16EE207 ELECTRONIC DEVICES AND CIRCUIT THEORY

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	5	40		8	5	5

Course Description and Objectives:

This course deals with fundamental concepts of semiconductor physics, devices and circuits. The objective of the course is to enable students to hookup and understand working of simple electronic circuits such as clippers, clampers, amplifiers, filters and regulators.

Course Outcomes:

The student will be able to:

- understand operation of semiconductor devices through energy band diagrams.
- analyze the characteristics of various semiconductor devices.
- differentiate between bipolar and unipolar conduction.
- understand the usefulness of semiconductor devices in circuit making.
- develop simple electronic circuits for various applications.

SKILLS:

ü *Identify defective electronic devices.*

ü *Identify semiconductor diode for a specific application.*

ü *Identify the transistor type for a given application.*

ü *Design and simulate simple electronic circuits using Multisim.*

ü *Design of amplifier for specified gain.*

UNIT – 1   **L-10**

SEMICONDUCTOR DIODES: Intrinsic and extrinsic semi conductors with their energy band diagrams, Mass action law, Formation of pn junction diode, PN-diode working under forward and reverse bias, V-I characteristics of diode, Diode equation, Temperature dependence of V-I characteristics, Energy band diagram of diode, Transition and diffusion capacitances, specifications of diodes, Breakdowns in diodes, Zener diode, Tunnel diode, Varactor diode, LED, Photo diode and LCD.

UNIT – 2   **L-08**

DIODE APPLICATIONS: Basic building blocks of linear mode power supply, Derivations of ripple factor, Efficiency, TUF, Peak factor, Form factor, Percentage regulation and PIV of half wave rectifier, Centre-tapped full wave rectifier and bridge rectifier, Circuit operation and derivation of ripple factor for capacitor filter, Simple zener regulator, Basic operation and types of diode clippers and basic operation and types of diode clampers.

UNIT – 3   **L-09**

TRANSISTORS:

BJT: Formation of PNP and NPN transistors, Transistor current components, Transistor as an amplifier - CB, CE and CC configurations with performance comparison.

FET: Working principles and characteristics of JFET and MOSFET.

UNIT – 4   **L-08**

TRANSISTOR BIASING (BJT & FET): DC load line, AC load line and selection of operating point, Need for biasing, Various biasing techniques - Fixed bias, Collector to base bias and self bias with stability factors; Various compensation circuits, Thermal runaway and thermal stability.

UNIT - 5   **L-10**

SINGLE STAGE AMPLIFIERS:

BJT amplifiers: Small signal low frequency transistor amplifier circuits, h-parameter representation of a transistor, Analysis of single stage transistor amplifier using h-parameters - Voltage gain, Current gain, Input impedance and output impedance; Comparison of transistor configurations in terms of A_i, Z_i, A_v and Z_o, Frequency response of common emitter amplifier, Common base amplifier, Common collector amplifier.

FET amplifiers: FET amplifiers at low frequencies, CS, CD and CG configurations at low frequencies, Gain band width product.

ACTIVITIES:

o *Choose a diode for a cell-phone / laptop / tablet adapter.*

o *Zener diode for voltage regulation.*

o *Design three types of biasing circuits and determine the stability factors in each case.*

o *Transistor as an amplifier for the given specifications.*

o *Design a wideband amplifier with FET.*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS   Total hours: 30

1. PN Junction diode characteristics.
2. Zener diode characteristics
3.   Design Zener Diode based Voltage Regulator
4. Determination of ripple factor and efficiency of half wave rectifier with and without filter
5. Determination of ripple factor and efficiency of center tapped full wave rectifier with and without filter.
6. Determination of ripple factor and efficiency of bridge rectifier with and without filter.
7. Construction of various diode clipping circuits.
8. Transistor CB characteristics (Input and output).
9. Transistor CE characteristics (Input and output).
10. Transistor CC characteristics (Input and output).
11. FET characteristics.

TEXT BOOKS:

1. J. Millman, C.C. Halkias, "Electronic Devices and Circuits", 9th edition, Tata Mc-Graw Hill, 2012.
2. S.Salivahanan, "Electronic Devices and Circuits" , 5th edition,Tata Mc-Graw Hill, 2010.

REFERENCE BOOKS:

1. R.L.Boylestad and Lovis Nashelsky, "Electronic Devices and Circuits Theory", 10th edition, Pearson Education, 2010.
2. K Thomson, "Electronic Switching Circuits", 2nd edition, Oxford University Press, 2012.
3. Sedra A.S. and K.C. Smith, "Micro Electronic Circuits", 6th edition, Oxford University Press, 2010.