Course Handout (Part II)

Dated: 2/ 8 /2017

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 : **H.D.Mathur**
Team of Instructors : **Abhijit R Asati, Pawan K Ajmera, K K Gupta, Arnab Hazra, Mahesh Angira, Rahul Singhal, Kavindra Kandpal, Anantha Krishna Chintanpalli, Harshavardhan S**

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 principal objective of this course is to teach the principles of three different aspects of electrical sciences (1) Circuits (2) Electronics and (3) Electro magnetics to the student composed of mixed disciplines.

3. **Text Books:**
Leonard S. Bobrow and Navneet Gupta, Foundations of Electrical Engineering, Oxford University Press, Asian Edition, 2015.
Reference Books:
. 1. Allan R Hambley, Electrical Engineering: Principles and Applications; 5th Edition, Prentice Hall of India, 2011.

4. **Course Plan:**

Module No.	Coverage	Ref.(TB)	Learning Outcome
1	L1.1 Basic circuit elements (Voltage,	1.1 -1.7	To develop understanding about basic circuit elements and the laws for solving basic electrical circuits
	L1.2 current sources, and Resistors), Kirchhoff's law (KCL and KVL),		
	L1.3 Current division, voltage division, instantaneous power, Inductors, Capacitor		
2	L2.1 Independent and Dependent sources, Source transformation	1.8, 2.4	To analyse and study the types of sources in network analysis
3	L3.1 Nodal analysis and Mesh analysis	2.1- 2.3	To study circuit analysis techniques
4	L4.1 Thevenin's Theorem	2.4,2.6	To use and understand applications of various network theorems in simplifying electrical circuits.
	L4.2 Norton's Theorem		
	L4.3 Maximum Power Transfer Theorem and Superposition		
5	L5.1 Transient response of first order circuit (Natural response)	3.2-3.5	To understand the order of the circuit and study its transient and

	L5.2 Transient response of First order circuit (complete response)		steady state response.
	L5.3 Transient response of second order circuit (Natural response)		
	L5.4 Transient response of second order circuit (complete response)		
6	L6.1 Time-domain analysis, Waveforms, power factor,	4.1,4.2, 4.3	To study about phasors and phasor algebra.
	L6.2 Phasor representation of alternating quantities, j operator and Phasor algebra, frequency-domain analysis		
7	L7.1 Type of power in electrical system	4.4,4.5	To study the concept of power in AC circuits and their significance in real life.
	L7.2 Average Power, apparent power and problems based on them.		
	L7.3 complex power and problems based on it.		
8	L8.1 Three phase Circuits (Y connections)	4.6	To study the poly-phase circuits and their application in real world.
	L8.2 Three phase Circuits (Δ connections)		
9	L9.1 Frequency response, Filters (Low Pass, High Pass and Band Pass)	5.1,5.2	To study the frequency response and resonance phenomenon in electrical systems. Filters and their use in practical electrical circuits.
	L9.2 Resonance		
	L9.3 Quality factor		
10	L10.1 Basics of Semiconductors	6.2(partly), 6.3, 6.4	To study basics of semiconductors and diodes and their application in various electronic circuits.
	L10.2 PN junction, Junction diode,		
	L10.3 Ideal diode and applications (rectifiers and clippers)		
11	L11.1 Zener diodes and its model	6.6	To study the breakdown mechanisms in semiconductor diodes
	L11.2 Zener diode application as voltage regulation and clipper)		
12	L12.1 Basic operation of BJT	7.1-7.3	To study the construction and operation of Bipolar Junction Transistors
	L12.2 Characteristics of BJT		
	L12.3 Problem on various BJT circuits		
13	L13.1 Basic operation and characteristics of JFET	8.1,8.2, 10.1	To study the types, construction, characteristic and operation of Field Effect Transistors To study circuit analysis techniques with OPAMP
	L13.2 Basic operation and characteristics of MOSFET		
	L13.3 Problem on various JFET and MOSFET circuits		
	L13.4 Basics of operational amplifier and its application		
14	L14.1 Analogy between electrical & magnetic circuits, B-H curves,	13.1, 13.2 (partly) 13.3-13.7 13.8-13.9 15.1 -	To develop the fundamentals of electromechanics, the magnetic effects associated with transformer, physical structure and basic working of DC/ AC machines
	L14.2 Hysteresis, Electromagnetic Induction, Magnetic coupling		
	L14.3 Lenz's law, Transformers,		
	L14.4 Ideal transformer and their uses		
	L14.5 Basics of rotating machines		

		15.2 (Partly)	
	14.6 Types and characteristics of rotating machines		

5. Evaluation Scheme:

S No.	Evaluation Component	Duration	Marks (300)	Weightage	Date & Time	Nature of Component
1.	Mid-Sem Test	90 min.	105	35%	10/10 11:00 - 12:30 PM	Open Book
2.	Surprise quiz	20 min	60	20%	During Common Hour	Closed Book
3.	Comprehensive	3 hrs.	135	45%	4/12 AN	Closed Book

6. **Chamber Consultation Hour:** Will be displayed on Nalanda.
7. **Course Notices**: All notices of this course will be displayed on the **Nalanda only**
8. **Make–up Examination:** No make-up will be given for surprise 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