



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

## COURSE CONTENT

ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING								
<b>I Semester:</b> CSE (AI&ML) / IT / AERO / MECH / CIVIL								
<b>II Semester:</b> CSE / CSE (DS) / CSE (CS)								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
AEED01	Foundation	3	-	-	3	40	60	100
<b>Contact Classes: 48</b>	<b>Tutorial Classes: Nil</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 48</b>			
<b>Prerequisite: Physics</b>								

### I. COURSE OVERVIEW:

This course enables knowledge on electrical quantities such as current, voltage, and power, energy to know the impact of technology in global and societal context. It provides the knowledge on basic DC and AC circuits used in electrical and electronic devices, highlights the importance of electrical machines and basics of semiconductor devices like diodes and transistors.

### II. COURSES OBJECTIVES:

The students will try to learn

- I The fundamentals of electrical circuits and analysis of circuits with DC and AC excitation using circuit laws.
- II The construction and operation of Electrical machines.
- III The operational characteristics of semiconductor devices with their applications.

### III. COURSE OUTCOMES:

At the end of the course students should be able to:

- CO 1 Make use of basic electrical laws for solving DC and AC circuits.
- CO 2 Apply network theorems for analysis of simple electrical circuits.
- CO 3 Demonstrate the fundamentals of electromagnetism for the operation of DC and AC machines.
- CO 4 Utilize the characteristics of semiconductor devices for the application of rectifiers and regulators.
- CO 5 Interpret the transistor configurations for optimization of the operating point.
- CO 6 Understand the amplifier circuits using transistors for calculating different parameters

### IV. COURSE CONTENT:

#### MODULE-I: INTRODUCTION TO ELECTRICAL CIRCUITS (09)

**Circuit concept:** Ohm's law, Kirchhoff's laws, the equivalent resistance of networks, star to delta transformation, mesh and nodal analysis (with DC source only).

**Single phase AC circuits:** representation of alternating quantities, RMS, average, form and peak factor, RLC series circuit.

#### MODULE-II: NETWORK THEOREMS AND THREE-PHASE VOLTAGES (10)

**Network Theorems:** Superposition, reciprocity, Thevenin's, Norton's, Maximum power transfer theorems for DC excitation circuits, three phase voltages (Definitions only): Voltage and current relationships in star and delta connections.

#### MODULE-III: ELECTRICAL MACHINES AND SEMICONDUCTOR DIODES (10)

**DC and AC machines:** Motors and generators, principle of operation, parts, EMF equation, types, applications, losses and efficiency.

**Semiconductor diode:** P-N Junction diode, symbol, V-I characteristics, half wave rectifier, full wave rectifier, bridge rectifier and filters, diode as a switch, Zener diode as a voltage regulator.

#### **MODULE-IV: BIPOLAR JUNCTION TRANSISTOR AND APPLICATIONS (10)**

**Bipolar junction transistor:** Characteristics and configurations, working principle NPN and PNP transistor, CE, CB, CC configurations – input and output characteristics, transistor as a switch.

#### **MODULE-V: TRANSISTOR AMPLIFIERS (09)**

**Amplifier circuits:** Two port devices and network, small signal models for transistors, concept of small signal operation, amplification in CE amplifier, h parameter model of a BJT- CE, CB and emitter follower analysis.

#### **V. TEXT BOOKS:**

1. M. S. Sukhija, T. K. Nagsarkar, *Basic Electrical and Electronics Engineering*, Oxford, 1<sup>st</sup> Edition, 2012.
2. Salivahanan, *Electronics Devices & Circuits*, TMH 4<sup>th</sup> Edition 2012.

#### **VI. REFERENCE BOOKS:**

1. CL Wadhwa, *Electrical Circuit Analysis including Passive Network Synthesis*, International, 2<sup>nd</sup> Edition, 2009.
2. David A Bell, *Electric circuits*, Oxford University Press, 7<sup>th</sup> Edition, 2009.
3. PS Bimbra, *Electrical Machines*, Khanna Publishers, 2<sup>nd</sup> Edition, 2008.
4. D.P. Kothari and I. J. Nagrath, *Basic Electrical Engineering*, Tata McGraw Hill, 4<sup>th</sup> Edition, 2019.

#### **VII. ELECTRONICS RESOURCES:**

1. <https://www.kuet.ac.bd/webportal/ppmv2/uploads/1364120248DC%20Machines>
2. <https://www.eleccompengineering.files.wordpress.com/2014/08/a-textbook-of-electrical-technologyvolume-ii-ac-and-dc-machines-b-l-thferaja.pdf>
3. [https://www.geosci.uchicago.edu/~moyer/GEOS24705/Readings/Klempner\\_Ch1.pdf](https://www.geosci.uchicago.edu/~moyer/GEOS24705/Readings/Klempner_Ch1.pdf)
4. <https://www.ibiblio.org/kuphaldt/electricCircuits/DC/DC.pdf>
5. <https://www.users.ece.cmu.edu/~dwg/personal/sample.pdf>
6. <https://www.iare.ac.in>

#### **VIII. MATERIALS ONLINE**

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Definitions and terminology
5. Open ended experiments
6. Model question paper-i
7. Model question paper-ii
8. Lecture notes
9. Early learning readiness videos (elrv)
10. Power point presentations