bus bar protection.
- CO5 Understand different types of static relays and their applications.
- CO6 Understand different types of over voltages and protective schemes required for insulation co–ordination.

Course Code	

R194102	Power System Operation and Control

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Compute optimal scheduling of Generators.
CO2 Understand hydrothermal scheduling.
CO3 Understand the unit commitment problem
CO4 Understand importance of the frequency
CO5 Understand importance of PID controllers in single area and two area systems.
CO6 Understand reactive power control and compensation for transmission line

Course Code	Program Elective -IV (HVDC TRANSMISSION)
R194103a	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Study the concepts of HVDC Transmission & their converters
CO2 Study the concepts HVDC system control methods
CO3 Study the concepts of converter faults and protection schemes for converter & lines
CO4 Study the concepts of reactive power control, hamonics in HVDC systems & design of filters.
CO5 Study types of MTDC system and DC circuit breakers

Course Code	Program Elective -IV (EHVAC TRANSMISSION)
R194103b	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Calculate the transmission line parameters.
CO2 Calculate the field effects on EHV and UHV AC lines.
CO3 Analyze voltage control and compensation problems in EHV and UHV transmission systems.
CO4 Determine the corona, RI and audible noise in EHV and UHV lines
CO5 Understand reactive power compensation using SVC and TCR

Course Code	

R194103c	Program Elective -IV (FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS)

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Understand power flow control in transmission lines using FACTS controllers.
- CO2 Explain operation and control of voltage source converter.
- CO3 Analyze compensation methods to improve stability and reduce power oscillations in the transmission lines.
- CO4 Explain the method of shunt compensation using static VAR compensators.
- CO5 Understand the methods of compensations using series compensators.
- CO6 Explain operation of Unified Power Flow Controller (UPFC).

Course Code	Program Elective -IV (HIGH VOLTAGE ENGINEERING)
R194103d	

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Be in a position to measure dielectric property of materials used in HV equipment
- CO2 Understand theory of breakdown and withstand phenomenon for gaseous dielectric materials.
- CO3 Understand theory of breakdown and withstand phenomenon for liquids & solid dielectric materials.
- CO4 Acquaint with the techniques of generation of high AC, DC Impulse voltages and currents
- CO5 Getting knowledge of measurement of high AC, DC, Impulse voltages and currents.

Course Code	Program Elective -IV (UTILIZATION OF ELECTRICAL ENERGY)
R194104a	

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Understand various level of illuminosity produced by different illuminating sources
- CO2 Estimate the illumination levels produced by various sources and recommend the most efficient illuminating sources and design different lighting systems by taking inputs and constraints in view
- CO3 Identify most appropriate heating or welding techniques for suitable applications.
- CO4 Identify a suitable motor for electric drives and industrial applications
- CO5 Determine the speed/time characteristics of different types of traction motors
- CO6 Know the necessity and usage of different energy storage schemes for different applications.

Course Code	

R194104b	Program Elective -V (SMART GRID TECHNOLOGIES)

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Understand smart grids and analyse the smart grid policies and developments in smart grids.
CO2 Develop concepts of smart grid technologies in hybrid electrical vehicles etc.
CO3 Understand smart substations, feeder automation, GIS etc
CO4 Analyse micro grids and distributed generation systems.
CO5 Analyse the effect of power quality in smart grid and to understand latest developments in ICT for smart grid.

Course Code	
R194104c	Program Elective -V (POWER SYSTEM DEREGULATION)

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Understand of operation of deregulated electricity market systems
CO2 Typical issues in electricity markets
CO3 Analyze various types of electricity market operational and control issues using new mathematical models.
CO4 Understand LMP‘s wheeling transactions and congestion management.
CO5 Analyze impact of ancillary services.

Course Code	
R194104d	Program Elective -V (HYBRID ELECTRIC VEHICLES)

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Know the concept of electric vehicles and hybrid electric vehicles
CO2 Familiar with different configuration of hybrid electric vehicles.
CO3 Understand the power converters used in hybrid electric vehicles
CO4 Know different batteries and other energy storage systems.

Course Code	
R194105a	Open Elective-II (AI TECHNIQUES AND ITS APPLICATIONS)

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Know different models of artificial neuron & Use learning methods of ANN.
CO2 Use different paradigms of ANN.
CO3 Classify between classical and fuzzy sets.
CO4 Use different modules of Fuzzy logic controller.
CO5 Apply Neural Networks and fuzzy logic for real-time applications.

Course Code	Open Elective-II (LINEAR CONTROL SYSTEMS)
R194105b	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Understand the basic concepts, properties of feedback and mathematical modeling of control systems and frequency domain approach.
CO2 Understand the transfer function analysis in signal flow graphs of control systems.
CO3 Employ the time domain analysis to quantify the performance of linear control systems and specify suitable controllers.
CO4 Perform frequency domain analysis of control systems required for stability analysis
CO5 Apply state variable theory to determine the dynamic behavior of linear control systems.

Course Code	Open Elective-II (MEASUREMENTS AND INSTRUMENTATION)
R194105c	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Choose right type of instrument for measurement of ac and dc Electrical quantities.
CO2 Choose right type of instrument for measurement of power and power factor
CO3 Select right type for measurement of R, L, and C.
CO4 Understand the effectiveness of Transducer
CO5 Able to understand Digital Meters.

Course Code	Microprocessors and Microcontrollers Laboratory
R194106	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Write assembly language program using 8086 micro based on arithmetic, logical, and shift operations
CO2 Interface 8086 with I/O and other devices
CO3 Do parallel and serial communication using 8051 & PIC 18 micro controllers.

Course Code	Power Systems and Simulation Laboratory
R194107	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Determine the parameters of various power system components which are frequently occur in power system studies and he can execute energy management systems functions at load dispatch center.

Course Code	Universal Human Values 2: Understanding Harmony

COURSEOUTCOMES

By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction. This is only an introductory foundationalinput. It would be desirable to follow it up by a) faculty-student or mentor-mentee programs throughout their time with the institution b) Higher level courses on human values in every aspect of living. E.g. as a professional.

Course Code	Program Elective –VI (AI APPLICATIONS IN ELECTRICAL ENGINEERING)
R194201a	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Know different models of artificial neuron & Use learning methods of ANN.
CO2 Use different paradigms of ANN.
CO3 Classify between classical and fuzzy sets.
CO4 Use different modules of Fuzzy logic controller.
CO5 Apply Neural Networks and fuzzy logic for real-time applications.

Course Code	Program Elective –VI (VLSI DESIGN)
R194201b	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Understand the insights of the MOS devices and its characteristics.
CO2 Appreciate the different VLSI process technologies.
CO3 Design the CMOS combinational logic circuits and its layout.
CO4 Develop the sequential circuits and clocking schemes.
CO5 Realize the Design flow of application-specific Integrated circuit

Course Code	

R194201c	Program Elective –VI (CYBER SECURITY)

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Illustrate the broad set of technical, social & political aspects of Cyber Security and
CO2 security management methods to maintain security protection
CO3 Appreciate the vulnerabilities and threats posed by criminals, terrorist and nation states to national infrastructure
CO4 Illustrate the nature of secure software development and operating systems
CO5 Demonstrate the role security management plays in cyber security defense and legal and social issues at play in developing solutions.

Course Code	
R194201d	Program Elective –VI (ELECTRICAL MACHINE DESIGN)

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Design main dimensions of rotating machines.
CO2 Design transformers and determine main dimensions.
CO3 Design field circuit of DC machines and Synchronous machines.
CO4 Design armature of DC machines and AC machines.

Course Code	
R194202a	Program Elective -VII (SWITCH MODE POWER CONVERSION)

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Analyze operation and control of non-isolated and isolated switch mode converters.
CO2 Design non-isolated and isolated switch mode converters.
CO3 Analyze operation and control of resonant converters.
CO4 Feedback design of switch mode converters based on linearized models.

Course Code	
R194202b	Program Elective -VII (EMBEDDED SYSTEMS)

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Know basics of embedded system, classification, memories, different communication interface and what embedded firmware is and its role in embedded system, different system components.
CO2 Distinguish all communication devices in embedded system, other peripheral device.
CO3 Distinguish concepts of C versus embedded C and compiler versus cross-compiler.
CO4 Choose an operating system, and learn how to choose an RTOS

Course Code	Program Elective -VII (PROGRAMMABLE LOGIC CONTROLLERS & its APPLICATIONS)
R194202c	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Understand I/O modules of PLC systems
CO2 Understand Boolean algebra system and spray process system
CO3 Understand PLC Programming and PLC Registers.
CO4 Understand PLC Functions
CO5 Understand Data Handling functions

Course Code	Program Elective -VII (COMMUNICATION SYSTEMS)
R194202d	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Understand the basics of communication system, analog and digital modulation techniques
CO2 Apply the knowledge of digital electronics and understand the error control coding techniques.
CO3 Summarize different types of communication systems and its requirements.

Course Code	Open Elective-III (MICROPROCESSORS AND MICROCONTROLLERS APPLICATIONS)
R194203a	

COURSEOUTCOMES

After completion of course, students would be ableto:

CO1 Understand the Microprocessor capability in general and explore the evaluation of microprocessors.
CO2 Understand the addressing modes of Microprocessors
CO3 Understand the Microcontroller capability
CO4 Program Microprocessors and Microcontrollers.
CO5 Interface Microprocessors and Microcontrollers with other electronic devices
CO6 Develop cyber physical systems

Course Code	Open Elective-III (FUNDAMENTALS OF UTILIZATION OF ELECTRICAL ENERGY)
R194203b	

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Know the various sources of electrical energy and its generation technologies for conventional and non-conventional energy sources.
- CO2 Know various types of illumination equipment, illumination measurement and illumination techniques.
- CO3 Learn about various methods used for electrical energy based heating and welding applications
- CO4 Know about the mechanisms, equipment and technology used in the electric traction.
- CO5 Understand the importance of electrical earthing, earthing equipment and electrical earthing measurement methods

Course Code	Open Elective-III (ELECTRICAL ESTIMATION AND COSTING)
R194203c	

COURSEOUTCOMES

After completion of course, students would be ableto:

- CO1 Identify the various electrical apparatus and their interconnections.
- CO2 Select suitable electrical supply system and design earthing systems of various electric loads
- CO3 Estimate the cost for installation of wiring for different types of building and small industries.
- CO4 Identify the components of electrical substations.
- CO5 Design suitable control circuit for starting of three phase induction motor and synchronous motor.