



Uka Tarsadia University

B. Tech.

**CE / IT / AI & DS / CYBER SECURITY / CE (SE) / CSE / CSE (CC) /
CSE (AI&ML) / CSE (CS)**

Semester I

BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING EL3005

EFFECTIVE FROM July-2024

Syllabus version: 1.0

Subject Code	Subject Title
EL3005	Basics of Electrical and Electronics Engineering

Teaching Scheme				Examination Scheme			
Hours		Credits		Theory Marks		Practical Marks	Total Marks
Theory	Practical	Theory	Practical	Internal	External	CIE	
3	2	3	1	40	60	50	150

Objectives of the course:

- To provide elementary concepts and components of electrical and electronics engineering, to enrich interdisciplinary skills and knowledge.
- To apply knowledge of electrostatic and electromagnetic, AC circuit in electrical networks.
- To estimate various applications of semiconductor device with electrical safety.

Course outcomes:

Upon completion of the course, the student shall be able to,

CO1: To understand fundamental principle of electrical circuit.

CO2: To comprehend electrostatic and electromagnetism principles and its applications.

CO3: To understand fundamentals of Single-Phase AC circuits.

CO4: To interpret concept of semiconductor device.

CO5: To comprehend fundamentals of transistor.

CO6: To recognize electrochemical storage device and electrical safety.

Sr. No.	Topics	Hours
Unit-I		
1	Elementary Concepts and Components: Introduction of electrical current, Voltage, Power and energy, Sources of electrical energy – Independent and dependent Source, Source conversion, Ideal electrical circuit elements – Resistor, inductor and capacitor, Fundamental laws of electric circuits – Ohm's Law and Kirchhoff's Laws, Analysis of series, Parallel and series-parallel circuits, Star-Delta conversion, Node and mesh analysis.	9
Unit-II		
2	Electrostatics: Electric charge and laws of electrostatics, Definitions – Electric field, Lines of force, Electric field intensity, Electric flux and flux density, Electrostatic induction, Dielectric strength, Capacitor, Capacitor in series and parallel, Energy stored in a capacitor.	4

3	Electromagnetism: Faradays laws, Lenz's law, Fleming's rules, Magnetic circuits, Statically and dynamically induced EMF, Concepts of self-inductance, Mutual inductance, Inductance in series and parallel, Hysteresis and Eddy current losses, Energy stored in magnetic fields.	3
Unit-III		
4	Single Phase A.C. Circuits: Generation of sinusoidal voltage, Definition of average value, Root mean square value, Form factor and peak factor, Phasor representation of alternating quantities, Analysis with phasor diagrams of R, L, C, R-L, R-C and R-L-C circuits, Concepts of real power, Reactive power, Apparent power and power factor, Series, Parallel and series – Parallel circuits, Power in AC circuit.	6
Unit-IV		
5	Semiconductor Physics: Semiconductor, Bonds in semiconductors, Widely used semiconductors, Energy band description of semiconductors, Effect of temperature on semiconductors, PN Junction, Properties of PN-Junction, Volt-Ampere characteristics of PN Junction, Important Term.	4
6	Semiconductor Diode: Crystal diode equivalent circuits, Crystal diode rectifiers, Output frequency of half-wave rectifier, Full-wave rectifier, Full-wave bridge rectifier, Efficiency of full-wave rectifier, Nature of rectifier output, Comparison of rectifiers, Types of filter circuits, Half-wave voltage doubler. Special Purpose Diode: Zener Diode, Light-Emitting Diode (LED), Photo-diode, Tunnel diode, Varactor diode, Shockley diode.	5
Unit-V		
7	Transistor: Transistor, Transistor symbols, Transistor connections, Characteristics of common base connection, Measurement of leakage current, Common collector connection, Commonly used transistor connection, Transistor load line analysis, Practical way of drawing CE circuit, Performance of transistor amplifier, Power rating of transistor.	8
Unit-VI		
8	Electrochemical Storage Device: Introduction of batteries, E.M.F and internal resistance of a cell, Primary and secondary cells, Cell capacity, Types and specifications of batteries, Charging & discharging of battery, Safe disposal of batteries. Electrical Safety: Electrical safety, Different protective devices such as fuse, M.C.B. and ELCB.	6

Sr. No.	Basics of Electrical and Electronics Engineering(Practicals)	Hours
1	To Study Different types of Symbols used in Electrical and Electronics Engineering.	2
2	To verification of Ohm's Law.	2
3	To verification of Kirchhoff's Law.	4
4	To verify series / parallel connection of Resistors, Capacitors & Inductors.	4
5	To verify Characteristics Capacitor.	4
6	To verify Half Wave & Full Wave Rectifiers.	2
7	To verify V-I Characteristics of Diode.	2
8	To verify V-I Characteristics of Zener Diode.	2
9	To verify I/O Characteristics of Transistor.	4
10	To study Electro Magnet and Electro Magnetism.	2
11	To study House Electrical wiring training system.	2

Text books:

1. B.L.Theraja, "A Text Book of electrical Technology", 1st Edition, Volume - I, S.Chand Publication.
2. V.K Mehta, "Principles of electronics", S. Chand Publication.

Reference books:

1. Jacob Millman and Christos Halkias, "Integrated Electronics", 2nd Edition, Tata McGraw Hill Publication.
2. Abhijit Chakrabarti, "Basic Electrical Engineering", 1st Edition, Tata McGraw- Hill Publication.
3. V.N. Mittle and Arvind Mittle, "Basic Electrical Engineering", 2nd Edition, Tata McGraw- Hill Publication.

Course objectives and Course outcomes mapping:

- To provide elementary concepts and components of electrical and electronics engineering: C01.
- To apply knowledge of electrostatic and electromagnetic, AC circuit in electrical networks: C02, C03.
- To estimate various applications of semiconductor device with electrical safety: C04, C05, C06.

Course units and Course outcomes mapping:

Unit No.	Unit Name	Course Outcomes					
		C01	C02	C03	C04	C05	C06
1	Elementary Concepts and Components	√					
2	Electrostatics and Electromagnetism		√				
3	Single Phase A.C. Circuits			√			
4	Semiconductor Physics, Semiconductor Diode, and Special Semiconductor Diode				√		
5	Transistor					√	

6	Electrochemical Storage Device and Electrical Safety						√
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Programme outcomes:

- PO 1: Engineering knowledge: An ability to apply knowledge of mathematics, science, and engineering.
- PO 2: Problem analysis: An ability to identify, formulates, and solves engineering problems.
- PO 3: Design/development of solutions: An ability to design a system, component, or process to meet desired needs within realistic constraints.
- PO 4: Conduct investigations of complex problems: An ability to use the techniques, skills, and modern engineering tools necessary for solving engineering problems.
- PO 5: Modern tool usage: The broad education and understanding of new engineering techniques necessary to solve engineering problems.
- PO 6: The engineer and society: Achieve professional success with an understanding and appreciation of ethical behavior, social responsibility, and diversity, both as individuals and in team environments.
- PO 7: Environment and sustainability: Articulate a comprehensive world view that integrates diverse approaches to sustainability.
- PO 8: Ethics: Identify and demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work.
- PO 9: Individual and team work: An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO 10: Communication: 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: An ability to 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: A recognition of the need for, and an ability to engage in life-long learning.

Programme outcomes and Course outcomes mapping:

Programme Outcomes	Course Outcomes					
	C01	C02	C03	C04	C05	C06
P01	√	√	√	√	√	√
P02	√	√	√			
P03	√	√	√	√	√	
P04	√	√	√	√	√	
P05						
P06						
P07						
P08						
P09						
P010						
P011						
P012						