



**Annamacharya Institute of Technology and Sciences, Tirupati**  
**(AUTONOMOUS)**  
**Department of Electrical and Electronics Engineering**  
**Course Outcomes (COs)**  
**AK19 Regulations**

<b>Course Name</b>	<b>Course Outcomes (COs)</b>
<b>Algebra and Calculus</b>	<ol style="list-style-type: none"> <li>1. Develop the use of matrix algebra techniques that is needed by engineers for practical applications.</li> <li>2. Utilize mean value theorems to real life problems.</li> <li>3. Familiarize with functions of several variables which is useful in optimization.</li> <li>4. Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2-dimensional coordinate systems</li> <li>5. Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions</li> </ol>
<b>Applied Physics</b>	<ol style="list-style-type: none"> <li>1. Analyze the wave properties of light and the interaction of energy with the matter.</li> <li>2. Apply electromagnetic wave propagation in different guided media.</li> <li>3. Asses the electromagnetic wave propagation and its power in different media</li> <li>4. Analyze the conductivity of semiconductors.</li> <li>5. Interpret the difference between normal conductor and superconductor and apply the nanomaterials for engineering applications.</li> </ol>
<b>Problem Solving and Programming</b>	<ol style="list-style-type: none"> <li>1. Introduce the internal parts of a computer, and peripherals.</li> <li>2. Introduce the Concept of Algorithm and use it to solve computational problems</li> <li>3. Identify the computational and non-computational problems</li> <li>4. Teach the syntax and semantics of a C Programming language</li> <li>5. Demonstrate the use of Control structures of C Programming language</li> <li>6. Illustrate the methodology for solving Computational problems</li> </ol>
<b>Communicative English I</b>	<ol style="list-style-type: none"> <li>1. Identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English</li> <li>2. Formulate sentences using proper grammatical structures and correct word forms</li> <li>3. Speak clearly on a specific topic using suitable discourse markers in informal discussions</li> <li>4. Write summaries based on global comprehension of reading/listening texts</li> <li>5. Produce a coherent paragraph interpreting a figure/graph/chart/table</li> <li>6. Take notes while listening to a talk/lecture to answer questions</li> </ol>
<b>Electrical and Electronics Engineering Workshop</b>	<ol style="list-style-type: none"> <li>1 Demonstrate knowledge on different tools, abbreviations and symbols used in Electrical Engineering.</li> <li>2 Measure different electrical quantities using measuring instruments.</li> <li>3 Demonstrate how to trouble shoot the electrical equipment's (like fan, grinder, motor, etc.)</li> <li>4 Perform Wiring and Earthing for residential houses.</li> </ol>



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<p style="text-align: center;"><b>Applied Physics Lab</b></p>	<ol style="list-style-type: none"> <li>1. Analyze the wave properties of light and the interaction of energy with the matter.</li> <li>2. Apply electromagnetic wave propagation in different guided media.</li> <li>3. Assess the electromagnetic wave propagation and its power in different media</li> <li>4. Analyze the conductivity of semiconductors.</li> <li>5. Interpret the difference between normal conductor and superconductor and apply thenanomaterials for engineering applications.</li> </ol>
<p style="text-align: center;"><b>Problem Solving and Programming Lab</b></p>	<ol style="list-style-type: none"> <li>1. Construct a Computer given its parts (L6)</li> <li>2. Select the right control structure for solving the problem (L6)</li> <li>3. Analyze different sorting algorithms (L4)</li> <li>4. Design solutions for computational problems (L6)</li> <li>5. Develop C programs which utilize the memory efficiently using programming constructslike pointers.</li> </ol>
<p style="text-align: center;"><b>Communicative English I Lab</b></p>	<ol style="list-style-type: none"> <li>1. Remember and understand the different aspects of the English language proficiencywith emphasis on LSRW skills</li> <li>2. Apply communication skills through various language learning activities</li> <li>3. Analyze the English speech sounds, stress, rhythm, intonation and syllable divisionfor better listening and speaking comprehension.</li> <li>4. Evaluate and exhibit acceptable etiquette essential in social and professional settings.</li> <li>5. Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.</li> </ol>
<p style="text-align: center;"><b>Basics of Civil and Mechanical Engineering</b></p>	<ol style="list-style-type: none"> <li>1: understand principles of Stress and Strain</li> <li>2: understand basic principles of Strain Measurement and apply the concepts of StrainRosettes for strain measurement.</li> <li>3: understand common building materials used in construction and analyze characteristics dcommon building materials.</li> <li>4: Apply velocity ratio concepts in power transmission.</li> <li>5: Understand the principles of CAD, CAM &amp; CIM. (L.2)</li> </ol>
<p style="text-align: center;"><b>Differential Equations and Vector Calculus</b></p>	<ol style="list-style-type: none"> <li>1. Apply the mathematical concepts of ordinary differential equations of higherorder.</li> <li>2. Solve the differential equations related to various engineering fields.</li> <li>3. Identify solution methods for partial differential equations that model physical processes.</li> <li>4. Interpret the physical meaning of different operators such as gradient, curl and divergence.</li> <li>5. Estimate the work done against a field, circulation and flux using vector calculus.</li> </ol>



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<b>Chemistry</b>	<ol style="list-style-type: none"><li>1. Understand the behaviour of, and interactions between matter and energy at both the atomic and molecular levels</li><li>2. Compare the materials of construction for battery and electrochemical sensors</li><li>3. Understand the preparation, properties, and applications of thermoplastics &amp; thermosetting, elastomers &amp; conducting polymers.</li><li>4. HPLC and GC methods used for separation of gaseous and liquid mixtures.</li><li>5. Understand the disadvantages of using hard water and select suitable treatments domestically and industrially.</li></ol>
<b>Data Structures</b>	<ol style="list-style-type: none"><li>1. To teach the representation of solution to the problem using algorithm</li><li>2. To explain the approach to algorithm analysis</li><li>3. To introduce different data structures for solving the problems</li><li>4. To demonstrate modeling of the given problem as a graph</li><li>5. To elucidate the existing hashing techniques</li></ol>
<b>Engineering Workshop</b>	<ol style="list-style-type: none"><li>1 Apply wood working skills in real world applications.</li><li>2 Build different parts with metal sheets in real world applications.</li><li>3 Apply fitting operations in various applications.</li><li>4 Apply different types of basic electric circuit connections.</li><li>5 Demonstrate soldering and brazing.</li></ol>
<b>Engineering Graphics Lab</b>	<ol style="list-style-type: none"><li>1 Draw various curves applied in engineering.</li><li>2 Show projections of solids and sections graphically</li><li>3 Draw the development of surfaces of solids.</li><li>4 Use computers as a drafting tool.</li><li>5 Draw isometric and orthographic drawings using CAD packages.</li></ol>
<b>Basics of Civil and Mechanical Engineering Lab</b>	<ol style="list-style-type: none"><li>1. Impart basic principles of bending test on Cantilever beam and simply supported beam</li><li>2. Understand principles of strain measurement using electrical strain gauges</li><li>3. Impart concepts of Torsion, compression and water absorption</li><li>4. Apply velocity ratio concepts in power transmission</li><li>5. Understand the principles of CAD, CAM &amp; CIM</li></ol>
<b>Chemistry Lab</b>	<ol style="list-style-type: none"><li>1. To familiarize the students with the basic concepts of chemistry of materials</li><li>2. Prepare advanced polymer materials</li><li>3. Measure the strength of an acid present in secondary batteries</li><li>4. To familiarize with digital and instrumental methods of analysis</li></ol>



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<b>Data Structures Lab</b>	<ol style="list-style-type: none"> <li>1. To introduce to the different data structures</li> <li>2. To elucidate how the data structure selection influences the algorithm complexity</li> <li>3. To explain the different operations that can be performed on different data structures</li> <li>4. To introduce to the different search and sorting algorithms.</li> </ol>
<b>Transform Techniques and Complex Variables</b>	<ol style="list-style-type: none"> <li>1. Apply the Laplace transform for solving differential equations (continuous systems)</li> <li>2. Find the Fourier series of periodic signals</li> <li>3 Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms</li> <li>4 Solve linear/nonlinear algebraic and transcendental equations using numerical methods</li> <li>5 Solve ordinary differential equations by Euler's method, modified Euler's method, Runge Kutta method, Predictor Corrector method and Milne's method</li> </ol>
<b>Communicative English II</b>	<ol style="list-style-type: none"> <li>1. Prioritize information from reading texts after selecting relevant and useful points</li> <li>2. Paraphrase short academic texts using suitable strategies and conventions</li> <li>3. Make formal structured presentations on academic topics using PPT slides with relevant graphical elements</li> <li>4. Participate in group discussions using appropriate conventions and language strategies</li> <li>5. Prepare a CV with a cover letter to seek internship/ job</li> <li>6. Collaborate with a partner to make presentations and Project Reports</li> </ol>
<b>Internet of Things (IoT)</b>	<p>CO1 Interpret the vision of IoT from a global context</p> <p>CO2 Determine the Market perspective of IoT</p> <p>CO3 Compare and Contrast the use of Devices, Gateways and Data Management in IoT</p> <p>CO4 Implement state of the art architecture in IoT</p> <p>CO5 Illustrate the application of IoT in Industrial Automation and identify Real World Design Constraints</p>
<b>Electrical Circuit Analysis</b>	<p>CO1: Apply network theorems for the analysis of electrical circuits.</p> <p>CO2: Determine the transient and steady-state response of electrical circuits.</p> <p>CO3: Analyze circuits in the sinusoidal steady-state domain (single-phase and three phase). CO4: Analyze two port networks using network parameters</p> <p>CO5: Apply mesh and nodal analysis to solve electrical circuit problems</p>



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<p><b>Electronic Devices and Circuits</b></p>	<p>CO1: Ability to understand the operation of diodes and special electronic devices with V-I characteristics.            CO2: Ability to understand the operation of different rectifiers and filters.            CO3: Ability to understand the construction, operation of BJT, FET in different configurations            CO4: Ability to understand importance of biasing and design of DC biasing circuits.            CO5: Ability to understand small signal model and design of amplifiers with BJTs and FETs.</p>
<p><b>Engineering Electromagnetics</b></p>	<p>CO1: Understand basic principles, concepts and fundamental laws of electromagnetic fields.            CO2: Translate from one coordinate system to another.            CO3: Describe electrostatics, magneto statics and time-varying fields            CO4: Analyze the interaction between electricity and magnetism.            CO5: Calculate the quantities associated with uniform plane wave motion in different media of Transmission.</p>
<p><b>Environmental Studies</b></p>	<p>CO: 1 Students get sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.            CO: 2 Students realize the need to change their approach, so as to perceive our own environmental issues correctly, using practical approach based on observation and self-learning.            CO: 3 Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.            CO: 4 Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage            CO: 5 To get knowledge on various environmental acts and to engage all the students life- long learning of rain water harvesting</p>
<p><b>Communicative English II Lab</b></p>	<p>CO: 1 Prioritize information from reading texts after selecting relevant and useful points.            CO: 2 Make formal structured presentations on academic topics using PPT slides with relevant graphical elements.            CO: 3 Participate in Group discussions using appropriate conventions and language strategies.            CO: 4 Paraphrase short academic text using suitable strategies and conventions.            CO: 5 Collaborate with a partner to make presentations and Project</p>
<p><b>Internet of Things (IoT) Lab</b></p>	<ol style="list-style-type: none"> <li>1. Choose the sensors and actuators for an IoT application.</li> <li>2. Select protocols for a specific IoT application.</li> <li>3. Utilize the cloud platform and APIs for IoT application.</li> <li>4. Experiment with embedded boards for creating IoT prototypes.</li> <li>5. Design a solution for a given IoT application.</li> </ol>
<p><b>Electrical Circuit Analysis Lab</b></p>	<p>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</p>



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<b>Electronic Devices and Circuits Lab</b>	CO1: Ability to test and operate diodes and special electronic devices. CO2: Ability to construct and operate rectifiers without and with filters CO3: Ability to construct and operate BJT, FET in different configurations CO4: Ability to design DC biasing circuits for Transistors CO5: Ability to design amplifiers using BJTs and FETs.
<b>Numerical Methods and Probability</b>	1) Evaluate approximating the roots of polynomial and transcendental equations by differential algorithms 2) Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations 3) Apply discrete and continuous probability distributions 4) Design the components of a classical hypothesis test 5) Infer the statistical inferential methods based on small and large sampling tests
<b>Basics of Python Programming</b>	1. To learn the fundamentals of Python 2. To elucidate problem-solving using a Python programming language 3. To introduce a function-oriented programming paradigm through python 4. To get training in the development of solutions using modular concepts 5. To introduce the programming constructs of python
<b>Design Thinking and Product Innovation</b>	1 Summarize the basics of Engineering design process. 2 Explain historical development of Physics and science to Engineering. 3 Apply systematic approach to innovative designs. 4 Identify new technologies and requirement for new product development. 5 Explain and study of Product Development.
<b>Electrical Machines - I</b>	CO1: Apply the concepts of magnetic circuits to compute induced EMF and force in Electro-magnetic systems. CO2: Analyze the operation, conditions required of self-excitation of DC Generators and parallel operation of DC Generators. CO3: Distinguish the operation of various dc motors and determine the performance of DC machine using the results of tests. CO4: Explain the principle, constructional features and evaluate the performance characteristics of single phase transformers by conducting various tests. CO5: Analyze the operations of Auto Transformer, Three Phase Transformer and parallel operation of Transformers.
<b>Analog Electronic Circuits</b>	CO1: Ability to understand multi stage amplifiers using BJT and FET. CO2: Ability to understand high frequency model and analyze its frequency responses. CO3: Ability to understand feedback amplifiers and oscillators along with design. CO4: Ability to understand power amplifiers. CO5: Ability to understand tuned amplifiers and their effect on bandwidth and stability
<b>Digital Electronic Circuits</b>	CO1: Ability to realize and implement Boolean and switching functions. CO2: Ability to minimize switching functions. CO3: Ability to design combinational circuits. CO4: Ability to design sequential logic circuits. CO5: Ability to understand concepts of Programmable Memories



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<b>Biology for Engineers</b>	<p>CO: 1 Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.</p> <p>CO: 2 Explain about biomolecules, their structure, function and their role in the living organisms. How biomolecules are useful in Industry.</p> <p>CO: 3 Brief about human physiology.</p> <p>CO: 4 Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.</p> <p>CO: 5 Know about application of biological principles in different technologies for the production of medicines and pharmaceutical molecules through transgenic microbes, plants and animals</p>
<b>Electrical Machines - I Lab</b>	<p>CO1: Identify the reason as to why D.C. Generator is not building up voltage</p> <p>CO2: Conduct experiments to obtain the no-load and load characteristics of D.C. Generators</p> <p>CO3: Conduct tests on D.C. motors for determination and predetermination of efficiency</p> <p>CO4: Control the speed of D.C. motor in a given range using appropriate method</p> <p>CO5: Conduct tests on transformers for predetermination of efficiency and load sharing</p>
<b>Basics of Python Programming Lab</b>	<ul style="list-style-type: none"> <li>• Design solutions to mathematical problems.</li> <li>• Organize the data for solving the problem.</li> <li>• Develop Python programs for numerical and text based problems.</li> <li>• Select appropriate programming construct for solving the problem.</li> <li>• Illustrate object oriented concepts.</li> </ul>
<b>Design Thinking and Product Innovation Lab</b>	<ol style="list-style-type: none"> <li>1. Explain the motion transmission through belts, chains and gears.</li> <li>2. Ability to analyse mechanical advantage through pulleys and other mechanisms.</li> <li>3. Explain the different electrical equipment such as mechanical calculators, automotive devices such as wiper.</li> <li>4. Ability To design a device for Water Level Indicator.</li> <li>5. Ability to design and simulation of a Hydraulic Shaper, simple pneumatic and hydraulic circuits using basic components.</li> </ol>
<b>Analog and Digital Electronic Circuits Lab</b>	<p>CO1: Ability to design multi stage amplifiers, power amplifier and tuned amplifier</p> <p>CO2: Ability to design feedback amplifiers and oscillators along with design.</p> <p>CO3: Ability to verify all basic Logic gates</p> <p>CO4: Ability to design Combinational Circuits</p> <p>CO5: Ability to design flip flops and Counters</p>
<b>Power Systems - I</b>	<p>CO1: Acquire knowledge on thermal, gas and nuclear power plants operation.</p> <p>CO2: Understand the operation of AC and DC distribution systems.</p> <p>CO3: Understand the operation of Air Insulated &amp; Gas Insulated (GIS) Substations.</p> <p>CO4: Familiarize with voltage control and power factor improvement techniques.</p> <p>CO5: Analyze economic aspects of power generation and different types of tariff methods.</p>
<b>Electrical Machines - II</b>	<ol style="list-style-type: none"> <li>1. Understand the fundamentals of windings, pulsating magnetic fields and revolving magnetic field.</li> </ol>



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	<p>2. Understand the fundamentals and performance analysis of three phase and single-phase induction.</p> <p>3. Understand operation, various methods of starting, braking and speed control of induction motors.</p> <p>4. Analyze the phasor diagrams, parallel operation of alternators, synchronization and load division of synchronous generators.</p> <p>5. Analyze the phasor diagram, determination of V and inverted V curves and power circles of synchronous motor.</p>
<b>Control Systems</b>	<p>1. Understand the basics of systems, modelling of various kind of systems, detection of transfer function from the pictorial representation.</p> <p>2. Acquire knowledge of open loop and closed loop systems.</p> <p>3. Learn to use block diagram to find the overall transfer function of first and second order systems.</p> <p>4. Understand transient and steady state response, time domain specifications and the concept of Root loci.</p> <p>5. Analyze frequency domain specifications, Bode diagrams and Nyquist plots.</p>
<b>Power Electronics</b>	<p>1. Understand the basic operating principles of power semiconductor switching devices.</p> <p>2. Analyze the operation of AC-DC and DC to DC converters and their control.</p> <p>3. Analyze the operation of DC-AC and AC to AC converters and their control.</p> <p>4. Understand the operation of cyclo converters.</p>
<b>Signals and Systems</b>	<p>CO1. Understand mathematical description and representation of continuous time and discrete time signals.</p> <p>CO2: Resolve signals in frequency domain using Fourier series and Fourier Transforms.</p> <p>CO3: Apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back.</p> <p>CO4: Understand the properties of systems, response of LTI systems and filters. CO5: Able to analyze LTI systems using Laplace and Z-Transforms.</p>
<b>Analog and Digital IC Applications</b>	<p>CO1: Understand the basic building blocks of linear integrated circuits and its characteristics.</p> <p>CO2: Design the Multivibrator circuits using IC555 and determine the frequency of oscillation and time delay, and understand the concept of A/D and D/A Converters.</p> <p>CO3: Understand the concept of active filters and oscillators.</p> <p>CO4: Design of CMOS logic circuits and analysis of performance characteristics. CO5: Implementation of digital logic circuits with the estimation of power and speed.</p>
<b>Linear System Analysis</b>	<p>CO1: Analyse the spectral characteristics of continuous-time periodic and a periodic signals using Fourier analysis</p> <p>CO2: Represent CT and DT systems in the Frequency domain using CTFT, DTFT</p> <p>CO3: Apply the Laplace transform for analyze of continuous-time signals and systems</p> <p>CO4: Apply the Z- transform for analyze discrete-time signals and systems</p> <p>CO5: Understand the process of sampling and the effects of under sampling</p>
<b>Managerial</b>	<p>CO1: Understand the fundamentals of Economics and Managerial economics</p>





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<b>Economics and Financial Analysis</b>	viz., Demand, Production, cost, revenue and markets. CO2: Apply the Concept of Production cost and revenues for effective Business decision CO3: Analyze how to invest their capital and maximize returns. CO4: Evaluate the capital budgeting techniques. CO5: Define the concepts related to financial accounting and management and able to develop the Accounting statements and evaluate the financial performance of business entity.
<b>Computer Networks</b>	1. Run and manage the Internet, part of the Internet, or an organization's network that is connected to the Internet. 2. Understand the basics of data communications and networking 3. The protocols used in the Internet communication
<b>Analog and Digital Communications</b>	CO1. Describe of various amplitude modulation and demodulation techniques. CO2. Understand various angle modulation and demodulation techniques. CO3. Explain AM, FM Transmitters and Receivers. CO4. Analyze and design the various pulse modulation techniques. CO5. Design various digital carrier modulation techniques and baseband transmission.
<b>Constitution of India</b>	1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics. 2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India. 3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution. 4. Discuss the Powers and functions of Governor, President, and Judiciary. 5. Discuss the functions of local administration bodies.
<b>Electrical Machines - II Lab</b>	1. Analyze and apply load test, no-load and blocked-rotor tests for construction of circle diagram and equivalent circuit determination in a single-phase induction motor. 2. Predetermine regulation of a three-phase alternator by synchronous impedance & m.m.f methods. 3. Predetermine the regulation of Alternator by Zero Power Factor method Xd and Xq determination of salient pole synchronous machine. 4. Evaluate and analyze V and inverted V curves of 3 phase synchronous motor
<b>Control Systems Lab</b>	1. Acquire knowledge of feedback control and transfer function of DC servo motor. 2. Familiarize mathematical modelling of systems and design controllers and compensators. 3. Get the knowledge on transient and steady state behaviour of second order systems. 4. Determine the performance and time domain specifications of first and second order systems. 5. Implement MATLAB analysis to real life systems.
<b>Power Electronics Lab</b>	1. Understand and analyze various characteristics of power electronic devices with gate firing circuits and forced commutation techniques.



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	<ol style="list-style-type: none"> <li>2. Analyze the operation of single-phase half &amp; fully-controlled converters and inverters with different types of loads.</li> <li>3. Analyze the operation of DC-DC converters, single-phase AC Voltage controllers, cyclo- converters with different loads.</li> <li>4. Create and analyze various power electronic converters using MATLAB software.</li> </ol>
<b>Power Systems - II</b>	<ol style="list-style-type: none"> <li>1. Understand the classification and parameters of conductors, transmission lines.</li> <li>2. Analyze power system transients and the effect on power systems.</li> <li>3. Understand the factors governing the performance of transmission lines.</li> <li>4. Analyze the properties of overhead lines and their types.</li> <li>5. Understand the types and construction of underground cables.</li> </ol>
<b>Electrical Measurements and Instrumentation</b>	<ol style="list-style-type: none"> <li>1. Understand different types of measuring instruments, their construction, operation and characteristics.</li> <li>2. Identify the instruments suitable for typical measurements.</li> <li>3. Apply the knowledge about transducers and instrument transformers to use them effectively.</li> </ol>
<b>Power System Analysis</b>	<ol style="list-style-type: none"> <li>1. Remember and understand the concepts of per unit values, Y Bus and Z Bus formation.</li> <li>2. Apply the concepts of good algorithm for the given power system network and obtain the converged load flow solution.</li> <li>3. Analyse the symmetrical faults and unsymmetrical faults.</li> <li>4. Analyze algorithms for different networks and determine load flow studies and zero, positive and negative sequence impedances to find fault calculations.</li> <li>5. Understand and select efficient Circuit Breakers to improve system stability.</li> </ol>
<b>Neural Networks and Fuzzy Logic</b>	<ol style="list-style-type: none"> <li>1. Understand the basic architecture of artificial neural network terminologies and techniques.</li> <li>2. Understand approaches and architectures of Artificial Intelligence.</li> <li>3. Perform the training of neural networks using various learning rules.</li> <li>4. Create different neural networks of various architectures both feed forward and feed backward.</li> <li>5. Application of ANN to System Identification and Pattern recognition.</li> </ol>
<b>Microprocessors and Microcontrollers</b>	<p>CO1: Understand concepts of Intel x86 series of processors            CO2: Do programming with 8086 microprocessors            CO3: Understand concepts of MSP 430 Controllers            CO4: Program MSP 430 for designing any basic Embedded System            CO5: Design and implement some specific real time applications Using MSP 430 low power microcontroller.</p>
<b>Renewable energy technologies</b>	<ol style="list-style-type: none"> <li>1. Explain the current energy scenario and requirement of migration to renewable energy sources.</li> <li>2. To understand role significance of solar energy.</li> <li>3. To provide importance of Wind Energy.</li> <li>4. To understand the role of ocean energy in the Energy Generation.</li> <li>5. To understand role of hydrogen in non-conventional energy</li> </ol>
<b>Business Data Analytics</b>	<ol style="list-style-type: none"> <li>1. Introduce the Business intelligence concepts ,techniques and models</li> <li>2. understand the modeling process behind business analytics analyze different data analysis tools and techniques</li> </ol>
<b>Principles of</b>	<ol style="list-style-type: none"> <li>1. Gain and demonstrate the basic skills of effective oral communication, for</li> </ol>



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<b>Effective Public Speaking</b>	<p>use throughout your academic career and beyond.</p> <p>2. Learn and develop the skills necessary to maximize public speaking effectiveness, including effective research and organization of information, how to make the most of presentation aids (and not become reliant on them!), and understanding the speaker-audience relationship.</p> <p>3. Develop critical thinking and listening skills, enabling you to maximize your own understanding as an audience member, and offer considered and constructive critiques of others' speeches.</p> <p>3. Become more confident in public speaking arenas, whether as a formal speech giver or as a participant in group settings. Improvement will be valued over perfection.</p>
<b>Optics</b>	<p>1. Analyze the wave properties of light.</p> <p>2. Interpret the interaction of energy with matter.</p> <p>3. Analyze the semiconductor photo devices.</p> <p>4. Interpret structural spectroscopic techniques.</p> <p>5. Analyze NMR and ESR spectra.</p>
<b>Quantum Mechanics</b>	<p>1. Analyze the Classical theory of quantum mechanics and Different effects.</p> <p>2. Illustrate the experimental evidence of matter waves.</p> <p>3. Analyze Heisenberg's Uncertainty Principle and Experimental Verification.</p> <p>4. Analyze the Time dependent and independent Schrodinger's Equation.</p> <p>5. Evaluate the One Dimensional Potential Well and Barrier Potential.</p>
<b>Professional Ethics and Human values</b>	<p>1. It ensures students sustained happiness through identifying the essentials of human values and skills.</p> <p>2. The students will understand the importance of Values and Ethics in their personal lives and professional careers.</p> <p>3. The students will learn the rights and responsibilities as an employee, team member and a global citizen.</p> <p>4. Students understand practically the importance of trust, mutually satisfying human behaviour and enriching interaction with nature.</p> <p>5. Students can able to develop appropriate technologies and management patterns to create harmony in professional and personal life.</p>
<b>Power Systems Lab</b>	<p>1. Acquire practical knowledge on calculation of sequence impedance, fault currents, voltages and sub transient reactance's. Get the practical knowledge on how to draw the equivalent circuit of three winding transformer.</p> <p>2. Acquire knowledge on development of MATLAB program for formation of Y and Z buses.</p> <p>3. Acquire knowledge on development of MATLAB programs for Gauss-Seidel and Fast Decouple Load Flow studies.</p> <p>4. Acquire knowledge on development of SIMULINK model for single area load frequency problem.</p>
<b>Microprocessors and Microcontrollers Lab</b>	<p>CO1: To apply the assembly language instructions of 8086 microprocessor to describe the concept of programming and its applications to real world.</p> <p>CO2: To demonstrate the steps in executing an assembly language program using an assembler.</p> <p>CO3: Understand concepts of MSP 430 Controllers</p> <p>CO4: Program MSP 430 for designing any basic Embedded System</p> <p>CO5: Design and implement some specific real time applications Using MSP 430 low power microcontroller.</p>



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<b>Electrical Measurements Lab</b>	<ol style="list-style-type: none"> <li>1. Understand calibration of various electrical measuring instruments.</li> <li>2. Accurately determine the values of inductance and capacitance using AC bridges.</li> <li>3. Analyze coefficient of coupling between two coupled coils.</li> <li>4. Accurately determine the values of very low resistances.</li> <li>5. Understand the working principles of displacement transducers.</li> </ol>
<b>Switch Gear and Protection</b>	<ol style="list-style-type: none"> <li>1. Acquire knowledge on various types of fuses, breakers and relays used for power system protection.</li> <li>2. Design protection system for generators and transformers.</li> <li>3. Identify various types of the relays in protecting feeders, lines and bus bars.</li> <li>4. Demonstrate the protection of a power system from over voltages.</li> </ol>
<b>High Voltage Engineering</b>	<ol style="list-style-type: none"> <li>1. Discuss and analyze the various types of electrical stress control techniques in gas and vacuum insulation systems</li> <li>2. Derive and analyze the expression of current growth and breakdown voltage due to various mechanisms of gaseous breakdown in dielectrics/insulation</li> <li>3. Derive and analyze the various mechanisms of breakdown in liquid and solid dielectrics breakdown</li> <li>4. Acquire knowledge on generation and measurement of high voltage and high current.</li> <li>5. Acquire knowledge on over voltage and insulation coordination in electric power systems.</li> </ol>
<b>Embedded Systems</b>	<p>CO1: Understand the fundamental concepts of Embedded systems.</p> <p>CO2: Analyze TM4C Architecture, Instruction Set, addressing modes to develop programs for various applications using Assembly and Embedded C.</p> <p>CO3: Develop an embedded system by interfacing the microcontrollers and IDE tools.</p> <p>CO4: Figure out problems using TM4C On chip Resources such as Timer, Clock System, Low Power Modes/techniques and Interrupt Structure.</p> <p>CO5: Implement the protocols used by microcontroller to communicate with external sensors and actuators in real world.</p>
<b>Data Base Management Systems</b>	<ol style="list-style-type: none"> <li>1. Demonstrate the basic elements of a relational database management system,</li> <li>2. Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respective data.</li> <li>3. Apply normalization for the development of application software.</li> <li>4. Define Transactions which preserve the integrity of database</li> <li>5. Ability to understand Storage and Indexing Techniques</li> </ol>
<b>Mechanics of materials</b>	<ol style="list-style-type: none"> <li>1: Understand the system of forces on bodies.</li> <li>2: Determine the centroid and moment of inertia for different cross-sections.</li> <li>3: Understand the concepts of stress, strain, generalized Hooke's law, elastic moduli.</li> <li>4: Develop shear force and bending moment diagrams for different load cases.</li> </ol>



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	5: Compute the slope and deflection of simple beams
<b>Electrical Distribution Systems</b>	<ol style="list-style-type: none"> <li>1. Understand basics of distribution systems and substations.</li> <li>2. To understand about modelling of various loads.</li> <li>3. To perform distribution load flow solutions.</li> <li>4. To evaluate power loss and feeder cost.</li> <li>5. To know the principles of SCADA, Automation distribution system and management</li> </ol>
<b>Power Semi-conductor Drives</b>	<ol style="list-style-type: none"> <li>1. Identify the choice of the electric drive system based on their applications.</li> <li>2. Explain the operation of single and multi-quadrant electric drives.</li> <li>3. Analyze single phase and three phase rectifiers fed DC motors as well as chopper fed DC motors.</li> <li>4. Explain the speed control methods for AC-AC &amp; DC-AC converters fed to Induction motors and Synchronous motors with closed loop, and open loop operations.</li> </ol>
<b>Advanced Control Systems</b>	<ol style="list-style-type: none"> <li>1. Design state feedback controller and state observer.</li> <li>2. Understand and analyse linear and nonlinear systems using phase plane method.</li> <li>3. Understand and analyse nonlinear systems using describing function method.</li> <li>4. Understand and design optimal controller.</li> <li>5. Understand optimal estimator including Kalman Filter.</li> </ol>
<b>Power System Operation and Control</b>	<ol style="list-style-type: none"> <li>1. Understand to deal with problems in Power System as Power System Engineer.</li> <li>2. Understand to deal with AGC problems in Power System.</li> <li>3. Understand to deal the problems in hydroelectric and hydro thermal problems.</li> <li>4. Understand the complexity of reactive power control problems and to deal with them.</li> <li>5. Understand the necessity of deregulation aspects and demand side management problems in the modern power system era.</li> </ol>
<b>Flexible AC Transmission Systems</b>	<ol style="list-style-type: none"> <li>1. Understand various control issues, for the purpose of identifying the scope and for selection of specific FACTS controllers.</li> <li>2. Apply the concepts in solving problems of simple power systems with FACTS controllers.</li> <li>3. Design simple FACTS controllers and converters for better transmission of electric power.</li> <li>4. Understand to deal with problems in Power System as Power System Engineer.</li> </ol>
<b>Digital Signal Processing</b>	<p>CO1: Analyze discrete signals and systems in time and frequency domains.            CO2: Apply FFT algorithms to efficient computation of DFT.            CO3: Implement and realize various structures of IIR and FIR systems.            CO4: Design &amp; analyze various Analog Filters and Digital Filters.            CO5: Understand and apply the basics of multi rate digital signal processing.</p>
<b>Technical Writing</b>	<ol style="list-style-type: none"> <li>1. To acquaint students with a variety of forms of writing in science and technology;</li> <li>2. Develop research skills;</li> <li>3. Discuss and apply writing and formatting techniques;</li> </ol>



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<b>Effective technical Communication</b>	<ol style="list-style-type: none"><li>1. To develop awareness in students of the relevance and importance of technical communication and presentation skills.</li><li>2. To prepare the students for placements</li><li>3. To sensitize the students to the appropriate use of non-verbal communication</li><li>4. To train students to use language appropriately for presentations and interviews</li></ol>
<b>Soft skills</b>	<ol style="list-style-type: none"><li>1. Recognize the importance of verbal and non-verbal skills</li><li>2. Develop the interpersonal and intrapersonal skills</li><li>3. Apply grammatical structures to formulate sentences and correct word forms.</li><li>4. Create trust among people and develop employability skills</li></ol>
<b>Switchgear and Protection Lab</b>	<ol style="list-style-type: none"><li>1. Understand the operation and characteristics of switch gear used in protection of power systems.</li><li>2. Analyze the protection of parallel, radial feeders &amp; over voltage induction relay.</li><li>3. Analyze the functioning of various protection schemes using MATLAB.</li></ol>