

G PULLAIAH COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)

(Approved by AICTE | NAAC Accreditation with 'A' Grade |
Accredited by NBA (CIV, CSE, ECE & EEE) | Affiliated to JNTUA)
Nandikotkur Road, Venkayapalli (V), Kurnool - 518452, Andhra Pradesh

Program Outcomes (PO's):

Engineering Graduates will be able to

- ❖ **PO 1. Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering Fundamentals and an engineering specialization to the solution of complex engineering problems.
- ❖ **PO 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- ❖ **PO 3. Design / development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
- ❖ **PO 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- ❖ **PO 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- ❖ **PO 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess Societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- ❖ **PO 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.
- ❖ **PO 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- ❖ **PO 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- ❖ **PO 10. Communications:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give receive clear instructions.
- ❖ **PO 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- ❖ **PO 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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Course Name: FUNCTIONAL ENGLISH - A1001

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| A1001.1 | Have improved communication in listening, speaking, reading and writing skills in general. |
| A1001.2 | Have developed their oral communication and fluency in group discussions and interviews. |
| A1001.3 | Have improved awareness of English in science and technology context. |
| A1001.4 | Have achieved familiarity with a variety of technical reports. |

Course Name: MATHEMATICS – I – A1002


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| A1002.1 | The students become familiar with the application of differential and integral calculus, ordinary differential equations and vector calculus to engineering problems |
| A1002.2 | The students attain the abilities to use mathematical knowledge to analyze, formulate and solve problems in engineering applications. |

Course Name: COMPUTER PROGRAMMING - A1501

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| A1501.1 | Apply problem solving techniques in designing the solutions for a wide-range of problems |
| A1501.2 | Choose appropriate control structure depending on the problem to be solved |
| A1501.3 | Modularize the problem and also solution |

Course Name: ENGINEERING PHYSICS-A1003

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| A1003.1 | The different realms of physics and their applications in both scientific and technological systems are achieved through the study of physical optics, lasers and fibre optics. |
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| A1003.2 | The important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction are focused along with defects in crystals and ultrasonic non-destructive techniques. |
| A1003.3 | The discrepancies between the classical estimates and laboratory observations of physical properties exhibited by materials would be lifted through the understanding of quantum picture of subatomic world. |
| A1003.4 | The electronic and magnetic properties of materials were successfully explained by free electron theory and the bases for the band theory are focused. |
| A1003.5 | The properties and device applications of semiconducting and magnetic materials are illustrated. |
| A1003.6 | The importance of superconducting materials and nanomaterials along with their engineering applications are well elucidated. |

Course Name : ENGINEERING DRAWING - A1301

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| A1301.1 | Drawing 2D and 3D diagrams of various objects. |
| A1301.2 | Learning conventions of Drawing, which is an Universal Language of Engineers |
| A1301.3 | Drafting projections of points, planes and solids |

Course Name: ENGLISH LANGUAGE COMMUNICATION SKILLS (ELCS) - A1006

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| A1006.1 | Become active participants in the learning process and acquire proficiency in spoken English. |
| A1006.2 | Speak with clarity and confidence thereby enhance employability skills |

Course Name: ENGINEERING PHYSICS LABORATORY - A1007

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| A1007.1 | Would recognize the important of optical phenomenon like Interference and diffraction. |
| A1007.2 | Would have acquired the practical application knowledge of optical fiber, semiconductor, dielectric and magnetic materials, crystal structure and lasers by the study of their relative parameters. |
| A1007.3 | Would recognize the significant importance of nano materials in various engineering fields. |

Course Name: COMPUTER PROGRAMMING LAB - A1502


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| A1502.1 | Apply problem solving techniques to find solutions to problems |
| A1502.2 | Able to use C language features effectively and implement solutions using C language |
| A1502.3 | Improve logical skills. |

Course Name: MATHEMATICS – II- A1009

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| A1009.1 | The student gains the knowledge to tackle the engineering problems using the concepts of Fourier series, various transforms and partial differential equations |
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Course Name: ENGLISH FOR PROFESSIONAL COMMUNICATION- A1008


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| A1008.1 | Have acquired ability to participate effectively in group discussions. |
| A1008.2 | Have developed ability in writing in various contexts. |
| A1008.3 | Have acquired a proper level of competence for employability |

Course Name: ENGINEERING CHEMISTRY- A1004

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| A1004.1 | Differentiate between hard and soft water. Understand the disadvantages of using hard water domestically and industrially. Select and apply suitable treatments domestically and industrially. |
| A1004.2 | Understand the electrochemical sources of energy |
| A1004.3 | Understand industrially based polymers, various engineering materials |

Course Name: ENVIRONMENTAL STUDIES - A1005

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| A1005.1 | Students will get the sufficient information that will clarify modern environmental concepts like equitable use of natural resources, more sustainable life styles etc. |
| A1005.2 | Students will 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. |
| A1005.3 | 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. |


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| A1005.4 | By studying environmental sciences, students is exposed to the environment that enables one to find out solution of various environmental problems encountered on andoften. |
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Course Name: ELECTRICAL CIRCUITS - I - A1203

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| A1203.1 | Given a network, find the equivalent impedance by using network reduction techniques |
| A1203.2 | Given a circuit and the excitation, determine the real power, reactive power, power factoretc., |
| A1203.3 | Determine the current through any element and voltage across anyelement |
| A1203.4 | Apply the network theorems suitably |

Course Name: ENGINEERING CHEMISTRY LAB - A1010

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| A1010.1 | Would be confident in handling energy storage systems and would be able combat chemicalcorrosion |
| A1010.2 | Would have acquired the practical skill to handle the analytical methods with confidence. |
| A1010.3 | Would feel comfortable to think of design materials with the requisiteproperties |
| A1010.4 | Would be in a position to technically address the water relatedproblems. |

Course Name: ELECTRICAL CIRCUITS LAB -A1204

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| A1204.1 | Apply suitable theorems for circuit analysis and verify the resultstheoretically |
| A1204.2 | Experimental determination of two port network parameters and theoretical verification |
| A1204.3 | Measure active and reactive power experimentally and verify the theoreticalvalues |
| A1204.4 | Experimentally determine self inductance, mutual inductance and coefficient |


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| | of coupling |
| A1204.5 | Practically determine band width, Q-factor and verify with theoretical values. |

Course Name: ENGINEERING & I.T. WORKSHOP- A1302

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| A1302.1 | Disassemble and Assemble a Personal Computer and prepare the computer ready to use. |
| A1302.2 | Prepare the Documents using Wordprocessors |
| A1302.3 | Prepare Slide presentations using the presentation tool |
| A1302.4 | Interconnect two or more computers for informationsharing |
| A1302.5 | Access the Internet and Browse it to obtain the required information |

Course Name: Linear Algebra and Complex Variables -A1014

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| A1014.1 | Demonstrate knowledge of matrix calculation as an elegant and powerful mathematical language in connection with rank of a matrix, linear system of equations, linear dependence and independence |
| A1014.2 | Interpret the Eigen values and Eigen vectors of matrix in terms of the transformation it represents in to a matrix Eigen value problem. |
| A1014.3 | Define a quadratic form and determine its nature using Eigen values. Apply Beta and Gamma functions to evaluate many integrals which cannot be expressed in terms of elementary functions. |
| A1014.4 | Analyze the functions of complex variable which include continuity, differentiability and analyticity along with evaluation of Cauchy-Riemann equations in Cartesian and polar coordinates. |
| A1014.5 | Employ the Cauchy's integral theorem along with integral formula along with expansion in Taylor's series, Maclaurin's series and Laurent series. |
| A1014.6 | Evaluate the residual formula through Laurent series and residue theorem along with evaluation of improper real integrals. |

Course Name: ELECTRICAL MACHINES-I- A1205

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| A1015.1 | Calculate the e.m.f. generated on open circuit, terminal voltage on load and |
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| | load shared by each generator. |
| A1015.2 | Determine the gross torque and useful torque developed by DC motor and Identify suitable methods to control speed of DC motors. |
| A1015.3 | Calculate the losses and efficiency of DC generators and motors. |
| A1015.4 | Conduct O.C, S.C tests and predetermine the regulation, efficiency and draw the equivalent circuit of transformer. |
| A1015.5 | Compute the load shared by each transformer when several transformers operate in parallel. |
| A1015.6 | Construct and operating characteristics of three phase induction motors, and various tests are conducted to construct the circle diagram to determine the performance of induction motors. |

Course Name: ELECTRO MAGNETIC FIELDS-A1206

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| A1206.1 | Understand the behavior of static magnetic fields in standard configurations by applying vector calculus. |
| A1206.2 | Apply vector calculus to generalize the behavior of static electric fields in standard configurations. |
| A1206.3 | Analyze the inductance and capacitance for different structures. |
| A1206.4 | Apply basic laws of electric, magnetic and electromagnetic fields to find force. |
| A1206.5 | Analyze the effect of time varying fields involving both electric and magnetic field on a wave propagating through a medium along analysis of with modified Maxwell's equations for time varying fields. |
| A1206.6 | Use of modern tool MATLAB to simulate electromagnetic fields of transmission lines. |

Course Name: ELECTRICAL CIRCUITS – II –A1207

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| A1207.1 | Analyze three phase balanced and unbalanced circuits and determine line voltages, line currents, phase voltages and phase currents |
| A1207.2 | Measure active and reactive power consumed by a given three phase circuit |
| A1207.3 | Determine the transient response of R-L, R-C, R-L-C circuits for D.C and A.C Excitations |
| A1207.4 | Apply Fourier transforms to electrical circuits excited by non-sinusoidal sources |
| A1207.5 | Design different types of filters. |

Course Name: ELECTRONIC DEVICES AND CIRCUITS –A1401

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| A1401.1 | Understand the operation and characteristics of PN diode with diode's applications in electronic circuits. |
| A1401.2 | Formulate the electrical models for special semiconductor diodes like Tunnel diode, LED and Photodiode. |
| A1401.3 | Analyze various rectifiers and filter circuits used in regulated power supplies. |
| A1401.4 | Compare and contrast the construction, working principles, characteristics and applications of major electronic devices like BJT, FET and MOSFET. |
| A1401.5 | Design and analyze the DC bias circuitry of BJT. |
| A1401.6 | Design and analyze the small signal models of BJT & FET Amplifiers at low frequencies. |

Course Name: ELECTRICAL MACHINES-I LAB –A1208

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| A1208.1 | Understand the concept of OP-AMP such as differential amplifier modes analysis using r parameters, ideal OP-AMP parameter fundamentals and various stages in the OP-AMP. |
| A1208.2 | Depict the internal block diagram of operational amplifiers along with listing out some typical applications of operational amplifiers in linear and non linear modes of operation |
| A1208.3 | Analyze various applications of Op-Amp and also to design and construct waveform generation circuits. |
| A1208.4 | Study the block diagram of 555 timer and 565 phase locked loops ICs and employ them to construct various applications along with listing out different CMOS logic families. |
| A1208.5 | Differentiate between CMOS and TTL logic families; realize various logic functions using VHDL code for CMOS logic. |
| A1208.6 | Interpret various combinational and sequential logic circuits and simulate it by using VHDL code. |

Course Name: ELECTRICAL CIRCUITS AND SIMULATION LAB- A1209

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| A1209.1 | Explain electric circuit concepts by interpreting the simulation results |
| A1209.2 | Design RLC series circuit for specified frequency response |
| A1209.3 | Analyze three phase balanced and unbalanced circuits |
| A1209.4 | Design RL, RC and RLC circuits for specified transient response |
| A1209.5 | Design and Frequency Response of Low Pass and High Pass |

Course Name: ELECTRONIC DEVICES AND CIRCUITS LABORATORY-A1405

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| A1405.1 | Analyze the description of CRO and Function generator panels. |
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| A1405.2 | Find the cut-in voltage, static and dynamic resistances from V-I characteristics of PN junction diode. |
| A1405.3 | Find the breakdown voltage and Regulation characteristics of Zener diode. |
| A1405.4 | Compute the ripple content present in half wave and full wave rectifiers with and without filters. |
| A1405.5 | Plot the characteristics of BJT and FET. |
| A1405.6 | Draw the frequency response of single stage amplifiers at low, mid and high frequencies. |

Course Name: ELECTRICAL MACHINES-II –A1210

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| A1210.1 | Identify the three phase transformers employed in distribution and transmission system based on their connections. |
| A1210.2 | Understand the construction and principle of operation of round rotor and salient pole machines along with E.M.F Equation. |
| A1210.3 | Determine experimentally the characteristics of synchronous generator along with phasor diagram and also evaluate the regulation by synchronous impedance method, M.M.F method and Z.P.F method |
| A1210.4 | Interpret the parallel operation of synchronous generators and determination of sub-transient, transient and steady state reactance's |
| A1210.5 | Explain the principle of operation of synchronous motor along with V and Inverted V curves and also describe the concept of hunting and methods of starting in synchronous induction motor |
| A1210.6 | Infer the constructional features of single phase motor along with double revolving field theory and elementary idea of cross-field theory. Carry out a detailed analysis on special motors which include A.C series motor, universal motor and stepper motor. |

Course Name : CONTROL SYSTEMS –A1211

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| A1211.1 | Differentiate the open loop and closed loop control system along with understanding of fundamental concepts like signal flow graph and Mason's gain formula and also representing the transfer function of AC and DC servomotor. |
| A1211.2 | Analyze the time response of both first order and second order systems along with the designing of various controllers |
| A1211.3 | Apply the concepts of stability through Root locus technique, R-H Criterion in s-Domain |
| A1211.4 | Plot the phase and magnitude of various systems employing Bode plot, Nyquist plot and polar plot |
| A1211.5 | Design compensation techniques which involve lag, lead and lead-lag type. |
| A1211.6 | Derive the State models from schematic models along with diagonalization and formulation of state transition matrix |

Course Name: POWER SYSTEMS – I –A1212

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| A1212.1 | Recognize the importance of power generation and difference between renewable and non-renewable energy sources, recall the process of nuclear fission and chain reaction. |
| A1212.2 | Analyze the construction, working and operating principle, and essential components of various power generating stations with their relative merits and demerits. |
| A1212.3 | Design the layout and select the optimal location for different power plants along with its relevant features. |
| A1212.4 | Analyze the different methods and characteristics of solar, wind, biogas, geothermal and ocean power generating systems along with their economic and environmental aspects. |
| A1212.5 | Carry out a detailed analysis on the economic aspects of power generation involving various tariff methods and costs of generation. |

Course Name: LINEAR AND DIGITAL INTEGRATED CIRCUIT APPLICATIONS- A1414

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| A1414.1 | Understand the internal operation of Op-Amp and its specifications. |
| A1414.2 | Operate 555 timer in different modes like monostable and astable operations and study their applications and discuss about various DAC and ADC techniques |
| A1414.3 | Analyze and design applications like filters using Op-Amp and discuss about oscillators. |
| A1414.4 | Apply basic switching concepts for realizing logic circuits. |
| A1414.5 | Analyze and design combinational and sequential circuits. |
| A1414.6 | Write VHDL code for any type of logic circuit. |

Course Name: CONTROL SYSTEMS AND SIMULATION LAB –A1213

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| A1213.1 | Design the controllers/compensators to achieve desired specifications. |
| A1213.2 | Understand the effect of location of poles and zeros on transient and steady state behavior of systems. |
| A1213.3 | Assess the performance, in terms of time domain specifications, of first and second order systems. |
| A1213.4 | Understand the concepts of PLC and develop the PLC programs |
| A1213.5 | Use MATLAB/SIMULINK software for control system analysis and design. |

Course Name: ELECTRICAL MACHINES-II LAB –A1214

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| A1214.1 | Conduct suitable tests on single phase transformer and pre determine the efficiency and regulation at different loading conditions. |
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| A1214.2 | Perform the regulation of alternator by EMF and MMF methods in order to evaluate voltage regulation at different power factors. |
| A1214.3 | Carry out No load and blocked rotor tests on three phase induction motor to determine efficiency and also to draw the performance characteristics. |
| A1214.4 | Analyze the equivalent circuit diagrams of single phase induction motor by conducting various tests. |
| A1214.5 | Conduct the brake test on 3 phase induction motors and evaluate the performance characteristics |
| A1214.6 | Convert 3 phase to 2 phase connection in 3 phase transformer through Scott Connection |

**Course Name: LINEAR AND DIGITAL INTEGRATED CIRCUIT APPLICATIONS
LAB-A1415**

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| A1415.1 | Study the closed-loop Op-amp configurations. |
| A1415.2 | Generate sinusoidal, triangular & square waveform using op-amp. |
| A1415.3 | Design and verify the frequency response of the filters using TL082 Op Amp. |
| A1415.4 | Design and draw the internal structure of various logic gates. |
| A1415.5 | Implement Combinational circuits using VHDL source code. |
| A1415.6 | Develop VHDL source code and perform simulation. |

Course Name: POWER SYSTEMS-II -- A1218

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| A1218.1 | Apply the knowledge of electromagnetic fields to calculate the parameters of transmission lines and underground cables. |
| A1218.2 | Analyze the performance of various transmission lines, underground cables and overhead insulators. |
| A1218.3 | Design mechanical transmission lines using corona phenomenon, Sag and Tension. |
| A1218.4 | Analyze the distribution system, types of faults and protective devices |

Course Name: POWER ELECTRONICS – A1219

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| A1219.1 | Illustrate the fundamental concepts and techniques used in power electronic circuits. |
| A1219.2 | Analyze the performance and protection techniques of power electronic devices. |
| A1219.3 | Analyze the operation and performance of AC-DC, DC-DC, DC-AC and AC- |

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| | AC converters. |
| A1219.4 | Design a suitable power electronic converter circuit for given applications. |
| A1219.5 | Apply PWM techniques to improve the performance of DC-DC and DC-AC converters. |

Course Name: ELECTRICAL MEASUREMENTS AND INSTRUMENTATION - A1220

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| A1220.1 | Categorize various electrical instruments used for measuring electrical parameters. |
| A1220.2 | Analyze the errors and compensations in various electrical measuring instruments |
| A1220.3 | Measure current, voltage, power and energy in 1-phase and 3-phase circuits. |
| A1220.4 | Estimate the unknown quantities of resistance, inductance and capacitance using bridges |
| A1220.5 | Apply transducers, digital meters and CRO for measuring electrical parameters |

Course Name: DIGITAL ELECTRONICS - A1424

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| A1424.1 | Perform arithmetic operations on different number systems and to apply the principles of Boolean algebra to minimize logic expressions. |
| A1424.2 | Make use of k map and tabulation methods to minimize boolean functions and to implement with logic gates. |
| A1424.3 | Analyze basic components used in digital systems such as adder and subtractor, decoder, encoder, multiplexer, flip-flops, registers and counters |
| A1424.4 | Distinguish combinational and sequential logic in terms of their functions. |
| A1424.5 | Design various PLDs such as ROMs, PALs, PLAs and PROMs. |

Course Name: POWER ELECTRONICS LABORATORY - A1221

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| A1221.1 | Analyze the performance characteristics of SCR firing and commutation circuits. |
| A1221.2 | Plot the performance characteristics of AC-DC, DC-AC, DC-DC and AC-AC converters with R and RL Loads. |
| A1221.3 | Apply the knowledge of MATLAB to plot the characteristics of full converter, inverter and forced commutation circuits |

**Course Name: ELECTRICAL MEASUREMENTS AND INSTRUMENTATION
LABORATORY - A1222**

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| A1222.1 | Estimate resistance, inductance and capacitance of electrical circuits using bridges and dielectric strength of transformer oil |
| A1222.2 | Calculate the percentage error of various measuring instruments, LVDT, and resistance strain gauge |
| A1222.3 | Evaluate 3- Φ active power and reactive power of different loads. |
| A1222.4 | Calibrate single phase energy meter and DC Crompton potentiometer. |

**Course Name: ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS-
A1016**

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| A1016.1 | Build inferences and predictions based on the information provided in the context. |
| A1016.2 | Choose academic vocabulary appropriately both in speaking and in writing. |
| A1016.3 | Develop effective technical writing skills. |
| A1016.4 | Construct necessary skills to deliver presentation confidently for improving in respective domains |
| A1016.5 | Apply language structures to construct good relations. |

Course Name: POWER SEMICONDUCTOR DRIVES - A1223

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| A1223.1 | Identify a suitable electric drive system for desired application. |
| A1223.2 | Apply 1-phase & 3- phase controlled converters for speed control operation of DC drives. |
| A1223.3 | Apply the knowledge of DC-DC Converter and dual converter for speed and torque control of DC Drives. |
| A1223.4 | Apply the knowledge of AC voltage controller and cyclo-converter to control the speed of an induction motor and synchronous motor. |

Course Name: POWER SYSTEM ANALYSIS - A1224

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| A1224.1 | Apply computational methods to determine transmission line parameters. |
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| A1224.2 | Apply load flow methods to examine the load flow studies. |
| A1224.3 | Analyze symmetrical and unsymmetrical power system faults. |
| A1224.4 | Apply the methods to improve the steady state and transient stability of power systems. |

Course Name: MICROPROCESSORS AND MICROCONTROLLERS - A1427

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| A1427.1 | Analyze 8086 microprocessor and MSP430 microcontroller architectures |
| A1427.2 | Develop programs using 8086 microprocessor and MSP430 microcontroller |
| A1427.3 | Make use of peripherals of MSP430 to interface I/O devices |
| A1427.4 | Apply serial communication protocols for interfacing serial devices. |
| A1427.5 | Design embedded applications using MSP430 microcontroller |

Course Name: POWER SYSTEMS SIMULATION LABORATORY - A1230


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| A1230.1 | Develop a program to simulate Ferranti effect |
| A1230.2 | Develop a program to model transmission lines |
| A1230.3 | Develop a program for formation Y-Bus and Z-Bus |
| A1230.4 | Develop a program for load flow solution |
| A1230.5 | Develop a program for short circuit analysis |
| A1230.6 | Develop a Simulink model for evaluating transient stability |

Course Name: MICROPROCESSORS AND MICROCONTROLLERS LABORATORY- A1429

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| A1429.1 | Develop assembly language programs using EMU8086 emulator. |
| A1429.2 | Execute 8086 ALPs for arithmetic, logical, string, call operations. |
| A1429.3 | Build programs of MSP430 using embedded C. |
| A1429.4 | Interface LEDs push buttons, potentiometer to MSP430. |
| A1429.5 | Test and debug 8086 ALPs and MSP430 embedded C programs |

Course Name: PYTHON PROGRAMMING LABORATORY – A1529

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| A1529.1 | Apply fundamental programming concepts of python for solving general purpose problems |
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| A1529.2 | Implement sequences to solve complex problems |
| A1529.3 | Build functions to increase code reusability |
| A1529.4 | Implement modular programming for organized software development |
| A1529.5 | Make use of exception handling for robust programming. |

Course Name: HUMAN VALUES & PROFESSIONAL ETHICS - A1015

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| A1015.1 | Apply human values and ethics in professional life. |
| A1015.2 | Develop the moral ideals to maintain good relationships with people. |
| A1015.3 | Solve environmental related problems by keeping health of human being into consideration. |
| A1015.4 | Make use of the fundamental rights and human rights in life for individual dignity. |
| A1015.5 | Build the sound health system both physically and mentally by practicing yoga, karate, sports etc |

Course Name: SPECIAL ELECTRICAL MACHINES - A1251

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| A1251.1 | Analyze the performance of switched reluctance motors, stepper motors, permanent magnet dc motors linear motors and servo motors |
| A1251.2 | Deduce the emf and torque equations of stepper motor, servo motor, reluctance motor and BLDC motor. |
| A1251.3 | Apply speed control techniques for switched reluctance motors, stepper motors, Permanent magnet dc motors linear motors and servo motors. |
| A1251.4 | Plot the characteristics of switched reluctance motors, stepper motors, Permanent magnet dc motors linear motors and servo motors. |

Course Name: UTILISATION OF ELECTRICAL ENERGY - A1252

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| A1252.1 | Analyze various illumination systems, heating and welding techniques. |
| A1252.2 | Analyze the torque- speed characteristics, speed-time characteristics and specific energy consumption of electric locomotive |
| A1252.3 | Apply suitable braking technique to control the speed locomotive. |
| A1252.4 | Apply the power factor improvement and load factor improvement techniques |

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| | for effective usage of electrical energy. |
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Course Name: ADVANCED CONTROL THEORY - A1253

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| A1253.1 | Develop the mathematical model of linear/non-linear systems in state space. |
| A1253.2 | Investigate the controllability/observability of a given system. |
| A1253.3 | Analyze stability of linear / Non-linear systems using various methods. |
| A1253.4 | Design state feedback controller and optimal controller for a given system. |
| A1253.5 | Evaluate the stability of the given system by Lyapunov criterion. |
| A1253.1 | Develop the mathematical model of linear/non-linear systems in state space. |

Course Name: SOLAR ENERGY AND ITS APPLICATIONS - A1254

| | |
|---------|--|
| A1254.1 | Demonstrate the usage of solar energy for different electrical equipment's. |
| A1254.2 | Apply the principles of solar radiation to generate electrical energy. |
| A1254.3 | Analyze the thermal properties of solar energy collectors. |
| A1254.4 | Classify the methods to measure solar radiation and store solar energy. |
| A1254.5 | Analyze the economic aspects and environmental issues related to solar system. |

Course Name : ELECTRICAL AND HYBRID VEHICLES - A1255

| | |
|---------|--|
| A1255.1 | Analyze the topologies used for design of hybrid electric vehicles. |
| A1255.2 | Apply the concepts of power electronics & drives to control hybrid electric vehicles |
| A1255.3 | Analyze power flow control and various energy storage components used for hybrid electric vehicles |
| A1255.4 | Demonstrate different configurations, techniques and sizing of components used in hybrid electric vehicles |
| A1255.5 | Apply the Various energy management strategies in hybrid electric vehicles. |

Course Name: ELECTRICAL DISTRIBUTION AND AUTOMATION - A1256


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| A1256.1 | Categorize the different types of distribution system, feeders and loads. |
| A1256.2 | Compare the voltage drop and power loss for various distribution systems. |
| A1256.3 | Design a substation layout with optimal location. |
| A1256.4 | Analyze the methods for power factor correction. |
| A1256.5 | Apply the knowledge of Distribution automation and SCADA in Energy management systems operations. |

Course Name: FUNDAMENTALS OF SIGNALS AND SYSTEMS - A1257

| | |
|---------|--|
| A1257.1 | Distinguish between different signals and systems. |
| A1257.2 | Make use of Fourier series for the representation of signals. |
| A1257.3 | Analyze different signals by using an appropriate transform. |
| A1257.4 | Select an appropriate transform to find the transfer function of the system. |
| A1257.5 | Analyze the system stability in different domains. |

Course Name: WIND ENERGY AND ITS APPLICATIONS - A1258

| | |
|---------|---|
| A1258.1 | Apply various measurement techniques to determine the atmospheric and design boundaries of wind turbines. |
| A1258.2 | Apply a suitable turbine model to generate electrical energy from wind energy. |
| A1258.3 | Analyze the parameters of aerodynamics, DRC/PMG Generator and AC drive connected wind turbines. |
| A1258.4 | Apply suitable control and monitoring mechanism for wind energy systems. |

Course Name: MACHINE MODELING AND ANALYSIS - A1259

| | |
|---------|---|
| A1259.1 | Apply the principles of electrical machines in their design and modelling. |
| A1259.2 | Evaluate the Voltage and Torque Equation of DC and AC Machines. |
| A1259.3 | Differentiate the performance of machines using reference frame theory. |
| A1259.4 | Analyze the dynamic modelling and steady state behavior of various electrical Machines. |

Course Name: HIGH VOLTAGE ENGINEERING - A1260


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|---------|---|
| A1260.1 | Analyze the breakdown mechanisms of solids liquids and gases. |
| A1260.2 | Design the insulation for power system components. |
| A1260.3 | Analyze and calculate the circuit parameters involved in generation of high voltages. |
| A1260.4 | Measure the alternating signals, impulse high voltage signals, dielectric loss and partial discharge. |

Course Name: DIGITAL CONTROL SYSTEMS - A1261


| | |
|---------|--|
| A1261.1 | Apply the Sampling and reconstruction theory in A/ D & D/A Conversion. |
| A1261.2 | Solve the given differential equations using Z- transforms. |
| A1261.3 | Analyze the given discrete time system in frequency domain and Z domain. |
| A1261.4 | Design a given discrete time system in Z – Plane and state space representation. |
| A1261.5 | Investigate the Stability of the closed loop systems using Z- transforms. |

Course Name: SMART GRID TECHNOLOGY-A1262

| | |
|---------|---|
| A1262.1 | Demonstrate the need of converting conventional grid to Smart Grid. |
| A1262.2 | Assess the role of automation in Transmission and Distribution. |
| A1262.3 | Apply Evolutionary Algorithms for the Smart Grid. |
| A1262.4 | Analyze various Methods used for information security on smart grid |
| A1262.5 | Analyze Voltage and Frequency control techniques in Micro Grids. |

Course Name: FUNDAMENTALS OF ELECTRICAL ENGINEERING - A1281

| | |
|---------|--|
| A1281.1 | Apply network reduction techniques and knowledge of alternating quantities to calculate current, voltage and power for complex circuits. |
| A1281.2 | Analyze the electrical circuits using nodal analysis, mesh analysis and network theorems. |
| A1281.3 | Demonstrate the working principle and operation of DC machines, AC machines and single-phase transformers. |
| A1281.4 | Test the Performance of DC machines, AC machines and single-phase transformers. |


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Course Name:RENEWABLE ENERGY SOURCES - A1282

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|---------|--|
| A1282.1 | Apply the principles of Renewable energy sources for the construction of Power generating station. |
| A1282.2 | Analyze the various energy conversion systems and their limitations. |
| A1282.3 | Analyze Renewable energy sources for various environmental conditions |
| A1282.4 | Analyze the generation principles and operation of variety of sources of energy |

Course Name:ELECTRICAL MEASURING INSTRUMENTS - A1283

| | |
|---------|---|
| A1283.1 | Categorize various electrical instruments used for measuring electrical parameters. |
| A1283.2 | Design appropriate arrangement for extension of range in measuring instruments. |
| A1283.3 | Analyze the errors and compensations in various electrical measuring instruments |
| A1283.4 | Measure current, voltage, power and energy in 1-phase and 3-phase circuits. |
| A1283.5 | Estimate the unknown quantities of resistance, inductance and capacitance using bridges |

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G PULLAIAH COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)

(Approved by AICTE | NAAC Accreditation with 'A' Grade |
Accredited by NBA (CIV, CSE, ECE & EEE) | Affiliated to JNTUA)
Nandikotkur Road, Venkayapalli (V), Kurnool - 518452, Andhra Pradesh

Course Name: Mathematics-I :A2002

| | |
|---------|---|
| A2002.1 | Develop the use of matrix algebra techniques that is needed by engineers for practical applications |
| A2002.2 | Interpret the Eigen values and Eigen vectors of matrix in terms of the transformation it represents in to a matrix Eigen value problem |
| A2002.3 | Utilize mean value theorems to real life problems |
| A2002.4 | Familiarize with functions of several variables which is useful in optimization |
| A2002.5 | Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems |
| A2002.6 | Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions |

Course Name: CHEMISTRY: A2005

| | |
|---------|--|
| A2005.1 | To illustrate the molecular orbital energy levels for different molecular species and apply Schrödinger wave equation and particle in a box. |
| A2005.2 | To differentiate between pH metryPotentiometry and conductometric titrations. |
| A2005.3 | Explain the preparation properties and applications of polymers and describe the mechanism of conduction in conducting polymers. |
| A2005.4 | Understand the principles of different analytical instruments and explain their applications. |
| A2005.5 | Explain the concept of nano clusters nano wires and characterize the applications of SEM & TEM. |
| A2005.6 | Explain of different types of colloids ,their preparations , properties and applications |

Course Name: COMPUTER PROGRAMMING: A2501

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|---------|--|
| A2501.1 | Comprehend the fundamental concepts of computer hardware and problem solving abilities |
| A2501.2 | Knowledge on the basic concepts of algorithms, flow charts and python programming |
| A2501.3 | Ability to analyze the procedure for providing input and acquire output from the program along with implementation of control statements |
| A2501.4 | Interpret the importance of functions in programming |
| A2501.5 | Analyze and Modularize the problem and its solution by using functions. |
| A2501.6 | Ability to relate the concepts of strings, files and preprocessors to the real world applications |


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Course Name: ENGINEERING GRAPHICS AND COMPUTER AIDED DRAFTING :A2301

| | |
|---------|---|
| A2301.1 | Learning conventions of Drawing, which is an Universal Language Of Engineers. Also Interpret and Sketch the various curves which Including ellipse, parabola, hyperbola |
| A2301.2 | Analyze and draft the orthographic projections of points and lines |
| A2301.3 | Analyze and sketch the orthographic projections of planes and solids |
| A2301.4 | Revise and Improve their visualization skills in the development of new products |
| A2301.5 | Construct the isometric projection of an object employing orthographic projections |
| A2301.6 | Drawing 2D and 3D diagrams of various objects |

Course Name: CHEMISTRY LAB :A2009

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|---------|--|
| A2009.1 | Determine the cell constant and conductance of solutions |
| A2009.2 | Prepare advanced polymer materials |
| A2009.3 | Measure the strength of an acid present in secondary batteries |
| A2009.4 | pH metric titrations |
| A2009.5 | Verify Lambert-Beer's law |
| A2009.6 | Potentiometry - determination of redox potentials and emfs |

Course Name: COMPUTER PROGRAMMING LAB: A2502

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|---------|--|
| A2502.1 | Design solutions to mathematical problems & Organize the data for solving the problem |
| A2502.2 | Understand and implement modular approach using python |
| A2502.3 | Learn and implement various data structures provided by python library including string, list, dictionary and its operations etc |
| A2502.4 | Understands about files and its applications. |
| A2502.5 | Develop real-world applications, files and exception handling provided by python |
| A2502.6 | Select appropriate programming construct for solving the problem |

CO-ENGINEERING LABORATORY : A2302

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|---------|--|
| A2302.1 | To acquire the knowledge about the characteristics and working principles of semiconductor diodes, Bipolar Junction Transistor |
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| A2302.2 | Analysis of Single Phase AC Circuits, the representation of alternating quantities and determining the power in these circuits |
| A2302.3 | Able to Measure the amplitude and frequency utilizing oscilloscope and analyze the fabrication processes of printed circuit boards |
| A2302.4 | Apply wood working skills in real world applications. Build different parts with metal sheets in real world applications |
| A2302.5 | Apply fitting operations in various applications |
| A2302.6 | Apply different types of basic electric circuit connections |

Course Name: Mathematics-II :A2010

| | |
|---------|--|
| A2010.1 | Apply the mathematical principles to solve second and higher order differential equations |
| A2010.2 | Analyze the non- homogeneous linear differential equations along with method of variation of parameters |
| A2010.3 | Apply the concept of higher order differential equations to the various streams like Mass spring system and L-C-R Circuit problems |
| A2010.4 | Apply a range of techniques to find solutions of standard PDEs and basic properties of standard PDEs |
| A2010.5 | Analyze the vector calculus involving divergence, curl and their properties along with vector identities |
| A2010.6 | Apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals. |

Course Name: APPLIED PHYSICS : A2004

| | |
|---------|---|
| A2004.1 | Interpret the properties of light waves and its interaction of energy with the matter |
| A2004.2 | Explain the principles of physics in dielectrics and magnetic materials |
| A2004.3 | Apply electromagnetic wave propagation in different guided media |
| A2004.4 | Calculate conductivity of semiconductors |
| A2004.5 | Interpret the difference between normal conductor and super conductor |
| A2004.6 | Demonstrate the application of nanomaterials |

Course Name: DATA STRUCTURES :A2503

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|---------|---|
| A2503.1 | Learn to choose appropriate data structure as applied to specified problem definition. |
| A2503.2 | Design and analyze linear and non-linear data structures. |
| A2503.3 | Design algorithms for manipulating linked lists, stacks, queues, trees and graphs in python |
| A2503.4 | Demonstrate advantages and disadvantages of specific algorithms and data |

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| | structures |
| A2503.5 | Develop a base for advanced computer science study. |
| A2503.6 | Evaluate algorithms and data structures in terms of time and memory complexity of basic operations. |

Course Name: ELECTRICAL CIRCUITS-I :A2202

| | |
|---------|---|
| A2202.1 | Solve Electrical circuits with minimum complexity and the concepts of magnetic circuits will be used to understand the static induced E.M.F principle of Transformers. |
| A2202.2 | Differentiate the Active power and the role of reactive power in a electrical system for single phase and three phase systems which is the basis to analyze a complex Power system. |
| A2202.3 | Analyze series and parallel resonance circuits and current locus diagrams. |
| A2202.4 | Solve an Electrical circuit with minimum complexity by using various theorems and their applications. |
| A2202.5 | Determine various network parameters for different two port networks. |

Course Name: COMMUNICATIVE ENGLISH :A2001

| | |
|---------|---|
| A2001.1 | Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English |
| A2001.2 | Apply grammatical structures to formulate sentences and correct word forms |
| A2001.3 | Analyze discourse markers to speak clearly on a specific topic in informal discussions |
| A2001.4 | Evaluate reading/listening texts and to write summaries based on global comprehension of these texts. |
| A2001.5 | Create a coherent paragraph interpreting a figure/graph/chart/table |
| A2001.6 | Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English |

Course Name: COMMUNICATIVE ENGLISH LAB :A2006

| | |
|---------|--|
| A2006.1 | Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills |
| A2006.2 | Apply communication skills through various language learning activities |
| A2006.3 | Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension. |
| A2006.4 | Evaluate and exhibit acceptable etiquette essential in social and professional settings |
| A2006.5 | Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English. |
| A2006.6 | Improve upon speaking skills over telephone, role plays and public speaking |

Course Name: APPLIED PHYSICS LAB :A2008

| | |
|---------|---|
| A2008.1 | Operate optical instruments like microscope and spectrometer and understand the concepts of interference by finding thickness of paper, radius of curvature of Newton's rings |
| A2008.2 | interpret the concept of diffraction by the determination of wavelength of different colours of white light and dispersive power of grating |
| A2008.3 | demonstrate the importance of dielectric material in storage of electric field energy in the capacitors |
| A2008.4 | plot the intensity of the magnetic field of circular coil carrying current with varying distance and B-H curve |
| A2008.5 | evaluate the acceptance angle of an optical fiber and numerical aperture |
| A2008.6 | determine the resistivity of the given semiconductor using four probe method, the band gap of a semiconductor and identify the type of semiconductor using Hall effect |

Course Name: DATA STRUCTURES LABORATORY :A2504

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| A2504.1 | Practice the various DOS and LINUX Commands along with study of editors and also execute sample C programs |
| A2504.2 | Write a program to calculate roots of quadratic equation, factorial, Fibonacci series and also reverse the digits of a number |
| A2504.3 | Generate a program to check palindrome, Pascals Triangle, read and evaluate matrices and also perform addition, subtraction, division of complex numbers |
| A2504.4 | Design a program to implement numerical methods, sorting of strings in alphabetical order and perform various operations on strings |
| A2504.5 | Write a program to compute the salary statement, perform various arithmetic calculations along with maintaining students data |
| A2504.6 | Generate a program to evaluate the telephone bill along with calculating the execution time of a program |

Course Name: ELECTRICAL CIRCUITS-I LAB: A2205

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| A2205.1 | Verification of theorems like Norton's Theorem, Thevenin's theorem, super position theorem, maximum power transfer theorem experimentally and theoretically. |
| A2205.2 | Evaluate the frequency responses at which series and parallel resonance occurs in a given circuit |
| A2205.3 | Calculate the impedance and admittance parameters along with transmission parameter for a given circuit. |
| A2205.4 | Measure the active and reactive power for star and delta connected balanced loads |
| A2205.5 | Assess the value of 3 phase power for unbalanced loads employing two wattmeter method |

Course Name: TRANSFORM TECHNIQUES AND COMPLEX VARIABLES : A2015

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|---------|---|
| A2015.1 | Apply Laplace transforms to solve ordinary differential equations |
| A2015.2 | Build Fourier series and Fourier transforms of a given function. |
| A2015.3 | Test for analyticity of complex functions in the given domain |
| A2015.4 | Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours |
| A2015.5 | Evaluate improper integrals of complex functions using Residue theorem. |

Course Name: A2207– ELECTRICAL MACHINES – I

| | |
|---------|---|
| A2207.1 | Apply the principles of AC and DC machines to identify a suitable electrical machine for a given application. |
| A2207.2 | Deduce the emf / Voltage equations of DC Machines and single phase transformers. |
| A2207.3 | Analyze the various characteristics of DC Machines, single phase and three phase transformers. |
| A2207.4 | Test the performance of DC Machines and Single phase transformers. |
| A2207.5 | Apply suitable test to control the speed of DC motor. |

Course Name: A2208– ELECTROMAGNETIC FIELDS

| | |
|---------|--|
| A2208.1 | Apply orthogonal coordinate systems for Electric and magnetic fields over the distribution of charge. |
| A2208.2 | Analyse the charge configurations of Electric and Magnetic fields using Coulombs law, Gauss's law, Biot-Savart's Law, Ampere's circuital Law and Poynting theorem. |
| A2208.3 | Evaluate the capacitance, Inductance and Magnetic forces for various conductors in Electromagnetic fields. |
| A2208.4 | Investigate the behavior of Electric and Magnetic Fields in Static and Time Varying Fields by Maxwell's equations. |
| A2208.5 | Analyze the plane wave equation in free space, dielectrics and conductors. |

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Course Name :A2209 –ELECTRICAL CIRCUITS – II

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| A2209.1 | Analyze three phase circuits to determine line voltages, line currents, phase voltages and phase currents. |
| A2209.2 | Apply differential equation and Laplace transform techniques for transient response of series and parallel RLC circuits. |
| A2209.3 | Design a low pass filter, high pass filter, band pass filter and attenuators for given circuit parameters. |
| A2209.4 | Develop a dual circuit, cutset and tie set matrices for a given circuit. |

Course Name: A2408 – ELECTRONIC CIRCUITS-I

| | |
|---------|--|
| A2408.1 | Analyze the operation and characteristics of diodes and transistors. |
| A2408.2 | Analyze various applications of diodes and transistors. |
| A2408.3 | Make use of Boolean algebra postulates to minimize Boolean functions. |
| A2408.4 | Construct and analyze various combinational and sequential circuits used in digital systems. |

Course Name: A2210– ELECTRICAL MACHINES-I LABORATORY

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|---------|---|
| A2210.1 | Determine the critical field resistance and critical speed of a DC Shunt generator. |
| A2210.2 | Plot the characteristics of DC shunt, Series and Compound generators using load test. |
| A2210.3 | Test the performance of a given DC motor using suitable technique. |
| A2210.4 | Apply suitable test to calculate the losses for a given DC machine. |

Course Name:A2211 –ELECTRICAL CIRCUITS AND SIMULATION LABORATORY

| | |
|---------|--|
| A2211.1 | Analyze RL and RC series circuits, 3 phase balanced and unbalanced system and power system network using PSPICE programming. |
| A2211.2 | Test the transient response of DC & AC series RLC circuits using PSPICE programming. |
| A2211.3 | Design the dual network, low pass and high pass filter using PSPICE programming. |

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| A2211.4 | Simulate a given DC circuit using PSPICE programming. |
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Course Name:A2409 – ELECTRONIC CIRCUITS - I LABORATORY

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| A2409.1 | Analyze the description of CRO and Function generator panels. |
| A2409.2 | Determine cut-in, break-down voltages, static and dynamic resistances from V-I characteristics of electronic devices. |
| A2409.3 | Measure the ripple content present in rectifiers using with and without filters. |
| A2409.4 | Make use of small signal analysis to plot the characteristics of BJT and FET. |
| A2409.5 | Make use of Lab VIEW software to construct combinational and sequential circuits. |
| A2409.6 | Test and Debug the combinational and sequential circuits using LabVIEW Software. |

Course Name:A2017 –QUANTITATIVE APTITUDE AND REASONING – I


| | |
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| A2017.1 | Identify the problems by applying mathematical fundamentals |
| A2017.2 | Apply the suitable logical methods to solve the problems |
| A2017.3. | Solve the various problems by using quantitative mathematical fundamentals |
| A2017.4 | Analyse the comprehensive data with logical ability |

Course Name:A2032 – HUMAN VALUES AND PROFESSIONAL ETHICS

| | |
|---------|--|
| A2032.1 | Apply human values and ethics in professional life. |
| A2032.2 | Develop the moral ideals to maintain good relationships with people. |
| A2032.3 | Solve environmental related problems by keeping health of human being into consideration. |
| A2032.4 | Make use of the fundamental rights and human rights in life for individual dignity |
| A2032.5 | Build the sound health system both physically and mentally by practicing yoga, karate, sports etc. |

Course Name:A2019 – MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

| | |
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| A2019.1 | Analyze the concepts of managerial economics and financial accounting to make better decisions in the organization |
| A2019.2 | Analyze the demand, production, cost and break even to know interrelationship among variables and their impact |


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| A2019.3 | Classify the market structure to decide the fixation of suitable price |
| A2019.4 | Apply capital budgeting techniques to select best investment opportunity |
| A2019.5 | Analyze and prepare financial statements to assess financial health of business |

Course Name:A2212 – ELECTRICAL MACHINES – II

| | |
|---------|--|
| A2212.1 | Apply the principles of AC machines to identify a suitable electrical machine for a given application. |
| A2212.2 | Deduce the power and torque equations of Induction motors and synchronous machines. |
| A2212.3 | Analyze the various characteristics of induction motors and synchronous machines. |
| A2212.4 | Test the performance of induction motors and synchronous machines. |
| A2212.5 | Apply a suitable test to control speed of Induction motors. |

Course Name:A2213 – CONTROL SYSTEMS

| | |
|---------|--|
| A2213.1 | Determine the transfer function of a given system using different techniques. |
| A2213.2 | Analyze the response of a given system in time and frequency domains. |
| A2213.3 | Test the stability, observability and controllability of a given system. |
| A2213.4 | Apply suitable technique for calculating the gain margin and phase margin of a given system. |

Course Name:Analog Electronic Circuits : C211

Year of Study: 2012-13/2013-14/2014-15/2015-16/2016-17

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|--------|---|
| C211.1 | Analyze the multi stage amplifiers which include BJT and FET RC Coupled amplifiers in terms of frequency response and bandwidth |
| C211.2 | Describe the effect of negative feedback on amplifier characteristics along with analysis of voltage series, current series, voltage and current shunt feedback amplifiers |
| C211.3 | Interpret the condition for oscillations along with the analysis of Hartley, Colpitts, Clapp and Tuned Collector oscillators |
| C211.4 | Estimate the frequency and amplitude stability of oscillators which include crystal oscillators, RC oscillators and Weinbridge oscillators |
| C211.5 | Identify Large Signal Amplifiers Along With Efficiency And Carry Out Analysis On Power Dissipation, Thermal Runaway, Push-Pull Amplifier. |
| C211.6 | Discuss the response characteristics of high pass and low pass circuits for various excitations and also analyze the working and design of bistable, monostable and Astable multi vibrators |

Course Name:A2214 - ELECTRICAL POWER GENERATION

| | |
|---------|--|
| A2214.1 | Apply the knowledge of conversion of energy for different energy sources to generate electrical power. |
| A2214.2 | Draw the layouts of different electrical power generating systems. |
| A2214.3 | Select the optimal location for the establishment of different electrical power plants. |
| A2214.4 | Analyze the base load and peak load conditions to select suitable generating stations. |
| A2214.5 | Compare different types of tariffs suitable for different loads. |

Course Name:A2419 – ELECTRONIC CIRCUITS-II

| | |
|---------|--|
| A2419.1 | Analyze the characteristics and applications of operational amplifier. |
| A2419.2 | Construct different active filters and oscillator circuits using op-amp and make use of IC 555 and PLL effectively in communication systems. |
| A2419.3 | Analyze the concepts of combinational and sequential logic circuits and use them in the design of latches, counters using digital IC's. |
| A2419.4 | Distinguish between different signals and systems. |
| A2419.5 | Analyze different signals by using an appropriate transform |

Course Name:A2215 - CONTROL SYSTEMS LABORATORY

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|---------|--|
| A2215.1 | Plot the characteristics of AC servo motor, DC servo motor, synchros and magnetic amplifier. |
| A2215.2 | Determine the transfer function of DC machine and time domain specifications of second order system. |
| A2215.3 | Analyze the different logic gates using Programmable Logic Controller |
| A2215.4 | Analyze the stability of given system in time domain and frequency domain using MATLAB software. |
| A2215.5 | Test the effect of P, PD, PI, PID controller on a second order system. |

Course Name:A2216–ELECTRICAL MACHINES-II LABORATORY

| | |
|---------|---|
| A2216.1 | Test the performance of 1 phase Transformer, 3 phase induction motor and synchronous motor by conducting suitable test. |
| A2216.2 | Determine circuit parameters of a 1 phase Transformer, 3 phase induction motor and synchronous motor by conducting suitable test. |
| A2216.3 | Apply Scott connection for the conversion of a 3 phase to 2 phase systems. |
| C407.3 | Employ 8086 processor for Dos/BIOS programming involving display of characters and strings |

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|---------|---|
| A2216.4 | Determine the regulation of a 3 phase alternator and 1 phase transformer by conducting suitable test. |
| A2216.5 | Test the parallel operation and polarity test of a single phase transformer. |

Course Name:A2420 – ELECTRONIC CIRCUITS-II LABORATORY

| | |
|---------|---|
| A2420.1 | Implement different configurations of operational amplifiers. |
| A2420.2 | Construct and analyze various active filters using op-amp. |
| A2420.3 | Design and draw the internal structure of various logic gates. |
| A2420.4 | Analyze the generation of operations of various signals and sequences using MATLAB. |

Course Name:A2018 –QUANTITATIVE APTITUDE AND REASONING – II

| | |
|----------|---|
| A2018.1 | Identify the problems by applying mathematical fundamentals. |
| A2018.2 | Apply the suitable logical method to solve the problems. |
| A2018.3. | Solve the various problems by using quantitative mathematical fundamentals. |
| A2018.4 | Analyse the comprehensive data with logical ability. |

Course Name:A2031-ENVIRONMENTAL SCIENCE

| | |
|---------|---|
| A2031.1 | Solve environmental problems through higher level of personal involvement and interest. |
| A2031.2 | Apply ecological morals to keep up amicable connection among nature and human beings. |
| A2031.3 | Recognize the interconnectedness of human dependence on the earth's ecosystems. |
| A2031.4 | Apply environmental laws for the protection of environment and wildlife. |
| A2031.5 | Influence society in proper utilization of goods and services. |


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|--------|---|
| C407.4 | Realize the string operation and instruction prefix involving move block, reverse string, sorting, inserting using 8086 processor |
| C407.5 | Carry out the process of interfacing using 8259, 8279 and 8251 |

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Course Name: **Electrical circuits -I**

| Course Outcomes | |
|-----------------|--|
| CO1 | Analyze the concept of electrical circuits and magnetic circuits and study different techniques to calculate voltage and current. |
| CO2 | Determining the response of circuits to single phase A.C excitation and evaluate the RMS value and Average Values |
| CO3 | Depict the locus diagrams of various combinations of circuits along with the analysis of concept of resonance |
| CO4 | Understand the concept of bandwidth and Q factor in various series and parallel circuits. |
| CO5 | Interpret the technique of solving circuits employing theorems which involve Norton's, Thevenin's, Maximum Power transfer theorem etc. |
| CO6 | Analyze the concept of two port parameters with respect to impedance, admittance, Transmission and Hybrid parameters |

Course Name: **MATHEMATICS-I (R15 & R18)**

| Course Outcomes | |
|-----------------|---|
| CO1 | Apply the mathematical principles to solve first and second order differential equations |
| CO2 | Analyze the non homogeneous linear differential equations of second and higher order along with Euler – Cauchy's equations and Legendre's linear equation |
| CO3 | Apply the differential equations of second and higher order in various streams - --like Electrical Circuits, Simple Harmonic motion, Deflection of beams |
| CO4 | Estimate the Taylors and Maclaurin series involving Maxima and minima of functions consisting of 2 variables along with radius of curvature |
| CO5 | Evaluate the multiple integrals involving double and triple integrals along with change of order of integration and apply the multiple integrals to areas and volumes in polar and Cartesian coordinates. |
| CO6 | Analyze the concept of vector calculus involving divergence, curl, green's theorem, Stoke's and Gauss theorems |


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Course Name: **MATHEMATICS-II (R15 & R18)**


| Course Outcomes | |
|-----------------|--|
| CO1 | Analyze the concept of Laplace transform of standard functions along with inverse transform, dirac's delta function and convolution theorem |
| CO2 | Apply the Laplace transforms to ordinary differential equations of first order and second order |
| CO3 | Carry out the determination of Fourier coefficients in terms of Fourier series involving Half range Fourier sine and cosine expansions |
| CO4 | Interpret the Fourier integral theorem along with Fourier sine and cosine transformation and also the concept of inverse transformation |
| CO5 | Formulate the partial differential equations through elimination of arbitrary constants and also understand the technique of separation of variables |
| CO6 | Analyze the technique of Z-transformation for various conditions along with analysis of Fourier transforms |

Course Name: **NETWORK ANALYSIS LAB**

| Course Outcomes | |
|-----------------|---|
| CO1 | Solve the electrical network using mesh and nodal analysis by applying network theorems |
| CO2 | Estimate the impedance for maximum power transfer and will be in a position to design the systems for maximum power transformation. |
| CO3 | Analyze the transient response of series and parallel A.C. circuits and to solve problems in time domain using Laplace Transform. |
| CO4 | Communicate clearly and use the appropriate medium, including written, oral, and electronic methods. |
| CO5 | Analyze and design a filter to meet its specifications using PSPICE Software |
| CO6 | Engage in independent and lifelong learning in the context of technological changes. |

Course Name: **NETWORK ANALYSIS**

| Course Outcomes | |
|-----------------|--|
| CO1 | Analyze the concept of electrical circuits and magnetic circuits and study different techniques to calculate voltage and current and also Interpret the technique of solving circuits employing various theorems |
| CO2 | Perform the D.C and A.C transient analysis on combination of circuits along with source transformation |
| CO3 | understand and analyze the fundamental concept of single phase circuits and also determine different powers for a given circuit |


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|-----|---|
| CO4 | Depict the locus diagrams of various combinations of circuits along with the analysis of concept of resonance |
| CO5 | understand and analyze the concept of two port parameters and apply it for different two port networks |
| CO6 | Understand the concept of filters and able to design different filters |

Course Name: **CONTROL SYSTEM ENGINEERING**

| | |
|-----|--|
| CO1 | Understand the concepts of feedback control systems, analogies between electrical and mechanical systems. |
| CO2 | Find the transfer function, time domain specifications and steady state errors. |
| CO3 | Apply R-H criterion and root locus concepts to determine the stability of the given system. |
| CO4 | Find the frequency domain specifications of second order systems and determine the stability of the systems using Bode plot and Nyquist plot techniques. |
| CO5 | Determine the transfer function and gain & phase margins from the Bode plot & Nyquist plot. |
| CO6 | Develop state model of a given system, solve the state equations and test the observability and controllability of the given system. |

Course Name: **CONTROL SYSTEMS AND SIMULATION LAB**

| Course Outcomes | |
|-----------------|--|
| CO1 | Determine experimentally the time domain responses of a given second order system |
| CO2 | Analyze the effect of P,PI,PID controller on the step response of a feedback control system |
| CO3 | Design & conduct experiment on Lead, Lag & Lead & Lag Compensators for the given specifications. |
| CO4 | Draw the characteristics of AC servo motor, DC servo motor and Magnetic amplifier |
| CO5 | Apply the control systems concepts to synchro transmitter and synchro receiver pair |
| CO6 | Design state space based controllers, compensators and systems using MATLAB software. |

Course Name: **ELECTRICAL CIRCUITS – II**

| Course Outcomes | |
|-----------------|---|
| CO1 | Carry out the transient analysis of RL,RC,RLC series circuits for DC & AC Excitations |
| CO2 | Analyze three phase balanced and unbalanced circuits and determine line voltages,line currents, phase voltages and phase currents |
| CO3 | Measure active and reactive power in three phase circuit |


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|-----|--|
| CO4 | To understand the concept of graph Theory, nodal and mesh analysis |
| CO5 | Apply Fourier transforms to various electrical circuits. |
| CO6 | Design various types of filters. |

Course Name: **ELECTRICAL CIRCUITS AND SIMULATION LAB**

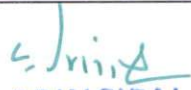
| Course Outcomes | |
|-----------------|---|
| CO1 | Explain electric circuit concepts by interpreting the simulation results. |
| CO2 | Design RLC series circuit for specified frequency response. |
| CO3 | Analyze three phase balanced and unbalanced circuits. |
| CO4 | Design RL, RC and RLC circuits for specified transient response. |
| CO5 | Design and Frequency Response of Low Pass and High Pass. |
| CO6 | Explain electric circuit concepts by interpreting the simulation results. |

Course Name: **ELECTRICAL MACHINES-I Lab**

| Course Outcomes | |
|-----------------|---|
| CO1 | Evaluate the open circuit characteristics in order to find the critical resistance, speed and also list out the external and internal characteristics of dc shunt machines. |
| CO2 | Perform the load test and brake test on DC shunt generator and motor in order to determine the performance characteristics. |
| CO3 | Determine the efficiency of DC shunt and series machines through fields test and Hopkinson's test respectively. |
| CO4 | Predetermine the efficiency of DC shunt motor by conducting Swinburne's test and also control the speed of dc motor by different method. |
| CO5 | Draw the characteristics of DC series generator by conducting load test and also carry out the separation of losses in DC shunt motor |
| CO6 | Analyze the performance curves of DC compound motor by conducting brake test on the motor |

Course Name: **ELECTRICAL MACHINES-I**

| Course Outcomes | |
|-----------------|---|
| C206.1 | Analyze the formulation of electromechanical energy conversion in single and multi excited systems. |
| C206.2 | Describe the principle of Operation of Motor, Generator and classify the DC Machines into separately excited and self-excited |
| C206.3 | Perform tests like swinburnes test and brake test in order to determine the losses and efficiency of DC Machines |
| C206.4 | Understand the methods to control the speed of DC motor by various methods like armature control, field control and ward leonard method |


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| C206.5 | Interpret the construction and working of three point starter and four point starter in dc motor for limiting the starting current |
| C206.6 | Interpret the concept of armature reaction and commutation in dc machine along with its corresponding improvement |

Course Name: **ELECTRICAL MACHINES-II**

| Course Outcomes | |
|-----------------|---|
| CO1 | Enumerate the working and construction of single phase transformer, along with determination of various tests in order to determine the performance and efficiency. |
| CO2 | Identify the three phase transformers employed in distribution and transmission system based on their connections. |
| CO3 | Investigate the operation and working principles of various types of induction motors and depict the torque speed characteristics |
| CO4 | Perform various tests on three phase induction motor like Brake test, No-Load and Blocked Rotor tests in order to determine the performance and efficiency. |
| CO5 | Conduct various tests like O.C, S.C and sumpners test on single phase transformer to determine the performance , losses and efficiency |
| CO6 | Analyze the various starting methods of induction motors and also control methods for speed control of induction motor. |

Course Name: **ELECTRICAL POWER GENERATING SYSTEMS**

| Course Outcomes | |
|-----------------|--|
| CO1 | Recognize the importance and economic aspects of power generation and difference between renewable and non-renewable energy sources, recall the process of nuclear fission and chain reaction. |
| CO2 | Analyze the construction, working and operating principle, and essential components of various power generating stations with their relative merits and demerits. |
| CO3 | Design the layout and select the optimal location for different power plants along with its relevant features. |
| CO4 | Analyze the different methods and characteristics of solar, wind, biogas, geothermal and ocean power generating systems along with their economic and environmental aspects. |
| CO5 | Carry out a detailed analysis on the economic aspects of power generation involving various tariff methods and costs of generation. |
| CO6 | Function effectively as a member or leader in a team in the development of Power System applications. |


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Course Name: **Electromagnetic Fields**

| Course Outcomes | |
|-----------------|--|
| CO1 | Apply vector calculus to generalize the behavior of static electric fields in standard configurations. |
| CO2 | Understand the behavior of static magnetic fields in standard configurations by applying vector calculus. |
| CO3 | Analyze the inductance and capacitance for different structures. |
| CO4 | Apply the force in electric field and magnetic field and both. |
| CO5 | Examine the effect of time varying fields involving both electric and magnetic field on a wave propagating through a medium along analysis of with modified Maxwell's equations for time varying fields. |
| CO6 | Use of modern tool MATLAB to simulate electromagnetic fields of transmission lines. |

Course Name: **Managerial Economics and Financial Analysis**

| Course Outcomes | |
|-----------------|---|
| CO1 | Understand, Concepts of economics, managerial economics, demand determinants, law of demand and its exceptions, types and measurement of elasticity of demand, demand forecasting. |
| CO2 | Understand production function, isoquants and isocosts, MRTS, least cost combination of inputs, Cobb-Douglas production function and law of return to scale. Types of cost, BEA, BEP.. |
| CO3 | Understand market structure, types of markets, price-output determination under perfect competition, monopoly, monopolistic competition and pricing methods, types of business organizations and LPG. |
| CO4 | Understanding the concepts of accounting principles and apply them to know the financial position of a company. |
| CO5 | Evaluate the financial position of the company by using Ratio Analysis. |
| CO6 | Understand capital, types, sources, estimation of capital requirements, capital budgeting and techniques of capital budgeting. |

Course Name: **MATHEMATICS-III (R15)**

| Course Outcomes | |
|-----------------|---|
| CO1 | Demonstrate knowledge of matrix calculation as an elegant and powerful mathematical language in connection with rank of a matrix, linear system of equations, linear dependence and independence. |

| | |
|-----|--|
| CO2 | Interpret the Eigen values and Eigen vectors of matrix in terms of the transformation it represents in to a matrix Eigen value problem. Define a quadratic form and determine its nature using Eigen values. |
| CO3 | Perform the solutions of algebraic and transcendental equation employing bisection method, false position method and Newton-Raphson method |
| CO4 | Understand the technique of interpolation along with Lagrange's formula and Newton's interpolation formulae. |
| CO5 | Understand and apply the concepts of curve fitting, numerical differentiation and integration. |
| CO6 | Interpret the numerical solutions of ordinary differential equations employing Taylor series, Euler's, Picard's and Runge-kutta methods. |

Course Name: **MATHEMATICS-IV (R15)**

| Course Outcomes | |
|-----------------|--|
| CO1 | Apply Beta and Gamma functions to evaluate many integrals which cannot be expressed in terms of elementary functions. |
| CO2 | Demonstrate the usage of Bessel functions and Legendre polynomials in solving various engineering problems. |
| CO3 | Analyze the functions of complex variable which include continuity, differentiability and analyticity along with evaluation of Cauchy-Riemann equations in Cartesian and polar coordinates |
| CO4 | Perform the Conformal mapping which includes bilinear transformation, translation, rotation, magnification and inversion. |
| CO5 | Employ the Cauchy's integral theorem along with integral formula along with expansion in Taylor's series, Maclaurin's series and Laurent series along with radius of convergence. |
| CO6 | Evaluate the residual formula through Laurent series and residue theorem along with evaluation of improper real integrals. |

Course Name: **ELECTRICAL MACHINES-II Lab**

| Course Outcomes | |
|-----------------|---|
| CO1 | Conduct suitable tests on single phase transformer and pre determine the efficiency and regulation at different loading conditions. |
| CO2 | Perform the regulation of alternator by EMF and MMF methods in order to evaluate voltage regulation at different power factors and also determine the X_d and X_q values. |
| CO3 | Carry out No load and blocked rotor tests on three phase induction motor to determine efficiency and also to draw the performance characteristics. |
| CO4 | Analyze the equivalent circuit diagrams of single phase induction motor by conducting various tests. |


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| CO5 | Conduct the brake test on 3 phase induction motors and evaluate the performance characteristics |
| CO6 | Convert 3 phase to 2 phase connection in 3 phase transformer through scott connection |

Course Name: **ELECTRICAL MACHINES-III**

| Course Outcomes | |
|-----------------|--|
| C304.1 | Understand the construction and principle of operation of round rotor and salient pole machines along with E.M.F Equation, different types of windings, alternator on load. |
| C304.2 | Determine experimentally the characteristics of synchronous generator along with phasor diagram and also evaluate the regulation by synchronous impedance method, M.M.F method and Z.P.F method. |
| C304.3 | Interpret the parallel operation of synchronous generators and determination of sub-transient, transient and steady state reactance's. |
| C304.4 | Explain the principle of operation of synchronous motor along with V and Inverted V curves and also describe the concept of hunting and methods of starting in synchronous induction motor. |
| C304.5 | Infer the constructional features of single phase motor along with double revolving field theory and elementary idea of cross-field theory. |
| C304.6 | Carry out a detailed analysis on special motors which include A.C series motor, universal motor and reluctance motor. |

Course Name: **ELECTRICAL MEASUREMENTS LABORATORY**

| Course Outcomes | |
|-----------------|--|
| CO1 | Perform the calibration and testing of single-phase energy meter and dynamometer power factor meter. |
| CO2 | Determine and formulate the parameters like resistance, inductance and capacitance using DC and AC bridges. |
| CO3 | Calculate the three-phase reactive power in the given circuit through single phase wattmeter |
| CO4 | Evaluate the three-phase real and reactive power in the given circuit through two single phase wattmeter. |
| CO5 | Measure parameters of choke coil using three ammeters and three voltmeters method. |
| CO6 | Analyze the calibration of LVDT, Strain gauge and DC Crompton Potentiometer and also depict their characteristics. |

Course Name: **ELECTRICAL MEASUREMENTS**

| Course Outcomes | |
|-----------------|--|
| CO1 | Calculate the various errors along with understanding the principle and operation of basic instruments employed for measuring purpose. |
| CO2 | Interpret the working and operating principle of current transformer and Potential transformer along with the 1 phase and 3 phase power factor meters. |
| CO3 | Categorizing the instruments employed for measurement of power and energy along with the analysis of A.C and D.C Potentiometers. |
| CO4 | Determine the measurement of passive parameters (R,L,C) through various bridges along with their phasor representation |
| CO5 | Explain the constructional details of ballistic galvanometer along with the B-H loop method of reversal. |
| CO6 | Carry out detailed analysis on the working and application of cathode ray oscilloscope along with the analysis on the working of digital meters |

Course Name: **ELECTRICAL POWER TRANSMISSION SYSTEMS**

| Course Outcomes | |
|-----------------|---|
| C302.1 | Analyze the passive parameters (R,L,C) of a transmission line and to calculate the same for different configurations of transmission lines. |
| C302.2 | Evaluate the performance of short, medium and long transmission lines along with surge impedance and surge impedance loading |
| C302.3 | Investigate the effect of Corona on the transmission lines and various reduction techniques along with types of Insulators and methods to provide equipotential distribution across them to protect from high dielectric stress |
| C302.4 | Estimate the mechanical design of transmission line involving Sag and tension calculations along with considering the effect of wind and ice. |
| C302.5 | Carry out detailed study about the various transients in power systems along with Bewley's Lattice diagrams |
| C302.6 | Interpret the insulation resistance , stress and capacitance of single core and three- core cable |

Course Name: **POWER ELECTRONICS AND SIMULATION LABORATORY**

| Course Outcomes | |
|-----------------|---|
| CO1 | Plot the output waveforms for the different gate firing circuits for SCR. |
| CO2 | Analyze the output waveforms for different firing angles by conducting experiments on single phase AC voltage controller and Cycle converter with R and RL loads. |
| CO3 | Analyze the output waveforms for different firing angles by conducting experiments on DC Jones Chopper and Single Phase Dual Converter with R and RL loads. |

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|-----|---|
| CO4 | Understand the operation of single phase series and parallel inverters with R and RL loads. |
| CO5 | Design Illumination control / Fan control using TRIAC |
| CO6 | Construct the output waveforms for Buck-Boost converter, Half bridge and Full bridge inverter circuit using MATLAB. |

Course Name: **POWER SYSTEM ANALYSIS**

| Course Outcomes | |
|-----------------|---|
| CO1 | Analyze the representation of various power system elements and formation of Y bus |
| CO2 | Design the formation of Z bus in power system in various addition / removal of buses |
| CO3 | Investigate power flow studies through the implementation of Gauss-siedel methods and Newton Raphson's method in rectangular and polar forms |
| CO4 | Carry out the short circuit analysis involving symmetrical fault analysis and analyze the concept of symmetrical components involving positive, negative and zero sequence components |
| CO5 | Investigate the steady state analysis in power systems under various operating conditions and also depict the power angle curve |
| CO6 | Interpret the transient state analysis in power systems by Equal area criterion and also calculate the solution of swing equation through runga-kutta method |

Course Name: **POWER SYSTEM PROTECTION**

| Course Outcomes | |
|-----------------|---|
| C404.1 | Realize the basic requirements of relays as primary and backup protection along with their constructional details |
| C404.2 | Analyze the static and microprocessor based relays along with their specifications, advantages and disadvantages |
| C404.3 | Interpret the various techniques involves in the generator and transformer protection against faults in the system |
| C404.4 | Explain the techniques involves in the protection of feeders and transmission lines |
| C404.5 | Understand the fundamental principles of circuit breakers along with their ratings and specifications |
| C404.6 | Describe the causes for over-voltages in power system and also explain the various protective schemes for the protection from over-voltages |

Course Name: **PROGRAMMABLE LOGIC CONTROLLER AND ITS APPLICATIONS**

| Course Outcomes | |
|-----------------|--|
| CO1 | Explain the basic concepts of Programmable Logic Controller, architecture and its connecting devices |


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| CO2 | Solve the given Logic gate diagram into PLC ladder diagram and vice versa |
| CO3 | Design and Programme a PLC ladder structures for Industrial Applications. |
| CO4 | Analyze the control circuits for various applications using Timers and Counters |
| CO5 | Understand the concept of different data handling functions used in PLC |
| CO6 | Apply the PLC simulation software on wide range of PLC applications |

Course Name: **DIGITAL SIGNAL PROCESSING LAB**


| Course Outcomes | |
|-----------------|--|
| CO1 | Compute the energy, power and convolution of discrete time sequences using MATLAB. |
| CO2 | Compute the DTFT, N-Point DFT using FFT algorithm. |
| CO3 | Design FIR filters using windowing techniques. |
| CO4 | Design IIR filter and verify its frequency response. |
| CO5 | Compare frequency response of FIR and IIR filters. |
| CO6 | Find the frequency response of analog filters. |

Course Name: **DIGITAL SIGNAL PROCESSING**

| Course Outcomes | |
|-----------------|---|
| CO1 | Analyze various discrete time signals and systems. |
| CO2 | Analyze the response of the discrete time systems in time and frequency domain. |
| CO3 | Compute and analyze DFT using various algorithms. |
| CO4 | Analyze various realization forms of FIR and IIR Filters. |
| CO5 | Design digital FIR and IIR filters and analyze their performances. |
| CO6 | Understand the basic concepts of sampling rate conversion and implement them. |

Course Name: **ELECTRICAL DISTRIBUTION SYSTEMS(R13&R15)**

| Course Outcomes | |
|-----------------|---|
| C401.1 | Identify and categorize the concept includes load distribution, load modeling related to distribution system. |
| C401.2 | Building up analyzing, designing of primary and secondary distribution feeders. |
| C401.3 | Evaluate the solutions of voltage drop and power loss calculations and manual methods of radial network. |
| C401.4 | Able to explain the substations layout showing the location of all |


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| | substations equipment |
| C401.5 | Determines the best capacitor location, Power factor correction, capacitor allocation to enhance the power factor and voltage profile. |
| C401.6 | Involve in lifelong learning to implement modern methods in distribution system in order to meet the demand growth in future. |

Course Name: **ENERGY AUDIT AND DEMAND SIDE MANAGEMENT**

| Course Outcomes | |
|-----------------|---|
| CO1 | Acquire knowledge about energy auditing and energy requirements and also about global energy scenario. |
| CO2 | Understand about motor energy audit and power factor improvement methods. |
| CO3 | Assess the need and type of instruments for energy audit and energy management and their applications |
| CO4 | Acquire an in-depth knowledge about the energy management. |
| CO5 | Acquire Knowledge about importance of evaluation, measurement and verification of demand side management programs |
| CO6 | Understand various Cost effectiveness test for demand side management programs |

Course Name: **HVDC TRANSMISSION(R15&R13)**

| Course Outcomes | |
|-----------------|--|
| C415.1 | Understand the concept of HVDC Transmission system over the existing AC transmission and Basic principle and operation of different HVDC converters. |
| C415.2 | Analyze and Apply the different power Converters and control methods to control the transmission system and distribution system |
| C415.3 | Understand the design of filters to eliminate the harmonics to improve the power quality. |
| C415.4 | Analyze different faults in HVDC system. |
| C415.5 | Use modern tools including MATLAB, PSPICE tools to simulate the High transmission system. |
| C415.6 | Engage in independent and lifelong learning in the context of HVDC technological changes |


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Course Name: **INSTRUMENTATION**

| Course Outcomes | |
|-----------------|--|
| CO1 | Understand the various concepts in characteristics of signals and errors in measurements along with signals and their representation for electronic instruments. |
| CO2 | Carry out the analysis of data transmission and telemetry system which is intermediate stage in instrumentation. |
| CO3 | Understand the data acquisition system components and record the data in analog and digital format. |
| CO4 | Analyze the signals employing signal analyzers and learn the measurement of non- electrical quantities like flow and pressure. |
| CO5 | Realize the different types of transducers along with their advantages and disadvantages which are primary sensing element in instrumentation. |
| CO6 | Implement the Measurement of non- electrical quantities employing various instruments. |

Course Name: **POWER QUALITY**

| Course Outcomes | |
|-----------------|---|
| CO1 | Understand the importance of Power Quality and obtain a brief idea of all power quality issues |
| CO2 | Comprehend the categories and characteristics of electromagnetic phenomenon on power systems, transients, short duration and long duration variations |
| CO3 | Understand the principles and devices for voltage regulation |
| CO4 | Study the nature of harmonics and evaluate certain methods to control harmonics distortions by applying various principles |
| CO5 | Learn about bench marking process, monitoring considerations, assessment of power quality measurement data and operation of monitoring equipment |
| CO6 | Understand the principles of operation of custom power devices which include SSCL, SSB, SSTS, DVR and UPQC. |

Course Name: **POWER SYSTEM AND SIMULATION LABORATORY**

| Course Outcomes | |
|-----------------|--|
| CO1 | Determine the positive, negative and zero sequence impedances of cylindrical rotor synchronous machine |
| CO2 | Carry out the fault analysis for various types of faults involving LG, LL, LLG and LLLG Faults |
| CO3 | Determine Sub transient reactance of salient pole synchronous machine and Equivalent circuit of three winding transformer. |
| CO4 | Carry out the analysis of formation of Y bus and Z bus applying MATLAB |

| | |
|-----|---|
| CO5 | Carry out the analysis of load flows involving Newton Raphson Method and Fast Decoupled Method applying MATLAB |
| CO6 | Develop a Simulink model for the problem of load frequency control involving single area and multi area systems |

Course Name: **POWER SYSTEM OPERATION AND CONTROL**

| Course Outcomes | |
|-----------------|---|
| CO1 | Analyze optimal operation of generators in thermal power plants without and with transmission losses. |
| CO2 | Interpret the importance of hydro thermal scheduling for long term and short term scheduling problems. |
| CO3 | Model the turbine, governor and generator load model mathematically and design the block diagram for load frequency control. |
| CO4 | Analyze the steady state response, dynamic response, load frequency control and economic dispatch control for two or more interconnected systems. |
| CO5 | Investigate the various methods of reactive power compensation in transmission system. |
| CO6 | Recognize the necessity for power system rescheduling and various key issues in deregulation |

Course Name: **UTILISATION OF ELECTRICAL ENERGY**

| Course Outcomes | |
|-----------------|---|
| CO1 | Explain the basic principles of light control and Different sources of Light |
| CO2 | Understand the various electric heating methods, equipment required for welding and also the difference between AC and DC welding . |
| CO3 | Interpret about the movement of a train and corresponding arrangements and also the features of a Traction Motor. |
| CO4 | Analyze the methods of controlling the trains electrically, terms related to electric traction and calculations of various parameters related to it |
| CO5 | Carry out a detailed review of existing Electric Traction Systems in India and analysis of Energy consumption in Electric Traction |
| CO6 | Engage in lifelong learning to develop modern methods in the prospect of optimum utilization of electrical energy for real world usage. |