Course Handout (Part II)   Dated: 11/ 08 /2023

In addition to part-I (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	: HARI OM BANSAL (hbansal@pilani.bits-pilani.ac.in)
Instructors (Lecture)	: Hari Om Bansal; Rajneesh Kumar; Dheerendra Singh; Syed Mohammad Zafaruddin
Instructors (Tutorial)	:Hari Om Bansal; Aditya Raw Gautam, Rajneesh Kumar; Dheerendra Singh; Puneet Mishra; Pankaj Arora, Bijoy Krishna Mukherjee; Punam Tiwari; Karunesh Kr Gupta; Sai Sesha Chalapathi Gattupalli; Rahul Kumar

1. **Course Description:** Course covers Basics of electrical circuit elements, Kirchhoff's law, Network analysis and Network theorems, Transient analysis of first order and second order circuits, Semiconductors and diodes, Basic operation and characterization of transistors (BJT and FET), Basics of operational amplifiers and its application, AC circuit analysis, Frequency response, Filters, Magnetic circuits and B-H curves, Transformer, Overview of electrical machines.

2. **Scope and Objective of the course:** The primary objective of this course is to teach the principles of three different aspects of electrical sciences: (1) Circuits Analysis (2) Electronic Devices and (3) Electromagnetics, to the students of mixed disciplines.

3. **Text Book:** **Leonard S. Bobrow and Navneet Gupta,** Foundations of Electrical Engineering, Oxford University Press, Asian Edition, 2015.

Course Plan:

Module	Lec	Coverage	Ref. (TB)	Learning Outcome
Basic electrical circuit laws and elements	1-2	Voltage and current sources, basic circuit components , Kirchhoff's current law (KCL), Kirchhoff's voltage, law (KVL), Instantaneous power, Inductors, Capacitors	1.1-1.7	Students will learn basic circuit elements and the laws of electrical science to solve basic electrical circuits.
	3	Independent and dependent sources, Source transformation	1.8, 2.4	Students will learn independent and dependent sources, source transformation.
Principles of circuit analysis	4-5	Nodal analysis, Mesh analysis	2.1-2.3	Students will be able to solve circuits by nodal and mesh analysis.
	6-8	Network theorems (Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Superposition theorem)	2.4,2.6	Students will be able to solve circuits using network theorems.
Time domain analysis	9-12	Transient response of first and second order circuits (natural and forced response)	3.2-3.5	Students will be able to perform time domain analysis of first and second order circuits.
AC analysis	13-14	Time-domain analysis, Waveforms, form factor, Phasor representation of alternating quantities, j operator and Phasor algebra, Frequency-domain analysis	4.1-4.3	Students will learn concept of phasor, phasor algebra, frequency domain analysis of AC circuits.

	15-17	Average power, apparent power and complex power	4.4-4.5	Students will learn concepts of power in AC circuits.
	18-19	Three phase circuits (Y and Δ connections)	4.6	Students will learn concepts of three phase circuits (Y and Δ connection).
Frequency response and resonance	20-22	Frequency response, Filters (Low Pass, High Pass and Band Pass), Resonance and Quality factor	5.1-5.2	Students will be able to perform frequency domain analysis of circuits and learn resonance and filters.
Semiconductor Devices - Diodes	23-25	Basics of semiconductors, PN junction, Junction diode, Ideal diode and applications (rectifiers and clippers)	6.2, (partly) 6.3,6.4,	Students will study basics of semiconductors, diodes and their use in various electronic circuits.
	26-27	Zener diode (its model and application as voltage regulator and clipper)	6.6	Students will learn applications of Zener diodes in electronic circuits.
Bipolar Junction Transistors (BJT)	28 - 30	Basic operation and characteristics of BJT	7.1-7.3	Students will learn the construction and operation of bipolar junction transistors.
Field-Effect Transistors (FET)	31-33	Operation and characteristics of JFET and MOSFET	8.1-8.2	Students will learn construction and operation of field effect transistors.
Operational amplifier	34	Basics of operational amplifier and its application	10.1	Students will learn op-amp circuits and the applications.
Magnetic circuits and transformers	35-36	Analogy between electrical and magnetic circuits, B-H curves	13.1-13.2 (partly) 13.3, 13.4	Students will learn the fundamental concept of electromechanics, magnetic circuits and transformers.
	37-38	Lenz's law, Transformers-Ideal transformer	13.6-13.9	Students will learn basic concepts of Transformers- ideal transformer.
Introduction to machines	39-40	Basics of rotating machines	15.1-15.2 (partly)	Students will learn construction and operation of DC/AC machines.

4. **Evaluation Scheme:**

S No.	Evaluation Component	Duration	Marks (300)	Weightage	Date & Time	Nature of Component
1.	Quizzes	15 Min.	60	20%	During Tutorial Hr	Closed Book
2.	Mid-Sem. Exam	90 Min.	105	35%	09/10 AN2	Open Book
3.	Comprehensive Exam.	180 Min.	135	45%	07/12 AN	Closed Book

5. **Chamber Consultation Hour:** To be announced in the class.
6. **Course Notices**: All notices of this course will be displayed on the **Nalanda only**
7. **Make–up Examination: No make-up will be given for quizzes**, however for other components; make-up will be given **ONLY** in cases of **sickness (hospitalization)** or **urgency** for going out of station. In such case student must produce the sufficient proof or must have taken the prior permission from the IC.

Instructor-in-Charge
EEE F111