LENDI INSTITUTE OF ENGINEERING AND TECHNOLOGY
An Autonomous Institution
Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada
Accredited by NBA and NAAC with "A" Grade
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Department of Electrical and Electronics Engineering

COURSE OUTCOMES

COURSE	COURSE OUTCOMES	
English – I C101	**C101.1**	Acquired listening, speaking, reading and writing skills necessary for the survival in the postmodern society through task-based and skill-based communication practices with judicious integration of modern tools.
	C101.2	Realization of technical communicative competence and attainment of group dynamism and problem solving skills through standard oral and written language models.
	C101.3	Development of fluency and accuracy for effective and professional communication in real-time situations by using appropriate verbiage and contextual knowledge.
	C101.4	Imbibed lifelong reading habit among the learners to grow both professionally and socially with ethical principles and values.
	C101.5	Application of own ideas as informed opinions that are in dialogue with a larger community of interpreters, and understand how their own approach compares to the variety of critical and theoretical approaches.
	C101.6	Demonstration of intercultural competence, knowledge of civic responsibility, and the ability to engage effectively in regional, national, and global communities.
Mathematics – I C102	**C102.1**	Identify and solve the first order differential equations. Able to model the real world problems using differential equations and analyze their solutions
	C102.2	Solve the higher order linear differential equations and model the electrical circuits using differential equations.
	C102.3	Understand and determine Laplace and Inverse Laplace transform of certain functions and solve an initial value problem for a differential equation using Laplace transform.
	C102.4	Acquire knowledge on partial differentiation and calculate total derivative, Jacobian and Maxima and Minima of function of several variables.

	C102.5	Form a partial differential equation and solve first order linear and non-linear partial differential equations.
	C102.6	Solve higher order homogeneous and non-homogeneous partial differential equations. Also able to classify second order partial differential equations.
Mathematics – II (MM) C103	**C103.1**	Understand the basic numerical methods and capable to solve and develop an algorithm for algebraic and transcendental equations.
	C103.2	Skill to Understand the interpolation methods and find the interpolation polynomials/values for the given data by the suitable interpolation method.
	C103.3	Able to apply numerical integration to evaluate definite integral and solving ordinary differential equations by using Taylor's series, Picard's method, Euler's method, Modified Euler's method and Runge-Kutta method.
	C103.4	Skill to find the Fourier series of different functions.
	C103.5	Understand the concept of Fourier transforms and find Fourier transforms for different functions.
	C103.6	Interpret to apply Z-transforms for the engineering problems like– properties – Damping rule – Shifting rule – Initial and final value theorems -Inverse z transform- -Convolution theorem – Solution of difference equation by Z -transforms
Engineering Physics C104	**C104.1**	Apply the basic principles and properties of light to construct and understanding the working mechanism of instruments such as Interferometer, Diffract meter and Polari meter.
	C104.2	Describe the applications of lasers by utilizing its characteristic properties and principles.
	C104.3	Explore the applications of optical fiber
	C104.4	Discuss the propagation of EM fields in isotropic & dielectric medium by observing their response to different materials.
	C104.5	Classify the solid state materials based on the band theory by applying the principles of Quantum Mechanics & free electron theory.
	C104.6	Identify the given semiconductor by studying its charge carriers through the Hall effect.
Professional ethics and Human Values C105	**C105.1**	Ensures engineers sustained happiness through identifying the essentials of human values and skills.
	C105.2	Produce knowledge among students about relational ship Engineering and professional ethics
	C105.3	Evaluate practically the importance of Engineering profession and enriching interaction with Engineer and society.
	C105.4	Provide appropriate knowledge for the safety and health

		of employees.
	C105.5	Harmony in professional and personal life.
	C105.6	Guide Engineer as a global problem solver and sustain in the cross cultural environment
Engineering Drawing C106	**C106.1**	Describe the construct polygons , curves and scales
	C106.2	Impart the significance of projection of points and lines
	C106.3	Understand to draw orthographic projections of lines inclined to both planes
	C106.4	Understand to draw the projection of planes
	C106.5	Understand to draw the projection of solids
	C106.6	Impart the visualization of 3D –objects and draw the orthographic, isometric views
English-Communication Skills Laboratory – I C107	**C107.1**	Enabling students to use Computer assisted Language Laboratory (CALL) to enhance their pronunciation through stress, intonation and rhythm for routine and spontaneous interaction
	C107.2	Attainment of communicative competence for the fulfilment of academic, professional and social purposes.
	C107.3	Attainment of language Proficiency through Contextualized, Task Based Activities to realize employment potential at the end of the course.
	C107.4	Acquired listening, speaking, reading and writing skills necessary for the survival in the postmodern society through task-based and skill-based communication practices with judicious integration of modern tools.
	C107.5	Development of fluency and accuracy for effective and professional communication in real-time situations by using appropriate verbiage and contextual knowledge.
	C107.6	Realisation of technical communicative competence and attainment of group dynamism and problem solving skills through standard oral and written language models.
Engineering Physics Laboratory C108	**C108.1**	Make use of interference in thin air films concept (Newton rings & parallel fringes) determine the radius of curvature of a given convex lens and thickness of given thin paper.
	C108.2	Determine the wavelengths of various spectral lines in the polychromatic source (Hg source) & the wavelength of Laser source by Diffraction.
	C108.3	Discuss the T-R characteristics of thermistor & calculate the energy band gap of semiconductor by understanding & analyzing the variation of resistance with temperature in devices such as thermistor, semiconductors, etc.,

	C108.4	Measure the rigidity modulus of the given wire & acceleration due to gravity at a given point by studying the modified Simple Harmonic oscillations using a Torsional and compound pendulums respectively.
	C108.5	Analyze the variation of intensity of magnetic field with distance along the axis of a current carrying circular coil.
	C108.6	Verify the laws vibrations of stretched string & determine the velocity of sound in air by using the resonance phenomenon.
	C108.7	Find out the resonance frequency the of LCR series circuit by studying its frequency response & Calculate the break down voltage of Zener Diode by analyzing its V-I characteristics
	C108.8	Estimate the numerical aperture and the acceptance angle of an optical fiber & also analyze the bending losses of the optical fiber.
Engg. Workshop & IT Workshop C109	**C109.1**	Student should able to Understand the basics of carpentry and able to make different carpentry joints.
	C109.2	Student should able to Understand the basics of fitting and able to make different fits.
	C109.3	Student should able to Understand the basics of black smithy and able to make different forged jobs.
	C109.4	Student should able to Understand the basics of house wiring and able to make different house wiring techniques used in our daily life.
	C109.5	Present and Describe how PCs and larger computer systems are used in the business community and the positive/negative impacts of that technology in business and society.
	C109.6	Assembling, Disassembling and Identification of various computer components, Installation of software.
	C109.7	Acquire the knowledge of various components like Storage Devices, I/O Port, Device Drivers, Assemblers, Compilers, Interpreters, Linkers, and Loaders.
	C109.8	Use various productivity tools like MS office.
English – II C110	**C110.1**	Acquired listening, speaking, reading and writing skills necessary for the survival in the postmodern society through task-based and skill-based communication practices with judicious integration of modern tools.
	C110.2	Realisation of technical communicative competence and attainment of group dynamism and problem solving skills through standard oral and written language models.
	C110.3	Development of fluency and accuracy for effective and

		professional communication in real-time situations by using appropriate verbiage and contextual knowledge.
	C110.4	Imbibed lifelong reading habit among the learners to grow both professionally and socially with ethical principles and values.
	C110.5	Application of own ideas as informed opinions that are in dialogue with a larger community of interpreters, and understand how their own approach compares to the variety of critical and theoretical approaches.
	C110.6	Demonstration of intercultural competence, knowledge of civic responsibility, and the ability to engage effectively in regional, national, and global communities.
Mathematics – III C111	**C111.1**	Determine the rank of a matrix by reducing to echelon form, normal form & solve system of simultaneous linear equations and apply these methods to find the current in electrical circuits using matrices.
	C111.2	Solve the problems related to Eigen values & Eigen vectors of a given matrix, determine the inverse and powers of a matrix using Cayley – Hamilton theorem and identify the rank, nature and index of a Quadratic form.
	C111.3	Identify the given curve by interpreting different properties of the curve. Able to determine Double integral over a surface and triple integral over a volume and find the lengths, surface areas and volumes of solids using double and triple integrals.
	C111.4	Understand Beta & Gamma functions and able to evaluate improper integrals using beta, gamma functions
	C111.5	Find the gradient of a scalar function, divergence & curl of a vector function and determine normal, flux and scalar potential using vector differentiation.
	C111.6	Determine line, surface and volume integrals and able to verify Green's, Stoke's and Gauss divergence theorems
Engineering Chemistry C112	**C112.1**	The impurities present in raw water, problems associated with hard water in industries and how to avoid them are understood. The students would be aware of different types of sterilization methods to get the drinking water.
	C112.2	The students able to construct the Electro chemical cell and develop different types of battery cells like organic, inorganic, fuel cells.
	C112.3	Creating awareness on problems created by corrosion of metals and its control methods

	C112.4	Usage of plastics not only in household appliances and also used as composites in automotive industries, bio plastic in surgeries. The students able to design FRP, Biodegradable polymers and Usage of conducting polymers as battery cells.
	C112.5	The students should know the importance of solid, liquid, gaseous fuels and also significant with the problems associated with impurities present in the fuel which leads to knocking in engines.
	C112.6	The students would be able to design ,develop advanced engineering materials like Nano materials, Refractories, Insulators, FRP, Liquid crystals and its applications like Nano-chips, Nano paints, solar cells etc.
Engineering Mechanics C113	**C113.1**	To find the resultant of any number of forces and can apply friction concept for a given body.
	C113.2	To draw free body diagram for a given body can calculate the forces in members of the truss.
	C113.3	To find the centroid and Centre of gravity of composite sections.
	C113.4	To evaluate and find the moment of inertia of composite sections.
	C113.5	To analyze the motion of the bodies and the forces causing the motion.
	C113.6	To apply Work-Energy and Impulse-Momentum equations to find out the different parameters.
Electrical Circuit Analysis – I C114	**C114.1**	Able to study the concepts of passive elements, types of sources and various network reduction techniques.
	C114.2	Able to understand the behavior of RLC networks for sinusoidal excitations. Concept of Power factor its importance
	C114.3	Able to study the performance of R-L, R-C and R-L-C circuits with variation of one of the parameters and to understand the concept of resonance.
	C114.4	Able to study the concept of magnetic coupled circuit their Applications in power Transmission
	C114.5	Able to understand the applications of network topology to electrical circuits.
	C114.6	Able to understand the applications of network theorems for analysis of electrical networks
Computer Programming C115	**C115.1**	Understand the basic terminology used in computer programming and Write, compile and debug programs in C language.
	C115.2	Analyze, design and develop programs involving decision structures, loops, arrays.
	C115.3	Analyze, design and develop programs involving modularization.

	C115.4	Developing the programs using dynamic memory concepts using pointers.
	C115.5	Design and develop programs using different user defined data types
	C115.6	Analyze ,Design and develop file handling programs
Engineering Chemistry Laboratory C116	**C116.1**	Students have practical exposure on volumetric analysis
	C116.2	Students acquire the skill to perform the Acid-Base titration in the real lab.
	C116.3	Students acquire the skill to perform the Redox titrations of a sample in the real lab
	C116.4	Students acquire the skill to prepare standard solutions of Mohr's salt.
	C116.5	Students acquire the skill to perform the Iodometric titration in the real lab
	C116.6	Students acquire the skill to perform the quality of raw water in the real lab
	C116.7	Students acquire the skill to perform the Complex metric-titration in the real lab
	C116.8	Students would be aware of instrumental methods of chemical analysis
	C116.9	Students acquire the skill to determine the concentration of H+ ions for a given water sample using. Ph Meter in the real lab.
	C116.10	Students would be aware of instrument like conductivity meter
	C116.11	Students would be aware of instrument like potentio meter
	C116.12	Students acquire the skill to determine the Vitamin – C concentration using volumetric analysis
English - Communication Skills Laboratory – II C117	**C117.1**	Enabling students to use Computer assisted Language Laboratory (CALL) to enhance their pronunciation through stress, intonation and rhythm for routine and spontaneous interaction
	C117.2	Attainment of communicative competence for the fulfilment of academic, professional and social purposes.
	C117.3	Attainment of language Proficiency through Contextualized, Task Based Activities to realize employment potential at the end of the course.
	C117.4	Acquired listening, speaking, reading and writing skills necessary for the survival in the postmodern society through task-based and skill-based communication practices with judicious integration of modern tools.
	C117.5	Development of fluency and accuracy for effective and professional communication in real-time situations by using appropriate verbiage and contextual knowledge.

	C117.6	Realisation of technical communicative competence and attainment of group dynamism and problem solving skills through standard oral and written language models.
C Programming Laboratory C118	**C118.1**	Apply and practice logical ability to solve the problems.
	C118.2	Understand and use C programming development environment to develop C programs.
	C118.3	Understand and apply the knowledge of arrays and strings
	C118.4	Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs.
	C118.5	Understand and apply User defined data types, the pointers, memory allocation techniques and use of files for dealing with variety of problems.

COURSE	**COURSE OUTCOMES**	
Electrical Circuit Analysis-II C201	**C201.1**	Analyze and determine three phase circuit parameters under balanced conditions
	C201.2	Analyze and determine three phase circuit parameters under unbalanced conditions
	C201.3	Understand the transient and steady state behavior of passive elements for DC and AC excitations.
	C201.4	Determine and relate two port network parameters and understand stability of network functions.
	C201.5	Design and synthesis of complex electrical circuits.
	C201.6	Understand wave symmetry and harmonics, representation of a finite series into an infinite series.
Thermal and Hydro Prime movers C202	**C202.1**	To get the knowledge about basic working principle of IC engines including the consideration of Performance parameters.
	C202.2	To get the knowledge about basic working principle of Rankine cycle and can calculate the efficiency and performance of a steam turbine and also know about steam tables.
	C202.3	Learning and understanding about the Gas Turbines and also calculate the efficiency and performance of gas turbines.
	C202.4	Imparting the knowledge of Impact of jets and also understand the working and construction of pumps.
	C202.5	Learning and understanding about the working and construction hydraulic turbines and can know do the design calculations.
	C202.6	To get the knowledge about Hydraulic power plant and can estimate load calculations.

Basic Electronics And Devices C203	**C203.1**	Understand the basic concepts of semiconductor physics.
	C203.2	Construction, operation and characteristics of PN junction diode and special diodes.
	C203.3	Operation of rectifiers and regulators and design of filter circuits
	C203.4	Acquire the knowledge about working principle of transistor & their characteristics. Concepts of biasing, stabilization and compensation techniques used in transistor circuits.
	C203.5	Explain the operation and characteristics of FET, Thyristors, Power IGBTs and Power MOSFETs.
	C203.6	Operating principles of feedback amplifiers, and importance of feedback in oscillators & amplifiers.
Complex Variables and Statistical Methods C204	**C204.1**	Understand the concept of analyticity of the complex functions, C-R equations and to find the velocity potential and flux functions of flow problems using C-R equations.
	C204.2	Evaluation of definite integration over a closed region by using complex integration and find the series expansions of analytical functions using Taylor's, Maclaurin's and Laurent's series expansion.
	C204.3	Complex integrals will be evaluated using Cauchy Residue theorem and evaluation of improper integrals
	C204.4	Understand how to find Bilinear Transformation of different functions – fixed point – cross ratio – properties – invariance of circles
	C204.5	Acquire knowledge on normal distribution and apply it to find the population parameters
	C204.6	Student able to know the procedure for testing of hypothesis and apply it for Tests concerning one mean and proportion, two means- Proportions and their differences using Z-test, Student's t-test - F-test and Chi -square test
Electro Magnetic Fields C205	**C205.1**	Calculate electric field and potentials using Gauss's law and solve Laplace's or Poisson's equations
	C205.2	Understand the concepts of capacitance, energy stored in dielectrics and concepts of conduction and convection currents.
	C205.3	Determine magnetic field intensity due to current, the application of ampere's law and the Maxwell's second and third equations.
	C205.4	Analyze the magnetic forces and torque produced by currents in magnetic field.
	C205.5	Ability to calculate self and mutual inductances and the energy stored in the magnetic field.
	C205.6	Acquires knowledge on time varying fields and get to calculate induced emf and know about displacement current and Pointing vector.

Electrical Machines-I C206	**C206.1**	Understand the concepts of electromagnetic energy conversion.
	C206.2	Explain the construction and operation of dc generators, , armature reaction and commutation
	C206.3	Study the performance characteristics of different types of dc generators.
	C206.4	Study the No-load, internal and external characteristics of different types of dc motors.
	C206.5	Design of armature resistance for starting of DC motors, different types of starters. Testing of dc motors.
	C206.6	Explain the design aspects of a dc machine
Thermal and Hydro Lab C207	**C207.1**	By learning the concept, a student can understand the working principle of IC engine and can able to draw valve and port timing diagrams.
	C207.2	The student can do the performance and can calculate the efficiency for a multi-cylinder petrol engine.
	C207.3	By understanding the above concept can easily know about diesel engines and can calculate the performance under varying loads.
	C207.4	The student can understand the various classification of boilers and their working principles
	C207.5	By learning the calibration techniques can understand how to control the flow of fluids in a piping system.
	C207.6	Student can evaluate performance of a pumps and turbines
Electrical Circuits Lab C208	**C208.1**	Design and analyze basic electrical circuits
	C208.2	Understand the simplification analogy of electrical circuits with the application of various network theorems
	C208.3	Study the behavior of RLC circuits at resonant frequency
	C208.4	Determination of 3-ϕ power of balanced and unbalanced systems
	C208.5	Understand and determine two-port network parameters & choke coil parameters
	C208.6	Analyze various inductive circuits and determine co-efficient of coupling
Environmental studies C209	**C209.1**	Student will be able to know about the environment, components, structure, functions of the environment and ecosystem.
	C209.2	Understands about the natural resources and environmental impacts and which kind of methods are to be applied for the sustainable development.
	C209.3	Ability to understand the biodiversity of India and identifies its threats. Apply the knowledge about the conservation practices to protect the biodiversity.
	C209.4	Acquire knowledge on environmental pollution and their effects on biotic and a biotic components and control

		measures of pollution.
	C209.5	Student will be able to know about the environment, components, structure, functions of the environment and ecosystem.
	C209.6	Understands about the natural resources and environmental impacts and which kind of methods are to be applied for the sustainable development.
Switching Theory and Logic Design C210	**C210.1**	Understand the numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, gray, and BCD.
	C210.2	Understand the simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions
	C210.3	Understand the design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
	C210.4	Understand the design and analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits
	C210.5	Understand the design and analyze flip flops ,registers and counters
	C210.6	Understand the design and analyze state diagrams for flip flops
Pulse & Digital Circuits C211	**C211.1**	To understand the response of RC low pass & high pass filter for sinusoidal and non-sinusoidal signals. Acquired knowledge about Switching Characteristics of various switching devices such as diode, transistor.
	C211.2	Design the nonlinear wave shaping circuits for generating the desired waveforms.
	C211.3	Design Bistable, Monostable and Astable Multivibrators using discrete components.
	C211.4	Realize logic gates using diodes and transistors.
	C211.5	Analyze voltage and current sweep circuits and identify methods to mitigate sweep errors.
	C211.6	Design and understand the Synchronization techniques, sweep circuits & Sampling Gates.
Power Systems-I C212	**C212.1**	Analyze and understand the generation of electrical power
	C212.2	Design the distribution of DC power system & AC power system
	C212.3	Study the operation and maintenance of Substations
	C212.4	Understand the concept of under Ground Cables
	C212.5	Understand the concept of load curves at all seasons.
	C212.6	Understand the concept of tariff and methods
Electrical	**C213.1**	Study the construction and operation of single phase

Machines-II C213		transformer.
	C213.2	Explain different tests performed on transformers to determine the performance characteristics.
	C213.3	Discuss about the types of three phase transformer connection, tap changing methods and 3-phase to 2-phase transformation.
	C213.4	Explain the construction, working and classification of three phase induction motor.
	C213.5	Determine the performance characteristics of induction motor and explain different phenomenon on the operation of induction motor
	C213.6	Design procedure for transformers and three phase induction motors
Control Systems C214	**C214.1**	Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
	C214.2	Determine time domain specifications of second order systems and error constants.
	C214.3	Analyze absolute and relative stability of LTI systems using Routh's stability criterion and Root Locus method.
	C214.4	Stability analysis of LTI systems using frequency domain techniques.
	C214.5	Design Lag and Lead compensators to improve system performance from frequency domain plots.
	C214.6	Representation and understand physical systems as state models and the concepts of controllability & Observability.
Electrical Machines -I Lab C215	**C215.1**	Determine the Performance of OCC, External Characteristics of DC Shunt, Series & Compound Generator.
	C215.2	Determine Performance of OCC , Internal & External Characteristics of DC Shunt Generator
	C215.3	Pre-determine the Efficiency of DC Generator and DC Motor & DC Generator,
	C215.4	Analyze the Performance Characteristics of DC Machine.
	C215.5	Study the Speed Control DC Shunt Motor
	C215.6	Determine the Moment of Inertia of DC Shunt Machine
Electronic Devices & Circuits Lab C216	**C216.1**	Identification, testing and study of Active, Passive components, Measuring Instruments
	C216.2	Analyse the working principle and V-I characteristics of PN junction and Zener Diodes
	C216.3	Evaluate the performance metrics of Half wave and Full wave rectifiers
	C216.4	Analyse the working principle and V-I characteristics of Transistors and JFETs
	C216.5	Design of different amplifiers for required gain bandwidth product values.
	C216.6	Distinguish the Thyristors Family devices and Examine the operating characteristics

COURSE	COURSE OUTCOMES	
Electrical Measurements C301	**C301.1**	Design and analysis of the operation of various Electrical measuring instruments.
	C301.2	Design and working of power, energy, pf and frequency measuring devices. Calibration of energy meters.
	C301.3	Understand the calibration process of measuring instruments using potentiometer and measurement of resistance, voltage and current..
	C301.4	Apply the concepts of Ac & DC bridges for measurement of electrical parameters.
	C301 .5	Study the construction and working of ballistic galvanometer and flux meter used for magnetic measurement.
	C301.6	Understand the concepts of various digital meters and application of lissajious patterns.
Managerial Economics and Financial Analysis C302	**C302.1**	Analyze macro, micro economic concepts useful for business units and determine influences of demand and supply analysis
	C302.2	Specifications of production functions , types of costs and solving engineering problems by applying knowledge of economics
	C302.3	Equipped with the consciousness about market structures and pricing methods of industries
	C302.4	Create awareness to start an enterprise in their own and identification of different stages of business cycle
	C302.5	Knowledge of preparation of accounts, financial statements and their analysis through ratios etc.,
	C302.6	Significant value with financing methods, their applicability in decision making and problem-solving skills according to new trends.
Power Systems-II C303	**C303.1**	Computation of inductance and capacitance of transmission lines using the concepts of GMD, GMR.
	C303.2	Classify & representation of transmission lines, and determination of their performance characteristics.
	C303.3	Study the performance and modeling of long transmission lines.
	C303.4	Understand the transient behavior of transmission lines.
	C303.5	Study the factors affecting the performance of transmission lines and power factor improvement methods.
	C303.6	Design of sag and tension of transmission lines. Overhead insulators and their application.
Electrical	**C304.1**	Construction & Operation of Single Phase IM and

Machines-III C304		their Application.
	C304.2	Explain the Construction & Operation of 3-Ph Alternator and different types of Armature Winding
	C304.3	Understand the Concepts of Voltage Regulation and Explain the Two Reaction Theory.
	C304.4	State Necessary & Sufficient Condition for Parallel operation and Explain the Concept of Load Sharing
	C304.5	Explain the Operation principle of Synchronous Motor and its Analysis.
	C304.6	Understand the Concepts of Hunting and Methods of Starting of Synchronous Motor
Power Electronics C305	**C305.1**	Explain the characteristics of various power semiconductor devices and analyze the operation of diode bridge rectifier
	C305.2	Design firing circuits for SCR. Analyze the operation of AC voltage controller and half–wave phase controlled rectifiers
	C305.3	Explain the operation of single phase full–wave converters and analyze harmonics in the input current.
	C305.4	Explain the operation of three phase full–wave converters and dual Converter
	C305.5	Analyze the operation of single phase cyclo converters and high frequency dc–dc converters
	C305.6	Explain the working of inverters and application of PWM techniques for voltage control and harmonic mitigation
Linear & Digital IC Applications C306	**C306.1**	Understanding the basic concepts of Differential Amplifiers and operational amplifiers Architecture.
	C306.2	Understanding the concepts relevant to various Op-Amp parameters and voltage rectifier circuits.
	C306.3	Examine the Design of Op-Amp circuits suitable for various Linear and Non-Linear Applications.
	C306.4	Analyze the design of active filters, analog multipliers and Modulators using Op-amps.
	C306.5	Utilize the architecture and working of 555 Timer for use in various applications.
	C306.6	Outline the different architecture of different digital to analog and analog to digital converters.
Electrical Machines-II Lab C307	**C307.1**	Determine the Efficiency & Regulation of Transformers and draw their Performance curves
	C307.2	Student can understand the concepts of Scott Connection Of Transformers
	C307.3	Pre-determine the Regulation of Three Phase Alternator by Various Methods, Find X d / Xq Ratio of Alternator and asses the

		performance of Three Phase Synchronous Motor.
	C307.4	perform Various Tests in Induction Motor for assessing its performance characteristics
	C307.5	Perform Synchronization Of Alternator By Dark Lamp Method
Control Systems Lab C308	**C308.1**	Time Response Analysis of Second Order Systems
	C308.2	Characteristics of Synchro's, AC & DC Motors and Magnetic Amplifiers
	C308.3	Effect of P,PI & PID controllers on Second Order Systems
	C308.4	Temperature Controller using PID, Lead and Lag Compensators and Effect of Feedback on DC Shunt Motor
	C308.5	Transfer Function of DC motor
IPR & Patents C309	**C309.1**	Knowledge on basic concepts of Intellectual Property , Innovations and Inventions of Intellectual Property Law
	C309.2	Evaluate the principles and rights afforded by Copyright, its infringement and International Copyright Law .
	C309.3	Analyze Patent registration requirements, infringement and Litigation, new developments and international laws
	C309.4	Registration Process of Trade Marks, Inter-parties proceedings, litigations , claims and global factors related to trade marks
	C309.5	Conceptual awareness about trade Secrets, Employee Confidentiality Agreement, Trade Secret Litigation and breach of law
	C309.6	Elucidate Cyber Law and Cyber Crimes , E-commerce, International aspects of Computer and Online Crime
Microprocessors & Microcontrollers C310	**C310.1**	Illustrate the internal architecture and working of various features of 8086 microprocessor and its successors 80286, 80386, 80486, Pentium.
	C310.2	Extend the 8086 functions with various operating modes, instruction set and addressing modes.
	C310.3	Identify assembler directives and apply the assembly language programming to solve different problems.
	C310.4	Outline various peripheral control ICs such as 8255, 8279, 8257 and 8259 and also write programs to develop different applications using them.
	C310.5	Illustrate the architecture, memory, timer, serial communication, controlling functions of 8051 microcontroller.
	C310.6	Develop assembly language programs of 8051

		microcontroller to control push button, LED, hex keypad, relay and latches commonly used in real world applications.
Switchgear and Protection C311	**C311.1**	Analyze the principles of arc interruption. Working principles of high voltage circuit breakers, their applications and comparison
	C311.2	Understand the working principle and constructional features of different types of electromagnetic protective relays and Static Relays
	C311.3	Acquire knowledge of various faults that occur in high power generators, transformers and their respective protective schemes
	C311.4	Improves the ability to understand various types of protective schemes used for feeders and bus bar protection.
	C311.5	Study the protection against over voltages and different grounding methods
Utilization of Electrical Energy C312	**C312.1**	Identify a suitable motor for electric drives and industrial Applications.
	C312.2	Identify most appropriate heating or welding techniques for suitable applications.
	C312.3	Understand various level of luminosity produced by different illuminating sources.
	C312.4	Estimate the illumination levels produced by various sources and recommend the most efficient illuminating sources and should be able to design different lighting.
	C312.5	Determine the speed/time characteristics of different types of traction motors.
	C312 .6	Estimate energy consumption levels at various modes of operation.
Power System Analysis C313	**C313.1**	Application of Graph theory. Representation of reactance diagram and formation of Y_{BUS}
	C313.2	Application of numerical methods for the power flow studies
	C313.3	Formation of Z_{BUS} and algorithm for Z_{BUS} modifications
	C313.4	Analysis of symmetrical fault analysis
	C313.5	Understand the concept of symmetrical component theory and its application for unsymmetrical fault analysis
	C313.6	Define stability and explain the various methods to improve stability of the power system
Management Science C314	**C314 .1**	Analyze and evaluate management concept and its implementation in aim of achieving organizational goals.

	C314 .2	To Equip with the concepts of operations, project management through technical relationships of input and output and inventory control
	C314 .3	To understand the importance and vital role of human resources power in the main functional areas of organization i.e., Marketing Management, Human Resource Management
	C314 .4	Project handling and controlling techniques for optimum utilization of resources
	C314 .5	Describes the concept and practical issues relating to strategic management and its role in long-term decision making
	C314 .6	Apply modern management techniques MIS, MRP, JIT and ERP etc to meet global challenges in effective manner
Power Semiconductor Drives C315	**C315.1**	Understand the fundamentals of electric drive and different electric braking methods.
	C315.2	Analyze the operation of three phase converter controlled dc motors and four quadrant operation of dc motors using dual converters.
	C315.3	Understand and analyze the converter control of dc motors in four quadrants.
	C315.4	Understand the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters.
	C315.5	Understand the principles of static rotor resistance control and various slip power recovery schemes.
	C315.6	Understand the speed control mechanism of synchronous motors
Power Electronics Lab C316	**C316.1**	Design and development of Power electronic based hardware & simulation circuits
	C316.2	Study the characteristics of various solid state devices
	C316.3	Study of Power conversion from AC to DC and vice versa using appropriate converter circuits (Single phase and Three phase)
	C316.4	Understand the operation of various power electronic circuits for conversion of power from AC to AC (Fixed, Variable) and Fixed DC to Variable DC
	C316.5	Understand the firing and commutation mechanism of SCR
	C316.6	Application of Power electronic converters for speed control of DC machines
Electrical Measurements Lab C317	**C317.1**	Understand the concepts of measurements of electrical quantities and calibration of different electrical measuring instruments.
	C317.2	Determination of 3-phase power of balanced loads

		using wattmeter's and CT'S.
	C317.3	Testing and calibration of various electrical quantity measuring instruments.
	C317.4	Measurement of the basic elements (R, L & C) in electrical circuits using different AC & DC Bridges.
	C317.5	Study the three voltmeter and 3 ammeter concept to measure various parameters of electrical circuits.
Renewable Energy Sources and Systems C401	**C401.1**	Understand the basic concepts of solar radiation, its data on earth's surface.
	C401.2	Study and design of different types of solar energy collectors
	C401.3	Study, design and selection of direct solar energy conversion system
	C401.4	Study and design of Wind energy conversion systems
	C401.5	Study the concepts of water energy to electrical conversion systems
	C401.6	Understand the methods of generation of electricity from chemical and geothermal resources
HVAC & DC Transmission C402	**C402.1**	Acquaint with HV transmission system with regard to power handling capacity, losses, conductor resistance and electrostatic field associated with HV. Further knowledge is gained in area of bundle conductor system to improve electrical and mechanical performance.
	C402.2	Determination of corona, radio interference, audible noise generation and frequency spectrum for single and three phase transmission lines.
	C402.3	Acquire knowledge in transmission of HVDC power with regard to terminal equipment's, type of HVDC connectivity and planning of HVDC system.
	C402.4	Develop knowledge with regard to choice of pulse conversion, control characteristic, firing angle control and effect of source impedance.
	C402.5	Understand the concepts of reactive power requirements of conventional control, filters and reactive power compensation in AC side of HVDC system
	C402.6	Calculate voltage and current harmonics, and design of filters for 6 and 12 pulse conversion
Power System Operation & Control C403	**C403.1**	Compute optimal scheduling of Generators.
	C403.2	Study and understand the Optimal scheduling of hydrothermal systems
	C403.3	Computation of Cost function formulation and understand the unit commitment problem.
	C403.4	Modeling of Turbine Generator sets and understand role of the frequency.

	C403.5	Significance of Economic dispatch control and load frequency control in single area and two area systems
	C403.6	Design of reactive power control and line power compensation in transmission systems
Instrumentation C404	**C404.1**	Represent of various types of signals and their performance characteristics
	C404.2	Classification and operation of different types of transducers
	C404.3	Measurement of different types of Non–electrical quantities.
	C404.4	Understand the construction and working principle of various types of digital voltmeters
	C404.5	Block diagram representation and operation of CRO, measurement of different parameters (phase and frequency) of a signal.
	C404.6	Study the concepts of different types of signal analyzers
Electrical Distribution system C405	**C405.1**	Explain the various factors of distribution system and understand the planning of distribution system
	C405.2	Design the substations and understand the need of feeder voltage levels.
	C405.3	Determine the voltage drop and power loss for different load areas.
	C405.4	Analyze and Compare the various protection schemes and its coordination Procedure.
	C405.5	Understand the effect of compensation on P.F improvement
	C405.6	Analyze various voltage control methods
Microprocessors & Microcontrollers Lab C406	**C406.1**	Develop Assembly language programs to demonstrate the arithmetic operations of binary, BCD, ASCII and Boolean logical operations.
	C406.2	Examine different string based operations in assembly language such as moving string, finding length of string, reverse of string, insertion, deletion, sorting.
	C406.3	Make use of standard DOS functions in assembly language to display message on screen, reading keys from keyboard with and without echo.
	C406.4	Experiment with different peripheral control ICs, 8259 interrupt control, 8279 keyboard/display control, 8255 peripheral program interface to build traffic lights control and stepper motor control.
	C406.5	Develop assembly language programs to make use of parallel ports, timers and serial port of 8051 microcontroller.
Electrical Simulation Lab	**C407.1**	Analyze and study the PSPICE & MATLAB simulations in application to electrical systems.

C407	**C407.2**	Design and Analyze the behavior of RLC electrical circuits with different inputs.
	C407.3	Understand and Simulate the significant power system aspects like, Transmission line simulation, Transformer modeling, Load flow studies and Load frequency control.
	C407.4	Design and Simulate various electronic circuits.
	C407.5	Understand the Modeling and Stability analysis of different electrical systems by Transfer function approach.
Power systems lab C408	**C408.1**	Determine the sequence impedance of Alternator and Transformer.
	C408.2	Determine the transmission line parameters and study the Ferranti Effect.
	C408.3	Estimate the dielectric breakdown voltage of liquid insulations.
	C408.4	Study the operation and calibrate tong tester.
	C408.5	Design and simulation of load frequency controllers, stability analysis and load flow studies of power system network.
Digital Control Systems C409	**C409.1**	Able to learn the advantages of discrete time control systems and the "know how" of various associated accessories.
	C409.2	Understand the concepts of z–transformations and their role in the mathematical analysis of different systems. (Like Laplace transforms in analog systems).
	C409.3	Ability to understand about State Space Representation of discrete time systems and test Controllability and Observability.
	C409.4	Acquire the knowledge to understand stability criterion for digital systems and methods adopted for testing the same are explained.
	C409.5	Capable to design discrete time control system by conventional methods for Lead, Lag and Lead-Lag compensators and digital PID controllers.
	C409.6	Design of state feedback controller through pole placement.
Extra High Voltage Transmission C410	**C410.1**	Ability to deriving the equations for electric stress enhancement in high voltage insulation defects.
	C410.2	Deriving the equations for charge movement during the breakdown process in gases, liquids and solids. Explaining the physical process of breakdown - based on the Townsend, Streamer and Leader models.
	C410.3	Understand the basic generation and measurement of High voltage and High current for testing purpose.
	C410.4	Understand the Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor,

		Partial discharge measurements
	C410.5	Test high voltage electrical Equipment with various testing devices Defining the standard test waveforms for selected HV tests. Deriving the performance equations for certain HV measurement systems (from dc through to systems to measure VFTs), and design these systems. Critically evaluating technical papers describing work in the field of HV engineering.
	C410.6	Testing of Insulators and bushings, Testing of Isolators and circuit breakers, Testing of cables, Testing of Transformers, Testing of Surge Arresters, Radio Interference measurements
Special Electrical Machines C411	**C411.1**	Understand the operation, design and control of switched reluctance motor.
	C411.2	Study the operation, performance and different control of stepper motors.
	C411.3	Acquire knowledge about the construction, operation and characteristics of permanent magnet DC motor.
	C411.4	Understand the operation of brushless DC motor
	C411.5	Explain the construction, operation and applications of linear induction motors.
	C411.6	Signify the various electrical motors applicable for traction drives.
Electrical Power Quality C412	**C412.1**	Differentiate between different types of power quality problems.
	C412.2	Explain the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power System.
	C412.3	Explain the principle of voltage regulation and power factor Improvement methods.
	C412.4	Analyze the effects of Harmonic Distortion & their solutions.
	C412.5	Demonstrate the relationship between distributed generation and power quality.
	C412.6	Explain the power quality monitoring concepts and the usage of measuring instruments.
Flexible AC Transmission System C410	**C413.1**	Understand the concept of power flow control in transmission lines using FACTS controllers.
	C413.2	Acquire knowledge on operation and control of voltage source converter.
	C413.3	Explain compensation methods to improve stability and reduce power oscillations in the transmission lines.
	C413.4	Application of static VAR compensators for shunt compensation.
	C413.5	Appreciate the methods of compensations by using series compensators.

	C413.6	Explain the operation of modern power electronic controllers
UNIX and Shell Programming C414	**C414.1**	Understand internal structure of Unix and its features
	C414.2	Use UNIX editors and tools to create and modify data files and documents.
	C414.3	Use UNIX at the command line to create and manage data, files, and programs.
	C414.4	Use UNIX shells and commands to create powerful data processing applications.
	C414.5	Develop shell scripts in order to perform basic shell programming
	C414.6	Build UNIX applications using the shell command interpreter and UNIX commands.
Power systems Reforms C415	**C415.1**	Understand the concepts of the restructuring models, independent system operator, congestion pricing and market power
	C415.2	Understand the structure of OASIS, definitions of transfer capability issues and methodologies to calculate ATC
	C415.3	Understand the concept of the introduction to congestion management and methods to relieve congestion
	C415.4	Understand the introduction to electricity price volatility, construction of forward price curves and challenges to electricity pricing
	C415.5	Able to develop the operational planning activities of ISO, the ISO in bilateral markets and operational planning activities of Genco.
	C415.6	Acquires knowledge on reactive power as an ancillary service and a review of synchronous generators as ancillary service providers.
Project C416	**C416.1**	Apply the concepts of electrical engineering to analyze the ideas students and design the physical/simulation model.
	C416.2	Enable students to work as an individual in a team inculcating leadership, management and financial oriented skills
	C416.3	Identify state of the art in the fields of electrical engineering through literature survey and implement the ideas using modern tools while enabling lifelong learning.
	C416.4	Design and develop models that are useful for the society/environment by following research ethics and values.
	C416.5	Improve writing and presentation skills of students so as to enable the work done by them to get published.