

110ES: BASIC ELECTRICAL ENGINEERING**CREDITS – 4 (L_c, T_c, P_c : 3,0,1)****Course Objective:**

The subject aims to provide the student to:

- Fundamental understanding of concepts of Electrical Engineering.
- Grasp the basics of circuit analysis and solution methods.
- Comprehend electric and magnetic circuits and understand the operation of electrical appliances.
- Learn domestic electrical safety and installation practices.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per week)			Credits	Assessment Scheme				Total Marks
L	T	P	C	Theory		Practical		150
				ESE	CE	ESE	CE	
3	0	2	4	60	40	20	30	

Course Contents:

Unit No.	Topics	Teaching Hours
1	DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, series and parallel connection of resistors, star delta transformation of resistor, Kirchhoff's current and voltage laws, analysis of simple circuits with dc excitation. KVL, KCL, Maxwell's loop analysis & nodal analysis, charging and discharging characteristics of capacitor and inductor.	12
2	Fundamentals of Electromagnetics: Analogy of electrical and magnetic circuits, Faraday's laws of electromagnetic induction, Lenz's law, Fleming's right-hand rule and left hand rule, self and mutual inductance, hysteresis loop, hysteresis loss and eddy current loss.	6
3	AC Circuits: Generation of single-phase sinusoidal voltages, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor, analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations, series and parallel, series resonance, basics of single phase and three-phase ac supply, generation of 3-phase voltages, voltage and current relations in star and delta connections, three-phase balanced circuits, power and power factor measurement by single wattmeter, two wattmeter & three wattmeter method, introduction to power factor and power factor correction methods.	12
4	Construction and Working of Different Electrical Appliances: D.C motors and its applications in various home appliances; A.C. motors and its applications in fan, pump and lift; electric vehicle; battery; inverter and its applications in fridge, air-conditioner, electric vehicle, solar rooftop, and emergency power sources.	6

Unit No.	Topics	Teaching Hours
5	Electrical Installations: Safety precautions, components of LT switchgear: Fuse, MCB, ELCB, Earthing and types of Earthing, types of Battery, charging and discharging process for the battery.	6
Total		42

List of References:

1. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw-Hill, 2009.
2. Ritu Sahdev, Basic Electrical Engineering, (ISBN: 9789386173492), Khanna Book Publishing Co., 2012
3. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
4. L.S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
5. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010. 7. V.D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
6. H.COTTON, "Electrical Technology", 7E (Paperback) – 1 January 2005.

Web Resources:

1. NPTEL course: Basic Electrical Technology This course, offered by IIT Kharagpur, covers the fundamental concepts of DC and AC circuits, network analysis, transformers, induction machines, and DC machines (NPTEL Online Courses) (NPTEL)
<https://archive.nptel.ac.in/courses/108/105/108105053/>
2. Fundamentals of Electrical Engineering, Don H. Johnson, Online:
<http://cnx.org/content/col10040/C O N N E X I O N S>, Rice University, Houston, Texas.
3. <https://ocw.mit.edu/search/?t=Electrical+Engineering>
4. <https://open.umn.edu/opentextbooks/textbooks/337>
5. <https://ncees.org/wp-content/uploads/2022/09/FE-Electrical-and-Computer-CBT-specs.pdf>

Course Outcomes (COs):

At the end of this course students will be able to:

1. To understand the fundamentals of electricity and able to do the basic circuit analysis.
2. To understand the magnetic circuits and its importance.
3. To analyze the AC electrical supply with mathematical representations.
4. To understand the construction and working principles of low voltage electrical appliances.
5. To make aware about the electrical safety and protection devices during electrical installation as per national and international norms.