# BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

# HYDERABAD CAMPUS

**FIRST SEMESTER 2020‑2021**

**Course Handout (Part-II)**

Date: 17.08.2020

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

**Course No.** : EEE F111

**Course Title** : ELECTRICAL SCIENCES

**Instructor-in-charge** : Sudha Radhika

**Instructors: Lectures**: Sudha Radhika, S.T.P Srinivas

**Instructors: Tutorials**: Sudha Radhika, S.T.P Srinivas, Sourav Nandi

1. **Course Description:**

Course covers basic passive and active circuit elements; network theorems and analysis; introduction to single and three phase systems; magnetic circuits; transformers; electrical machines; semi-conductor diodes and applications; transistors and applications; Digital electronics and commonly used measuring instruments.

1. **Scope and objective of the Course**:

A basic understanding of the working of electrical and electronic circuits and instruments is essential for all engineers and scientists. This course is designed to give the students of all branches a preliminary exposure to this field.The need for basic understanding in this field will come for non-electrical or electronic students at a later stage in their career growth..

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.

1. **Reference Book**:

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

**5.** **Course Plan**:

| **Lect. No.** | **Learning Objectives** | **Topics to be covered** | **Text Book Chapters** |
| --- | --- | --- | --- |
| 1 | Introduction | Introduction |  |
| 2 | To study basic circuit elements and the laws; | Voltage and current sources, Independent and Dependent sources resistors and ohm’s law, KCL, KVL; Current divider, Voltage divider rule, Instantaneous power | 1.1 to 1.5 |
| 3-4 | To study circuit analysis techniques and theorems. | Nodal and Mesh Analysis | 2.1, 2.3 |
| 5-6 | To study circuit analysis techniques and theorems. | Thevenin’s and Norton’s Theorems; Maximum Power Transfer Theorem, | 2.4, 2.5 |
| 7-8 | To study circuit analysis techniques and theorems. | Linearity and Superposition application in circuit analysis, Source transformation | 2.6 |
| 9 | Inductors and Capacitors | Inductors and capacitors and their integral relationships; | 3.1 to 3.2 |
| 11-13 | To study response of circuits having energy storing elements | First order circuits and natural response; First order circuits and complete response  Second Order Circuits | 3.3 to 3.6 |
| 14-18 | Alternating current circuits | A.C. Voltage & Current, Complex numbers, Frequency and Time Domain analysis | 4.1-4.3 |
| 19-21 | Alternating current circuits | Power and Power-factors, Poly-Phase circuits | 4.4 to 4.7 |
| 22-23 | Magnetic Circuits | Fundamentals of Electromagnetics, Magnetic fields and their effects, Magnetic Circuits and Materials | 14.1-14.2 |
| 24-25 | Transformers | Introduction , Ideal transformer; Equivalent circuit; Non-ideal transformer; | 14.3 -14.5 |
| 26-27 | Electrical Machines | Motors and generators | 15.4 |
| 28-31 | Principles and Applications of Semiconductor Diodes, Diode Circuits | Semiconductors, doping, Diodes, Zener diodes, effects of capacitance, Half-wave and full wave rectifiers | 6.1-6.7 |
| 32-35 | Bipolar Junction Transistors | *pnp* and *npn* transistors, Characteristics and Applications of BJTs, Modelling of BJT | 7.1-7.4 |
| 36-38 | Field Effect Transistors | JFET, MOSFET | 8.1-8.2 |
| 39-40 | Transistor Amplifiers | BJT amplifiers | 9.1 |
| 41-43 | Digital Systems | Binary numbers, Binary Arithmetic, Digital logic circuits, Boolean Algebra | 11.1-11.6, 12.1 |

**6. Evaluation Scheme**:

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| --- | --- | --- | --- | --- | --- |
| Component | **Duration** | **Perecentage weightage** | **Maximum Marks** | **Date & Time** | **Remarks** |
| Test 1 (T1) | 30 min | 15% | 45M | September 10 –September 20  (during scheduled class Hour) | OB |
| Test 2 (T2) | 30 min | 15% | 45M | October 9-October 20(during scheduled class hour) | OB |
| Test 3 (T3) | 30 min | 15% | 45M | November 10-November 20 during scheduled class hour) | OB |
| LT spice based Assignments/Quiz/ Term paper | Regular | 30% | 90M | ------ | OB |
| Comprehensive Examination | 2 hours | 25% | 75M | TBA | OB |

**7**. **Make-up policy**: Make-up will be given only under **exceptional circumstances** and with **prior permission**. No Makeup will be given for a LT spice based Assignments/Quiz/ Term paper evaluation component.

**8. Notices**: Notices concerning the course will be displayed in the CMS.

**9. Academic Honesty and Integrity Policy**: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**Dr. Sudha Radhika**

**INSTRUCTOR‑IN‑CHARGE**

**EEE F111**