

Basic Electronics

(Core Subject)

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| Course Code: | 15B11EC411 | Semester: | 4 th Semester, B. Tech (BI& BT) |
| Credits: | 4 | Contact Hours: | L-3, T-1, P-0 |

Course Objectives

1. To have understanding of Ohm's law, Kirchhoff's current and voltage laws.
2. To develop mathematical equations for circuit using node voltage and loop analysis.
3. Introduce the working, the characteristics and the applications of electronic devices.
4. To have basic understanding of digital electronics.
5. To analyze digital circuits with logic gates and the different number systems.

Course Outcomes

After successful completion of the course, student should be able to:

1. Design simple electric circuits to meet a practical requirement.
2. Provide an understanding of working of basic electronic circuits and find the expected outcome of the circuit.
3. Have understanding of the fundamental concepts and techniques used in digital electronics.

Course Contents

| Unit | Topics | References (chapter number, page no. etc) | Lectures |
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| 1. | Circuit Concepts: Terminal voltage; Open-circuit and Short-circuit; Circuit elements active and passive components ; Voltage divider, Current divider; Voltage source and Current source, Kirchhoff's circuit laws, Loop-current analysis, Node-voltage analysis. Concept of phasors, Behavior of R , L and C in AC circuits. | Basic Electrical Engineering D C Kulshreshtha Chapter 1, 2 and 3 | 12 |
| 2. | Semiconductor Diode PN -junction; Junction theory; V - I characteristics; Ideal diode; Static and dynamic resistance, | Electronic Devices and circuit theory : Boylestad and Nashelsky | 5 |

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| | rectifiers; Shunt capacitor filter. | Chapter 1 and 2 | |
| 3 | <p>Bipolar Junction Transistors (BJTs):</p> <p>Structure; Working of transistor; Input and output characteristics of common-base (CB) and common-emitter (CE) configurations; Relations between alpha and beta of a BJT; Definition of Voltage gain, Current gain, Input impedance, Output impedance of Amplifier; Comparison between three configurations; Basic CE amplifier circuit; DC load line.</p> | <p>Electronic Devices and circuit theory : Boylestad and Nashelsky</p> <p>Chapter 3</p> | 5 |
| 4 | <p>Transistor Biasing</p> <p>Need of biasing a transistor, Choice of operating point, Selection of operating point, Need for bias stabilization; Fixed bias circuit, Saturation point, Collector- to- base bias circuit, Voltage divider bias circuit</p> | <p>Electronic Devices and circuit theory : Boylestad and Nashelsky</p> <p>Chapter 4</p> | 5 |
| 5 | <p>Transistors (FETs)</p> <p><u>Junction Field-Effect Transistor (JFET)</u> : Basic construction, Pinch-off Voltage, Drain saturation current, Output characteristics, Voltage controlled resistor, JFET parameters.</p> <p><u>Metal Oxide Semiconductor Field Effect Transistor (MOSFET)</u> :Depletion <i>MOSFET</i> : Structure, Working principle, Circuit symbol, Output characteristics.</p> <p><u>Enhancement <i>MOSFET</i></u> : Structure, Formation of channel, Working principle, Circuit Symbol, Output characteristics; Comparison between JFET, MOSFET and BJT.</p> | <p>Electronic Devices and circuit theory : Boylestad and Nashelsky</p> <p>Chapter 6</p> | 6 |
| 6 | <p>Digital Circuits: Analog and digital signals; Binary, octal and hexadecimal numbers; Logic gates – OR, AND, NOT, NOR, NAND, XOR. Karnaugh Maps, Realization of logic gates using nMOS, pMOS and CMOS; Function of analog-to-digital circuit (ADC) and Digital-to-analog circuit (DAC). Sensors, Meters, Oscilloscope, Biosensors, ECG EEG</p> | <p>Digital Fundamentals: Floyd</p> <p>Chapter 1,2 and 3</p> | 11 |

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. Basic Electrical Engineering D C Kulshreshtha tata Mc Graw Hill
2. Electronic Devices and circuit theory : Boylestad and Nashelsky PHI
3. Digital Fundamentals Floyd

Reference Books

1. Adel S. Sedra, Kenneth C. Smith : Microelectronics Circuits, 5th Ed., Oxford University Press, 2004