DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BASIC ELECTRICAL & ELECTRONICS ENGINEERING (Common for all branches)	
Course Outcomes: At the end of this course students will demonstrate the ability to	
CO1	Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.
CO2	Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.
CO3	Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3										2	3
CO2	3	3	3										2	3
CO3	3	3	3	2									3	3

1 - Low, 2 - Medium, 3 - High

ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP (Common for all branches)	
Course Outcomes: At the end of this course students will demonstrate the ability to	
CO1	Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.
CO2	Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.
CO3	Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1										2	3
CO2	2	2	2										2	3
CO3	3	2	2										2	3

1 - Low, 2 - Medium, 3 - High

ELECTRICAL CIRCUIT ANALYSIS - I	
Course Objectives: To develop an understanding of the fundamental laws, elements of electrical circuits and to apply circuit analysis to DC and AC circuits.	
Course Outcomes: At the end of this course students will demonstrate the ability to	
CO1	Remembering the basic electrical elements and different fundamental laws.
CO2	Understand the network reduction techniques, transformations, concept of self-inductance and mutual inductance, phasor diagrams, resonance and network theorems.
CO3	Apply the concepts to obtain various mathematical and graphical representations.
CO4	Analyse nodal and mesh networks, series and parallel circuits, steady state response,different circuit topologies (with R, L and C components).
CO5	Evaluation of Network theorems, electrical, magnetic and single-phase circuits.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1										3	1
CO2	3	3	3										2	1
CO3	3	3	3										3	3
CO4	3	3	3										2	3
CO5	3	3	2										2	3

1 - Low, 2 - Medium, 3 - High

ELECTRICAL CIRCUIT AANALYSIS – I LABORATORY

Course Objectives:

To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics. It also gives practical exposure to the usageof different circuits with different conditions.

Course Outcomes: At the end of this course students will demonstrate the ability to

CO1	Understand the concepts of network theorems, node and mesh networks, series and parallel resonance and Locus diagrams.
CO2	Apply various theorems to compare practical results obtained with theoreticalcalculations.
CO3	Determine self, mutual inductances and coefficient of coupling values, parameters of choke coil.
CO4	Analyze different circuit characteristics with the help of fundamental laws and various configurations.
CO5	Create locus diagrams of RL, RC series circuits and examine series and parallelresonance.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	1		1	2		1		2	2	2
CO2	2	2	2	1	1		1	2		1		2	2	2
CO3	2	2	2	1	1		1	2		1		2	2	2
CO4	2	2	2	1	1		1	2		1		2	2	2
CO5	2	2	1				1						2	3

1 - Low, 2 - Medium, 3 - High

NETWORK ANALYSIS	
Course Outcomes: At the end of this course students will demonstrate the ability to	
CO1	Understand basic electrical circuits with nodal and mesh analysis.
CO2	Analyse the circuit using network simplification theorems.
CO3	Find Transient response and Steady state response of a network.
CO4	Analyse electrical networks in the Laplace domain.
CO5	Compute the parameters of a two-port network.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1										3	1
CO2	3	3	3										2	1
CO3	3	3	3										3	3
CO4	3	3	3										2	3
CO5	3	3	2										2	3

1 - Low, 2 - Medium, 3 - High

NETWORK ANALYSIS LABORATORY	
Course Outcomes:	
CO1	Verify Kirchoff's laws and network theorems.
CO2	Measure time constants of RL & RC circuits.
CO3	Analyze behavior of RLC circuit for different cases.
CO4	Design resonant circuit for given specifications.
CO5	Characterize and model the network in terms of all network parameters.

CO-PO Mapping

Cos	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	1		1	2		1		2	2	2
CO2	2	2	2	1	1		1	2		1		2	2	2
CO3	2	2	2	1	1		1	2		1		2	2	2
CO4	2	2	2	1	1		1	2		1		2	2	2
CO5	2	2	1		1		1						2	3

1 - Low, 2 - Medium, 3 - High

ELECTROMAGNETIC FIELD THEORY	
Course Objectives: 1. To review the fundamentals of the different coordinate systems, vector algebra and calculus 2. To teach the basic laws of electromagnetism 3. To learn to compute and visualize the electrostatic and magnetostatic fields for simple configurations 4. To analyse the time varying electric and magnetic fields and to understand Maxwell's equations 5. To understand the propagation of electromagnetic waves through different media	
Course Outcomes: After successful completion of the course, the student will be able to:	
CO 1	Remember the concepts of vector algebra, vector calculus, various fundamental laws, self and mutual inductance. (BL1)
CO 2	Understand the concepts of electrostatics, conductors, dielectrics, capacitance, magneto statics, magnetic fields, time varying fields, self and mutual inductances. (BL2)
CO 3	Apply vector calculus, Coulomb's law, Gauss's law, Ohm's law in point form, Biot- Savart's law, Ampere's circuital law, Maxwell's third equation, self and mutual inductances, Faraday's laws, Maxwell's fourth equation, Poynting theorem to solve various numerical problems. (BL3)
CO 4	Analyze vector calculus, electrostatic fields, behavior of conductor in electric filed, Biot-Savart's law and its applications. (BL4)
CO 5	Analyze magnetic force, moving charges in a magnetic field, self-inductance of different cables, mutual inductance between different wires and time varying fields. (BL4)

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	2									2	1
CO2	3	3	2	2									2	1
CO3	3	3	1	1									2	1
CO4	3	3	2	2									2	1
CO5	3	3	2	2									2	1
1: Low, 2-Medium, 3- High														

Electrical Circuit Analysis – II	
Course Objectives: 1. To know the analysis of three phase balanced and unbalanced circuits and to measure active and reactive powers in three phase circuits. 2. Knowing how to determine the transient response of R-L, R-C, R-L-C series circuits for D.C and A.C excitations. 3. To introduce the various two-port networks parameters for a given circuit. 4. To evaluation of poles and zeros of a given transfer function. 5. To study the different types of filters	
Course Outcomes: After successful completion of the course, the student will be able to:	
CO 1	Remember the concepts of Laplace transforms, formulation of various circuit topologies (R, L and C components) and basic filters. (BL1)
CO 2	Understand three phase balanced and unbalanced circuits, different circuit configurations and it's mathematical modeling, network parameters and various filters. (BL2)
CO 3	Apply Laplace transforms to solve various electrical network topologies and filter design concepts. (BL3)
CO 4	Analyze three phase circuits, transient response of various network topologies, electric circuits with periodic excitations and filter characteristics. (BL4)
CO 5	Design suitable electrical circuits and various filters for different applications. (BL5)

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	3	2									3	3
CO2	3	3	3	2									3	3
CO3	3	3	3	2									3	2
CO4	3	3	3	2									1	2
CO5	2	2	3	2									2	1
1: Low, 2-Medium, 3- High														

DC MACHINES AND TRANSFORMERS

Course Objectives:

1. To understand the constructional features of DC machines.
2. To understand the phenomena of armature reaction and commutation.
3. To understand the characteristics and parallel operation of dc machines.
4. To understand the methods for speed control of DC motors and applications of DC motors.
5. To understand the various types of losses that occurs in DC machines and how to calculate efficiency.
6. To understand the constructional features of a single phase transformer.
7. To understand the efficiency and voltage regulation of a transformer.
8. To understand the Autotransformers Construction & Comparison with two winding transformer.
9. To suggest a suitable three phase transformer connection for a particular operation.
10. To understand the tap changing of transformers.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1	Understand the process of voltage build-up in DC generators and characteristics. (BL2)
CO 2	Understand the process of torque production, starting and speed control of DC motors and illustrate their characteristics. (BL2)
CO 3	Obtain the equivalent circuit of single-phase transformer, auto transformer and determine its efficiency & regulation. (BL3)
CO 4	Apply various testing methods for transformers and speed control of DC motors. (BL3)
CO 5	Analyze various configurations of three-phase transformers. (BL4)

CO-PO Mapping

CO	PO												PSO	
	PO1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**
CO1	2	2	2	2		2				1	1	2	2	1
CO2	2	2	2	2		2				1	1	2	1	2
CO3	2	2	2	2		2				1	1	2	2	1
CO4	2	3	3	2		2				1	1	2	2	1
CO5	3	3	3	3		2				1	1	2	1	2

1: Low, 2-Medium, 3- High

ELECTRICAL CIRCUIT ANALYSIS - II AND SIMULATION LAB	
Course Objectives: The objectives are to study: 1. To design electrical systems. 2. To analyze a given network by applying various Network Theorems. 3. To measure three phase Active and Reactive power. 4. To understand the locus diagrams	
Course Outcomes: After successful completion of the course, the student will be able to:	
CO 1	Understand the power calculations in three phase circuits. (BL2)
CO 2	Analyze the time response of given network. (BL4)
CO 3	Determination of two port network parameters. (BL4)
CO 4	Simulate and analyze electrical circuits using software tools. (BL4)
CO 5	Apply various theorems to solve different electrical networks using simulation tools. (BL3)

CO-PO & PSO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3				2		1	2	2	2	2	2	2
CO2	3	3			2	2			2	2	2		2	2
CO3	3	3				2			2	2	2	2	2	2
CO4	3	3	3		2	2		1	2	2			2	2
CO5	3	3	3		2	2		1	2	2			2	2

1 – Low Level; 2 – Moderate Level; 3 – High Level

DC MACHINES AND TRANSFORMERS LAB	
Course Objectives: 1. To familiarize students about OCC and internal, external characteristics of dc shunt generator. 2. To know the performance characteristics and speed control method of dc shunt motor 3. To know how to predetermine the efficiency of dc shunt motor. 4. To find efficiency, losses and regulation of single phase transformer. 5. To know how to find motor and generator efficiency by connecting to dc shunt machines back to back 6. To familiarize students about characteristics of dc series motor	
Course Outcomes: After successful completion of the course, the student will be able to:	
CO 1	Demonstrate starting and speed control methods of DC Machines. L2
CO 2	Apply theoretical concepts to determine the performance characteristics of DC Machines. L3
CO 3	Analyze the parallel operation of single phase transformers. L4
CO 4	Determine the performance parameters of single-phase transformer. L3
CO 5	Analyze the performance analysis of transformers using various tests. L4

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO 2**
CO1	3	3	3	2	2				3	2		3	3	3
CO2	2	3	3	1	2				2	2		3	3	3
CO3	3	3	3	1	2				2	2		3	3	3
CO4	3	3	3	1	2				2	2		3	3	3
CO5	3	3	3	1	2				2	2		3	3	3
1: Low, 2-Medium, 3- High														

POWER SYSTEM – I	
Course Objectives: 1. To understand the structure, essential components and their layout in non renewable generating stations. 2. To understand the electrical power generation from renewable energy sources as Nuclear Energy 3. To understand the different types of substations and their working./operation. 4. To understand the various types of distribution system. 5. To understand the calculation of economic aspects and different types of tariff.	
Course Outcomes: On successful completion of the course, student will be able to:	
CO 1	Understand the different types of power plants, operation of power plants. (BL2)
CO 2	Understand the concepts of distribution systems, underground cables, economic aspects and tariff (BL2)
CO 3	Understand various substations that are located in distribution systems (BL2)
CO 4	Apply the above concepts to illustrate different power generation layouts (BL3)
CO 5	Analyze various economic aspects related to power generation and distribution (BL4)

CO-PO Mapping

CO	PO												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2										2	2
CO2	2	3											3	2
CO3	3	2											3	2
CO4	2	3	1										1	3
CO5	3	3											1	1

1: Low, 2-Medium, 3- High

INDUCTION AND SYNCHRONOUS MACHINES	
Course Objectives: 1. To understand the Constructional details, principle of operation and the importance of slip in Induction motor operation 2. To understand the slip-torque characteristics and torque calculations of Induction motor 3. To understand the methods of starting and speed control of Induction motor 4. To understand the construction and principle of working of synchronous machines 5. To understand the different methods of predetermining the regulation of alternators 6. To understand the concepts and computation of load sharing among alternators in parallel. 7. To understand the performance characteristics of synchronous motors and their use as synchronous condensers for power factor improvement. 8. To understand the different types of single phase motors and special motors used in house hold appliances and control systems.	
Course Outcomes: After successful completion of the course, the student will be able to:	
CO 1	Understand the construction, principle and operation of single phase and three phase induction motors (BL-2)
CO 2	Understand the construction, principle and operation of synchronous generator and Synchronous motor (BL-2)
CO 3	Understand various applications of various alternating machines (BL-2)
CO 4	Apply the above concepts to solve various mathematical and complex problems (BL-3)
CO 5	Analyze the characteristics of induction motor, synchronous motor and synchronous generators (BL-4)

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO 2**
CO1	3	2	1										2	2
CO2	3	2	2										2	2
CO3	3	2	2										2	2
CO4	3	2	1										2	2
CO5	3	2	1										2	2
1: Low, 2-Medium, 3- High														

CONTROL SYSTEMS	
Course Objectives: 1. To understand the merits and demerits of open and closed loop control systems 2. To understand the mathematical modeling of Electrical and mechanical control systems 3. To understand the step response of second order control systems 4. To plot Root locus for the given system transfer function 5. To understand the stability analysis from Bode plot, polar plots 6. To understand the state space analysis	
Course Outcomes: After successful completion of the course, the student will be able to:	
CO 1	Understand the concepts of various mathematical representations of control systems, Time response of first order and second order systems, stability, frequency response and fundamentals of modern control systems (BL-2)
CO 2	Apply Block diagram reduction, Signal flow graph, Routh criterion, Root locus, Bode, Polar, Nyquist concepts for solving various numerical problems (BL-3)
CO 3	Analyze time response characteristics, frequency response characteristics, stability analysis of various control systems (BL-4)
CO 4	Design various compensators and controllers for different control systems by using design procedures (BL-5)
CO 5	Create suitable control systems for various real time applications (BL-5)

CO-PO Mapping

CO	PO												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1	3	2												1
CO2	2	1												1
CO3	2	1												1
CO4	2	1	1											1
CO5	2	1	1											1
1: Low, 2-Medium, 3- High														

INDUCTION AND SYNCHRONOUS MACHINES LAB	
Course Objectives: 1. To find the performance of induction motor by calculating the efficiency. 2. To find direct and quadrature axis reactances of synchronous motor. 3.To find voltage regulation by using various methods on synchronous machine4.To determine 'v' and 'inverted v' curves of synchronous motor. 5. To find the efficiency and power factor from circle diagram byconducting no load andblocked rotor test on 3-phase induction motor.	
Course Outcomes: After successful completion of the course, the student will be able to:	
CO 1	Analyze various performance characteristics of 3-phase and 1-phase induction Motors (BL-4)
CO 2	Evaluate the performance of 3-phase Induction Motor by obtaining the circle diagram and equivalent circuit of 3-phase Induction Motor and single phase induction motor (BL-4)
CO 3	Adapt the power factor improvement methods for single phase Induction Motor (BL-3)
CO 4	Pre-determine the regulation of 3-phase alternator (BL-3)
CO 5	Determine the synchronous machine reactance of 3-phase alternator (BL-3)

CONTROL SYSTEMS LAB

Course Objectives:

The objectives are to study:

1.To provide practical knowledge for Time response of second order system

2. Determine of transfer functions of various systems and control of it by different Methodologies

3. The characteristics of Magnetic Amplifier, servo mechanisms which are helpful in automatic control systems

4. Determine the stability analysis of different system by using PSPICE and MATLAB

5. To study the closed loop performance for the given plant using P, PD, PI, PID Controllers.

6. The design of controllers/compensators to achieve desired specifications.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1	Understand how to use feedback control system to determine transfer function of DC servo motor and any other given circuit with R, L and C components (BL-2)
CO 2	Model the systems and able to design the controllers and compensators. (BL-3)
CO 3	Get the knowledge about the effect of poles and zeros location on transient and steady state behavior of second order systems and implement through software tools (BL-4)
CO 4	Determine the performance and time domain specifications of first and second order systems. (BL-4)
CO 5	Understand the stability analysis (BL-2)

CO-PO Mapping

CO	PO												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1	3	2			3				2	2		3	3	3
CO2	2	3	3	3	3				3	2		3	3	3
CO3	2	2	3	2	3				2	2		3	3	2
CO4	2	2	3	2	3				2	2		3	3	2
CO5	2	2	3	2	3				2	2		3	3	2

1: Low, 2-Medium, 3- High

POWER ELECTRONICS	
Course Objectives: 1. To understand the various applications of Power electronic devices for conversion, control and conditioning of the electrical power and to get an overview of different types of power semiconductor devices and their dynamic characteristics. 2. To understand the operation, characteristics and performance parameters of controlled rectifiers. 3. To study the operation, switching techniques and basics topologies of DC-DC switching regulators. 4. To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.	
Course Outcomes: At the end of this course, the students will be able to	
CO 1	Understand the I-V Characteristics and Gate Drive Requirements of Power Devices Including Diodes, Thyristors, MOSFETs, and IGBTs. -L2
CO 2	Design Single-Phase and Three-Phase Rectifiers with Different Load Conditions and Evaluate Power Factor and Source Inductance Effects. -L5
CO 3	Apply Duty Ratio Control and Analyze Steady-State Waveforms of Buck, Boost, and Buck-Boost Converters. L3
CO 4	Analyze the Operation of Inverters with Various Load Conditions and Commutation Techniques. L4
CO 5	Analyze the Operation of AC Voltage Controllers, and Cyclo Converters with Various Load Conditions and Commutation Techniques. L4

CO-PO Mapping

CO	PO												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3										3	2
CO2	3	2	3										3	2
CO3	3	2	3										3	2
CO4	3	2	3										3	2
CO5	3	2	3										3	2
1: Low, 2-Medium, 3- High														

POWER SYSTEMS - II

Course Objectives:

1. To study about line parameters and constants
2. To study the performance of transmission lines
3. To know about overhead line insulators, corona, sag and tension in transmission lines
4. To study about symmetrical components and different types of faults in power system.
5. To understand the concept of voltage control, compensation methods

Course Outcomes:

CO 1	Analyse the transmission lines and obtain the transmission line parameters and constants. L4
CO 2	Analyse transmission line performance.L4
CO 3	Design transmission lines to meet the day to day power requirements.L5
CO 4	Understand and apply Per Unit System for Fault Calculations. L2
CO 5	Apply load compensation techniques to control reactive power. L3

CO-PO Mapping

CO	PO												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2											3	2
CO2	2	3	1		1								1	3
CO3	3	3											1	1
CO4	3	3											2	2
CO5	3	3											2	2

1: Low, 2-Medium, 3- High

INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS

Course Objectives:

1. Introduce fundamental quantum concepts like superposition and entanglement.
2. Understand theoretical structure of qubits and quantum information.
3. Explore conceptual challenges in building quantum computers.
4. Explain principles of quantum communication and computing.
5. Examine real-world applications and the future of quantum technologies.

Course Outcomes:

CO 1	Explain core quantum principles in a non-mathematical manner. L2
CO 2	Compare classical and quantum information systems. L2
CO 3	Identify theoretical issues in building quantum computers. L2
CO 4	Discuss quantum communication and computing concepts. L2
CO 5	Recognize applications, industry trends, and career paths in quantum technology. L3

CO-PO Mapping

CO	**PO**												**PSO**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	-	-	-	-	-	-	-	2	-	2	2	2
CO2	3	3	-	-	2	-	-	-	-	-	-	2	2	2
CO3	2	3	2	2	3	-	-	-	-	-	-	2	2	2
CO4	2	2	-	2	3	-	-	-	-	2	-	2	2	2
CO5	1	-	-	-	2	2	-	-	1	3	2	3	2	2

1: Low, 2-Medium, 3- High

POWER ELECTRONICS LAB	
Course Objectives: 1. This course is intended to acquire practical knowledge about the operation of various power converters. 2. To understand the basics of triggering circuits required for various power converters.	
Course Outcomes: At the end of this course, the students will be able to	
CO 1	Analyze the Characteristics of Power Semiconductor Devices (SCR, MOSFET, IGBT) and their Role in Power Converters. L4
CO 2	Design and Implement Gate Firing Circuits for SCR-based Power Converters. L4
CO 3	Evaluate the Performance of Single-phase and Three-phase Power Converters with R and RL Loads. L5
CO 4	Apply Different Commutation Techniques to Analyze Inverter for Efficient Power Control. L3
CO 5	Apply Different Commutation Techniques to Analyze Chopper Circuits for Efficient Power Control. L3

CO-PO & PSO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2			2				2	2			3	2
CO2	2	3			2				2	2			3	2
CO3	3	3			2				2	2			3	2
CO4	2	3			2				2	2			3	2
CO5	3	3			2				2	2			3	2

1 – Low Level; 2 – Moderate Level; 3 – High Level

TINKERING LAB

Course Objectives:

The aim of tinkering lab for engineering students is to provide a hands-on learning environment where students can explore, experiment, and innovate by building and testing prototypes. These labs are designed to demonstrate practical skills that complement theoretical knowledge.

The objectives of the course are to:

1. Encourage Innovation and Creativity
2. Provide Hands-on Learning and Impart Skill Development
3. Foster Collaboration and Teamwork
4. Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship
5. Impart Problem-Solving mind-set

These labs bridge the gap between academia and industry, providing students with the practical experience. Some students may also develop entrepreneurial skills, potentially leading to start-ups or innovation-driven careers. Tinkering labs aim to cultivate the next generation of engineers by giving them the tools, space, and mind-set to experiment, innovate, and solve real-world challenges.

Course Outcomes: The students will be able to experiment, innovate, and solve real-world challenges

CO-PO & PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	2	2	3	2	2	3	2	3

1 – Low Level; 2 – Moderate Level; 3 – High Level

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION	
Course Objectives: 1. To study about the working principle of electrical measuring instruments 2. To study the performance of instrumental transformers, power factor, frequency and energy meters 3. To study the functioning of DC and AC bridges 4. To study the basics of digital volt meters and transducers 5. To understand the concept of sensors and data acquisition systems	
Course Outcomes:	
CO 1	Understand principle and working of electrical measuring instruments L2
CO 2	Understand the principle of operation of instrument transformers, energy meters and analog instruments L2
CO 3	Understand the principle and working of various DC and AC bridges for the measurement of Resistance, Inductance and Capacitance L2
CO 4	Understand the principle and working of different digital voltmeters and transducers L2
CO 5	Understand the working of various sensors and data acquisition systems L2

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2										3	2
CO2	3	3	2										3	2
CO3	3	3	2										3	2
CO4	3	3	2										3	2
CO5	3	3	2										3	2
1: Low, 2-Medium, 3- High														

POWER SYSTEM ANALYSIS	
Course Objectives: 1. The use of per unit values and graph theory concepts, solving a problem using computer. 2. Formation of Ybus and Zbus of a Power System network, power flow studies by various methods. 3. Different types of faults and power system analysis for symmetrical and also unsymmetrical faults. 4. Analysis of power system for steady state and transient stability and also methods to improve stability	
Course Outcomes:	
CO 1	Remember and understand the concepts of per unit values, Y Bus and Z bus formation, load flow studies, symmetrical and unsymmetrical fault calculations. L1
CO 2	Apply the concepts of good algorithm for the given power system network and obtain the converged load flow solution and experiment some of these methods using modern tools and examine the results. L4
CO 3	Analyse the symmetrical faults and unsymmetrical faults and done the fault calculations, analyse the stability of the system and improve the stability. L3
CO 4	Demonstrate the use of these techniques through good communication skills. L5
CO 5	Develop accurate algorithms for different networks and determine load flow studies and zero, positive and negative sequence impedances to find fault calculations. L5

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	3								3	3
CO2	3	3	3	3	3								3	3
CO3	3	3	3	3	3								3	2
CO4	3	3	3	3	3								3	2
CO5	3	3	3	3	3								3	2
1: Low, 2-Medium, 3- High														

TECHNICAL PAPER WRITING AND INTELLECTUAL PROPER RIGHTS	
Course Objectives: 1. To enable the students to practice the basic skills of research paper writing 2. To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights. 3. To practice the basic skills of performing quality literature review 4. To help them in knowing the significance of real life practice and procedure of Patents. 5. To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks	
Course Outcomes:	
CO 1	Identify key secondary literature related to their proposed technical paper writing. L1, L2
CO 2	Explain various principles and styles in technical writing. L1, L2
CO 3	Use the acquired knowledge in writing a research/technical paper. L3
CO 4	Analyse rights and responsibilities of holder of Patent, Copyright, Trademark, International Trademark etc. L4
CO 5	Evaluate different forms of IPR available at national & international levels also develop skill of making search of various forms of IPR by using modern tools and techniques. L5, L3, L6

CO-PO Mapping

CO	PO												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2		1	2			1		2		3	1	1
CO2	2				1			2	1	3	2	3	1	1
CO3	3	2	2	2	2			2	1	3	2	3	1	1
CO4	2					2		3		2	2	2	1	1
CO5	2	2		2	3			2		2	2	3	1	1
1: Low, 2-Medium, 3- High														

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB	
Course Objectives: To make the students learn about 1. Calibration of various electrical measuring instruments 2. Accurate determination of inductance and capacitance using AC Bridges 3. Measurement of resistance for different range of resistors using bridges 4. Performance of transducers and sensors	
Course Outcomes:	
CO 1	Determine the unknown Resistance, Inductance and Capacitance using AC and DC bridges.-L3
CO 2	Understand the calibration of single phase energy meter.-L2
CO 3	Understand the measurement of power, power factor in a single phase circuit and real, reactive Power in a three phase circuit. -L2
CO 4	Extend the range of Ammeter and Voltmeter. -L5
CO 5	Understand the working of Transducers, Measure distance, temperature, current, voltage and humidity using sensors. -L2

CO-PO & PSO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	1	2	1					2	2				1
CO2	2	2	2	1				1	2	2				2
CO3	2	2	1	1				1	2	2				1
CO4	2	2	2	1	1			1	2	2				2
CO5	2	2	2	1	1			1	2	2				2

1 – Low Level; 2 – Moderate Level; 3 – High Level

APPLICATIONS OF SOFT COMPUTING TOOLS IN ELECTRICAL ENGINEERING	
Course Objectives: The objectives of this course include: 1. Understand the basic concepts of Electrical Engineering. 2. Apply the concepts to design MATLAB models. 3. Analyse various Electrical engineering applications through MATLAB. 4. Develop real time models using MATLAB.	
Course Outcomes: At the end of the course the student will be able to	
CO 1	Understand the basic concepts of Electrical Engineering. -L2
CO 2	Apply the concepts to design MATLAB models. -L4
CO 3	Analyze various Electrical engineering applications through MATLAB. L3
CO 4	Develop real time models using MATLAB. -L5
CO 5	Design virtual PMU -L5

CO-PO & PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2										2	2	3
CO2	3	2	2	2	3					1		3	2	3
CO3	3	3	2	2	3					1	1	3	2	3
CO4	3	3	3	2	3				1	2	1	3	2	3
CO5	3	3	3	2	3				1	2	1	3	2	3

1 – Low Level; 2 – Moderate Level; 3 – High Level

POWER SYSTEM OPERATION AND CONTROL	
Course Objectives: The objectives of the course are to make the students learn about 1. Optimal Operation of Thermal Power Stations. 2. Hydrothermal Scheduling. 3. Modelling of Turbines and Generators. 4. Load frequency control of Single Area and Two Area Systems. 5. The Shunt and Series Reactive Power Compensations in Power Systems. 6. The Key Aspects of Power System Deregulation.	
Course Outcomes:	
CO 1	To Understand the Thermal Station Characteristics and Economic Dispatch Problem of Thermal Units and Understand the Optimal Scheduling of Hydro-Thermal Station with minimization of cost of Thermal station– L3.
CO 2	To Develop the First Order Models of Turbine, Governor and Generator Load Model – L4.
CO 3	To Evaluate the Steady State & Dynamic Analysis of Single Area and Two Area Load Frequency Control – L3.
CO 4	To Analyse the Series & Shunt Reactive Power Compensation in Transmission and Load Systems – L3.
CO 5	To Understand the Aspects of Power System Deregulation – L2.

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	2	2		2								3	2
CO2	2	2	2		2								3	2
CO3	2	2	2	2	2								3	2
CO4	2	2	2	2	2								3	2
CO5	2	2	2		2								3	2
1: Low, 2-Medium, 3- High														

POWER SYSTEMS AND SIMULATION LAB	
Course Objectives: The objectives of this course include 1. To do the experiments (in machines lab) on various power system concepts like determination of sequence impedance, fault analysis, finding of subtransient reactance's. 2. To draw the equivalent circuit of three winding transformer by conducting a suitable experiment. 3. To develop the MATLAB program for formation of Y and Z buses. To develop the MATLAB programs for Gauss-Seidel and fast decoupled load flow studies. 4. To develop the SIMULINK model for single area load frequency problem.	
Course Outcomes:	
CO 1	Analyze and determine the sequence impedances of both cylindrical rotor and salient pole synchronous machines to understand their behavior under various fault conditions. -L3
CO 2	Conduct fault analysis (LG, LL, LLG, and LLLG) on synchronous machines and interpret the impact of these faults on system stability and performance. -L2
CO 3	Develop and simulate load flow analysis using various methods (Gauss-Seidel, Newton-Raphson, Fast Decoupled) and formulate the YBus and ZBus for power system networks. -L5
CO 4	Model load frequency control problems for single and two-area systems, employing both uncontrolled and PI-controlled approaches to evaluate system performance.- L4
CO 5	Simulate load frequency control problems for single and two-area systems, employing both uncontrolled and PI-controlled approaches to evaluate system performance.-L6

CO-PO & PSO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	2	1	2				2	2		1	2	3
CO2	2	2	1	1	2				2	2		1	2	3
CO3	2	2	1	1	2				2	2		1	1	3
CO4	2	2	1	1	2				2	2		1	1	3
CO5	2	2	1	1	2				2	2		1	1	3

1 – Low Level; 2 – Moderate Level; 3 – High Level