25EE101: Basics of Electrical & Electronics Engineering

W. e. f. Academic Year:	**2025-26**
Semester:	**1/2**
Category of the Course:	**Engineering Science**
Prerequisite:	Nil
Rationale:	Electricity plays a vital role in our daily lives and is a major source of energy in both developing and developed countries. In fact, the amount of electricity used per person is often seen as a measure of how advanced a country is. That's why it's important for every engineering student to understand the basics of electrical engineering. In this subject, you will learn how to solve simple electrical circuits, get introduced to electrical machines like motors and generators, and understand how basic electrical systems work in homes. This knowledge will give you a strong foundation for any engineering field you choose.

Course Outcomes:

After Completion of the Course, Student will able to:

	Course Outcome (CO)	**RBT Level (Cognitive Domain)**
CO1	Understand and analyze DC circuits using basic laws like Ohm's law, KVL, and KCL.	Understand, Analyze
CO2	Analyze single-phase AC circuits, including RLC combinations and power calculations.	Analyze
CO3	Explain three-phase system basics and calculate phase-line voltage relationships.	Understand, Apply
CO4	Apply electrostatic principles to calculate capacitance and energy stored in capacitors.	Apply
CO5	Understand electromagnetic principles and describe transformer operation.	Understand
CO6	Explain the working of electronic components and analyze diode/transistor circuits.	Understand, Analyze

Teaching and Evaluation Scheme:

Teaching Scheme					**Examination Scheme**				
L	**T**	**P**	**C**	**Hrs/Week**	**IE**	**Theory**	**CIA**	**Practical**	**Total Marks**
03	-	02	04	05	40	60	30	20	150

IE: Internal Evaluation Theory: Theory Exam (End Semester)

CIA: Continuous Internal Assessment Practical: Practical Exam (End Semester)

Detailed Syllabus:

Topic		**Hrs.**	**% of Weightage**
UNIT: 1	**DC Circuits**	**07**	**16**

Introduction, Modern electron theory, Electric Potential and Potential difference, Resistance, Computation of Resistance, Conductance, Effect Of Temperature upon Resistance, Computation of resistance at different temperatures, Computation of α at different temperature, Ohm's law, Solutions of series-parallel in brief, star-delta Combination of Resistances, KVL & KCL for Resistive circuit.			
UNIT: 2	**AC Circuit**	**08**	**16**
Single Phase A.C. Circuits: Generation of sinusoidal voltage, Definition of average value, root mean square value, form factor and peak factor, Analysis of Purely Resistive, Inductive and Capacitive Circuit, Series Circuit Analysis of the R-L, R-C and R-L-C circuits; Concepts of Real power, Reactive power, Apparent power and Power factor.			
UNIT: 3	**Basics of Three phase circuit**	**04**	**10**
Necessity and Advantages of three phase systems, Generation of three phase power, Relationship between line and phase values of balanced three phase circuit.			
UNIT: 4	**Electrostatics**	**08**	**18**
Definitions of Electrostatic, Coulomb's law, Electric Field, Electric Field Intensity, Capacitor and Capacitance, Permittivity, Capacitance of a capacitor with uniform, composite, partly air and partly dielectric medium, capacitors in series and parallel, Charging & Discharging of capacitor, Energy Stored in a capacitor			
UNIT: 5	**Electromagnetics**	**10**	**22**
Magnetic Circuit, Comparison Between Electric And Magnetic Circuits, Faraday's law, Lenz's law, Electromagnetic induction, Statically and Dynamically Induced E.M.F., Series and Parallel Magnetic Circuit Calculations, Fleming's Right hand rule-Left hand rule, Coefficients of Self And Mutual Inductances, Magnetic Hysteresis, Eddy current loss, Construction and working principle of single-phase transformer			
UNIT: 6	**Electronic Systems**	**08**	**18**
Introduction, Forward and reverse bias of PN junction diode, Zener diode as voltage regulator, Rectifiers: Half wave, full wave – bridge and center tap, L and C filters for smoothing, Transistor: Bipolar junction transistor, construction and biasing, configuration			
		45	**100**

List of Practical:

Topic	Hrs
To Study Standard Symbols used in Electrical Engineering.	03
To observe the effect of temperature on Resistance of winding.	03
Verification of Kirchhoff's Law.	03
To obtain inductance, power and power factor of the Series RL circuit with AC supply using Phasor diagram.	03
To obtain capacitance, power and power factor of the Series RC circuit with AC	03

supply using Phasor diagram.	
To obtain inductance, capacitance, power and power factor of the Series R-L-C circuit with AC supply using Phasor diagram.	03
To measure Electrical Power in a single phase AC circuit by using, 1. Voltmeter-Ammeter method and 2. Wattmeter method	03
Verification of current and voltage relations in three phase balanced Star and Delta connected loads.	03
To study and demonstrate the operation of a Zener diode as a voltage regulator.	03
To obtain the characteristics of P-N Junction diode.	03
	30

Reference Books:

1. B.L. Theraja (2012), Electrical Technology, Vol – 1, S. Chand Publication.
2. U.A.Patel (2012), Elements of Electrical Engineering, Atul Publication.
3. Introduction to Electrical Engineering by Mulukutla S. Sarma, Oxford University Press.
4. V. N. Mittal and A. Mittal (2012), Basic Electrical Engineering, Tata McGraw Hill, Publication.
5. D.P. Kothari and I.J. Nagrath (2013), Theory and Problems in Basic Electrical Engineering, Prentice Hall, India.
6. J.N.Swamy, N.V.Sinha, Elements of Electrical Engineering, Mahajan Publishing House.
7. S.R. Vyas, S.G. Prajapati, R.P. Sukhadia, M. Rathod, Basic Electrical and Electronics Engineering, Synergy Knowledgeware.

Course Outcomes Mapping:

CO No.	Course Outcome (CO)	POs/PSOs Mapped	Cognitive Level (RBT)	Knowledge Category	Lecture (Hours)	Lab (Hours)
CO1	Understand and analyze DC circuits using basic laws like Ohm's law, KVL, and KCL.	PO1, PO2, PSO1	Understand, Analyze	Conceptual	7	9
CO2	Analyze single-phase AC circuits, including RLC combinations and power calculations.	PO1, PO2, PO4, PSO1,PSO2	Analyze	Procedural	8	3
CO3	Explain three-phase system basics and calculate phase-line voltage relationships.	PO1, PO2, PSO1	Understand, Apply	Procedural	4	3
CO4	Apply electrostatic principles to calculate capacitance and energy stored in capacitors.	PO1, PO2, PO4, PSO1, PSO2	Apply	Procedural	8	6
CO5	Understand electromagnetic	PO1, PO5, PSO2	Understand	Conceptual	10	3

	principles and describe transformer operation.					
CO6	Explain the working of electronic components and analyze diode/transistor circuits.	PO1, PO3, PO7, PO8, PSO2	Understand, Analyze	Procedural	8	6

Mapping of COs with POs & PSOs:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	0	0	0	0	0	0	0	0	0	0	3	0
CO2	3	3	0	2	0	0	0	0	0	0	0	0	3	3
CO3	3	3	0	0	0	0	0	0	0	0	0	0	3	0
CO4	3	3	0	2	0	0	0	0	0	0	0	0	3	3
CO5	3	0	0	0	1	0	0	0	0	0	0	0	0	3
CO6	3	0	1	0	0	0	1	1	0	0	0	0	0	3

3: High, 2: Medium, 1: Low