

BASIC ELECTRONICS DEVICES AND CIRCUITS

(Core Subject)

Course Code:	10B11EC211	Semester:	2nd Semester, B. Tech (ECE, CSE & IT)
Credits:	4	Contact Hours:	L-3, T-1, P-0

Course Objectives

The objectives are to study

1. To understand and acquire knowledge about various semiconductor devices.
2. To prepare the students to design simple electronic circuits to meet a practical requirement.

Course Outcomes

Upon successful completion of this course the students would have:

1. Acquire knowledge about the different semiconductor materials and their behavior.
2. Able to understand the construction, working and characteristic of diode, BJT and FET.
3. Develop an ability to design different biasing arrangements of BJT and FET for stabilizing the operating point.
4. Able to understand the working of basic electronic circuits.
5. Able to design complex electronic circuits using basic semiconductor devices.

Course Content

Unit	Topics	References (chapter number, page no. etc)	Lectures
1	Semiconductors Intrinsic semiconductors, Charge carriers (electrons and holes), Energy-band diagrams, Extrinsic semiconductors (N-type and P-type and their representation), Effect of temperature on conductivity	Chap- 1 R L Boylestad	5
2	Semiconductor Diodes Unidirectional property, Formation of depletion layer, Drift current, Diffusion current, <i>PN</i> -junction with no bias, with forward bias and with reverse bias, Transition and diffusion capacitances, <i>V-I</i> characteristics, Comparison of Si and Ge diodes, Temperature effects, Diode resistance (static and dynamic), Diode equation, Ideal diode, Circuit model of a diode.	Chap-1 R L Boylestad	8

3	<p>Diode Applications Block diagram of dc power supply, Half-wave and full-wave (centre tap and bridge) rectifiers, PIV rating of diode, Performance of half-wave and full-wave rectifiers, Shunt capacitor filter and its ripple factor, Clippers: Series and Parallel, Limiters; Clampers, SMPS. Breakdown Diodes : Zener and avalanche breakdown mechanism, Zener diode, Analysis of Zener voltage regulator</p>	<p>Chap-2 R L Boylestad</p>	8
4	<p>Bipolar Junction Transistors (BJTs) BJT Structure, Working of a transistor, Transistor current equation, Collector reverse saturation current, three configurations, CB and CE input and output characteristics, Comparison between three configurations, Basic CE amplifier, DC load line, Biasing of a transistor.</p>	<p>Chap-3,4 R L Boylestad</p>	8
5	<p>Transistor Amplifiers Amplification, A practical CE amplifier, Need of DC analysis, AC analysis, Role of capacitors.</p>	<p>Chap-3,5 R L Boylestad</p>	5
6	<p>Field-Effect Transistors (FETs) Junction Field-Effect Transistor (JFET): Basic construction, Pinch-off voltage, Drain saturation current, Output and transfer characteristics, Voltage controlled resistor, JFET parameters, JFET small-signal amplifier, Its AC analysis. Metal Oxide Semiconductor Field Effect Transistors (MOSFETs): <i>Depletion MOSFET</i> : Structure, Working principle, Output characteristics; <i>Enhancement MOSFET</i> : Structure, Formation of channel, Output characteristics; <i>CMOS</i>.</p>	<p>Chap-6,7 R L Boylestad</p>	8

Evaluation Scheme

1. Test 1 :15 marks
2. Test 2 : 25 marks
3. Test 3 : 35 marks
4. **Internal Assessment** : 25 marks
 - 10 Marks : Class performance, Tutorials & Assignments
 - 10 Marks : Quizzes
 - 5 marks : Attendance

Text Books

1. R L Boylestad and Nachelsky: Electronic Devices & circuit Theory, 10th Ed.Pearson.
2. Thomas L Floyd: Electronic Devices, Pearson Education (US), 1995.

Reference Books

1. B.G. Streetman: Solid State Electronic Devices, 5th Ed., Prentice Hall, 2000
2. Adel S. Sedra, Kenneth C. Smith : Microelectronics Circuits, 5th Ed., Oxford University Press, 2004