Semester – I

Subject Name: Basics of Electronics Engineering

Subject Code: 09CT0103

Diploma Branches in which this subject is offered: Information and Communication Technology

Objective: This subject provides an opportunity for the students to get familiarized with all basic electronics components and study the characteristics of diode, transistors etc. Also student will get the ability to do simulation of corresponding circuits. The lab is designed for second semester students.

Credits Earned: 3 Credits

Course Outcomes: After completion of this course, student will be able

1. Develop the conceptual knowledge about the semiconductor and learn fundaments of terminal characteristics of PN junction diode and design /analyze fundamental circuits based on PN junction diode.
2. Identify limitation of diode and learning fundaments of transistor structure, types and behavioral characteristics and comparison of various transistor configurations.
3. Exploring the DC load line, biasing methods, comparisons in various amplifier configurations by understanding effects of change in Q-point by factors affecting stability.
4. Understand the various configurations of feedback amplifier, fundamental of FET devices and MOSFET.
5. Understanding and awareness about various type of component like LED, LDR, Varactor Diode, Photo voltaic diode etc.
6. Able to get aware about various types of available cable and connectors.

Pre-requisite of course: Basic knowledge of physics and basic electrical theorems KCL, KVL and laws.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term work	
2	0	2	3	50	30	20	25	25	150

Contents:

Unit	Topics	Contact hours	Weightage (%)
1	**Semiconductor diode characteristics and its Applications** • Types of semiconductor. • P-N junction diode formation and characteristics. • Applications - Diode as rectifier, half wave, full wave and bridge rectifier. • Need of filters. • C, L, LC, π filters.	**5.5**	**20**
2	**Transistor characteristics and biasing** • PNP and NPN transistors, conduction through transistor leakage current, relationship between α and β. • Transistor configuration & characteristics for CB, CE, CC. • Load line and biasing methods of transistor.	**10**	**35**
3	**Transistor as an amplifier:** • Common emitter amplifier. • Common collector amplifier • Multistage amplifier	**2.5**	**9**
4	**Special purpose diode and Applications** • JFET and MOSFET • Special purpose diode, Zener diode & it's application, • Photo diode • LDR • Photovoltaic Cell • Light Emitting Diode • Varactor Diode • Digital Display	**5**	**18**
5	**Oscillators** • Working principle of oscillator • Different types of oscillators: Hartley oscillator, Colpitts oscillator, Phase- Shift Oscillator, Wien Bridge Oscillator, Crystal Oscillator, FET Oscillator.	**4**	**13**
6	**Cables and Connectors** • Cables: coaxial cable, twisted pair cable and fiber optic cable • Connectors: coaxial cable connectors, RJ-45, RS-232, HDMI connectors.	**1.5**	**5**
	Total	**28.5**	**100**

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyse	Evaluate	Create
20%	20%	30%	15%	10%	5%

Suggested List of Experiments:

Sr. No.	Unit No.	Name of Topics	Contact Hours
1	1	Study of Test and Measuring instruments. 1. Oscilloscope 2. Function Generator 3. Digital Multimeter 4. Variable DC power supply	1.5
2	1	Plot the V-I characteristics of PN junction diode under forward and reverse bias conditions. Also find the cut-in voltage, Static resistance, Dynamic resistance of PN junction diode in forward bias.	1.5
3	5	Obtain the forward bias and reverse bias characteristics of a Zener diode. Also find out the Zener break down voltage from the characteristics.	1.5
4	1	Design, test and compare performance of half wave and bridge full wave rectifier.	1.5
5	1	Design, test and compare performance of C, LC and π filter in terms of ripple factor.	1.5
6	5	Design and test Zener diode based regulated power supply and measure its load regulation and source regulation.	1.5
7	2	Plot the input and output VI-characteristics of NPN BJT in common emitter configuration.	1.5
8	2	Plot the input and output V-I characteristics of NPN BJT in common base configuration.	1.5
9	2	Configure and test NPN BJT as a switch.	1.5
10	2	Design fixed bias and emitter stabilize bias NPN BJT amplifier and compare variation in operating point with reference to temperature.	1.5
11	2	Design fixed bias NPN BJT amplifier and observe effect of Q-point variation on output waveform.	1.5

12	5	Plot output V-I characteristics of enhancement type MOSFET.	1.5
13	5	Plot output V-I characteristics of depletion type MOSFET.	1.5
14	6	Designs fabricate and test PCB for given specifications.	1.5
Simulation Based Experiments:			
1	1	Plot V-I characteristic of PN junction diode using Multisim.	40 minute
2	5	Plot V-I characteristic of Zener diode using Multisim.	40 minute
3	1	Design and simulate Half-wave rectifier using Multisim.	40 minute
4	1	Design and simulate Bridge Full-wave rectifier using Multisim.	40 minute
5	1	Design and simulate various shunt clipper circuits using Multisim.	40 minute
6	1	Design and simulate L, C, LC and pi filter using Multisim.	40 minute
7	2	Plot input and output V-I characteristic of NPN BJT in CE configuration using Multisim.	40 minute
8	2	Design fixed bias NPN CE amplifier and obtain its operating point.	40 minute
9	2	Design self-bias NPN CE amplifier and obtain its operating point.	40 minute
10	2	Plot output V-I characteristic of enhancement type MOSFET using Multisim.	40 minute

Instructional Method:

a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

References:

1. "Principle of Electronics" by V.K.Mehta S.Chand & Co. latest edition.
2. "Electronics Principles "by Albert Paul Malvino McGraw Hill, latest edition.
3. "Electronics Devices and Circuit Theory" by Robert L. Boylestad Pearson, latest edition.
4. Cables and Connectors by John Kadick AVO International, latest edition.

Supplementary Resources:

1. https://onlinecourses.nptel.ac.in/noc17_ee02/preview
2. https://electronicsforu.com/
3. http://www.ni.com/multisim/
4. http://www.circuitbasics.com/make-custom-pcb/