

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
HYDERABAD CAMPUS
SECOND SEMESTER 2022-2023
Course Handout (Part-II)

Date: 21.01.2024

In addition to general handout for all courses appended to the timetable, this portion gives further specific details regarding the course.

Course No. : EEE F111

Course Title : ELECTRICAL SCIENCES

Instructor-in-charge : Dr. Mithun Mondal

Instructors: Lectures: Dr. Mithun Mondal, Dr. Balasubramanian Malayappa

Instructors: Tutorials: Dr. Mithun Mondal, Dr. Balasubramanian Malayappa, Dr. Sayan Kanungo, Dr. Sanket Goel

1. Course Description:

The course covers various passive and active elements used in electrical networks, dependent and independent voltage and current sources (both DC and AC), analysis of DC and AC networks – KCL, KVL, network theorems, analysis and response of single order and second order circuits, polyphase circuits, magnetics, electromagnetic induction, transformers and basics of rotating electrical machines, basic electronic circuits using diodes and transistors, biasing and applications, operational amplifiers and introduction to digital electronics.

2. Scope and objective of the Course:

Understanding physics of operation of electrical and electronic circuits with various passive and active elements is required for all the engineering and science professionals. This course is designed to give the students of all engineering and science streams to give a primary exposure to basic electrical engineering. This is quite important for the students which will be useful for their career growth.

The objective of the course is to obtain basic knowledge on:

- a. Electrical and Magnetic Circuits.
- b. Electrical machines.
- c. Semiconductor Diodes and BJTs ; Digital electronics.

3. Text Book: Leonard S. Bobrow: Fundamentals of Electrical Engineering, Oxford University Press, Second Edition, 2005.

4. Reference Book:

Hughes: Electrical and Electronic Technology, Pearson Education, Ninth Edition, 2008.

5. Course Plan:

| Lect. No. | Learning Objectives | Topics to be covered | Chapters in Text Book |
|-----------|---|--|-----------------------|
| 1 | Introduction | Introduction | |
| 2-5 | To study basic circuit elements and the laws; | <ul style="list-style-type: none">Voltage and current sources, Independent and Dependent sources,Resistors and Ohm's law, inductors and | 1.1 to 1.8 |

| Lect. No. | Learning Objectives | Topics to be covered | Chapters in Text Book |
|------------------|--|--|------------------------------|
| | | capacitors and their integral relationships. <ul style="list-style-type: none"> • KCL, KVL; Current divider, Voltage divider rule, Instantaneous power | |
| 6-9 | To study circuit analysis techniques and theorems. | <ul style="list-style-type: none"> • Mesh and Nodal Analysis, • Thevenin's and Norton's Theorems • Source transformation and Maximum Power Transfer Theorem, | 2.1 to 2.4, 2.5 |
| 10 | To study circuit analysis techniques and theorems. | Linearity and Superposition application in circuit analysis. | 2.6 |
| 11-15 | Time Domain Analysis | <ul style="list-style-type: none"> • First order circuits and natural response; First order circuits and complete response. • Second Order Circuits | 3.1 to 3.5 |
| 16-20 | Alternating current circuits | <ul style="list-style-type: none"> • A.C. Voltage & Current, • Complex numbers, • Frequency and Time Domain analysis. | 4.1-4.5 and 5.1 |
| 21-23 | Alternating current circuits | Power and Power-factors, Poly-Phase circuits | 4.6 to 4.7 |
| 24-27 | Magnetic Circuits | <ul style="list-style-type: none"> • Fundamentals of Electromagnetics. • Series and parallel magnetic circuits. • Laws of Electromagnetic induction. • Principle of a Transformer, ideal operation with phasor diagram • Losses calculation, rating, OC and SC tests. | 13.1 to 13.7 |
| 28-32 | Electrical Machines | <ul style="list-style-type: none"> • DC Motors and generators • AC Motors and generators | 15.1, 15.2 |
| 33-35 | Digital Electronics | <ul style="list-style-type: none"> • Binary numbers, Binary Arithmetic, Digital logic circuits and Boolean algebra | 12.1 to 12.4 |
| 36-38 | Basic Electronics | <ul style="list-style-type: none"> • Types of materials, classification of semiconductors, doping, introduction to semiconductor devices – diodes and transistors | 6.1-6.8 |
| 39-42 | Bipolar Junction Transistors | <ul style="list-style-type: none"> • Basic operation of pnp and npn transistors, cutoff and saturation | 7.1-7.3 |

6. Evaluation Scheme:

| Component | Duration | Percentage weightage | Maximum Marks | Date & Time (Tentative) | Remarks |
|----------------------------------|----------|----------------------|---------------|---|---------|
| Daily interaction and assessment | 5-10 min | 10% | 30 M | Daily, during the lecture sessions | OB |
| Quizzes (2) | 40 min | 20% | 2 X 30 = 60 M | It will be announced a week before in the class | OB |
| Mid-term exam | 90 min | 30% | 90M | As per the date given in the Timetable | CB |
| Comprehensive Examination | 3 hours | 40% | 120M | As per the date given in the Timetable | CB |

7. Make-up policy: Make-up will be given only under **exceptional circumstances** and with **prior permission**.

NOTE: No Makeup will be given for any Assignments/Quiz/ Term paper evaluation component.

8. Notices: Notices concerning the course will be displayed in the CMS/ Google Classroom.

9. Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester, and academic dishonesty is unacceptable.

Dr. Mithun Mondal
INSTRUCTOR-IN-CHARGE
EEE F111