

COURSE TITLE : BASIC ELECTRONICS
COURSE CODE : 2041
COURSE CATEGORY : B
PERIODS/WEEK : 4
PERIODS/SEMESTER : 60
CREDITS : 4

TIME SCHEDULE

| MODULE | TOPICS | PERIODS |
|--------------|--|-----------|
| 1 | Introduction to Electronics, Passive Components. | 15 |
| 2 | Semiconductors and PN junction. | 15 |
| 3 | Diode Circuits - Rectifiers and Wave Shaping Circuits. | 15 |
| 4 | Bipolar Junction Transistor. | 15 |
| Total | | 60 |

Course Outcome:

| MODULE | GO | On completion of this course the student will be able: |
|--------|----|---|
| 1 | 1 | To Know about Electronics. |
| | 2 | To understand passive components. |
| 2 | 3 | To comprehend semiconductor physics and semiconductor diodes. |
| 3 | 4 | To understand the working of rectifiers and filter circuits. |
| | 5 | To understand voltage multipliers and wave shaping circuits. |
| 4 | 6 | To analyse Transistors. |

GO - General Outcome

Specific outcome:

MODULE I Introduction to Electronics, Passive Components.

1.1.0 Introduction to Electronics.

- 1.1.1 To distinguish principles behind Electrical and Electronic Systems.
- 1.1.2 To identify areas of application of electronics.
- 1.1.3 To compare active and passive components.

1.2.0 To understand the passive component.

- 1.2.1 To define resistance.
- 1.2.2 To list the specifications of resistor and their importance.
- 1.2.3 To explain colour coding of resistors.
- 1.2.4 To explain three and four digit coding of chip resistors.

- 1.2.5 To list the types of resistors.
- 1.2.6 To list the applications of fixed resistors and variable resistors in electronic circuits.
- 1.2.7 To find the effective resistance of series and parallel combination of resistors.
- 1.2.8 To define capacitance.
- 1.2.9 To describe the charging and discharging of capacitors.
- 1.2.10 To list types of capacitors - polarized (electrolytic, tantalum) and non polarized (paper, ceramic, polyester).
- 1.2.11 To describe ultra capacitor and chip capacitor.
- 1.2.12 To list the specifications of a capacitor and their importance.
- 1.2.13 To explain the standard representation of capacitor using numerical coding.
- 1.2.14 To list the uses of capacitors.
- 1.2.15 To find the effective capacitance of series and parallel combination of capacitors.
- 1.2.16 To define self and mutual inductance.
- 1.2.17 To list the different types of inductors and their applications.
- 1.2.18 To list the specification of an inductor.
- 1.2.19 To explain the working principle of transformers.
- 1.2.20 To list the types and applications of transformers.

MODULE II Semiconductors.

2.1.0 To comprehend semiconductor physics and semiconductor diodes

- 2.1.1 To draw the Energy Band diagrams of conductors, insulators and semiconductors.
- 2.1.2 To describe intrinsic and extrinsic semiconductors.
- 2.1.3 To mention the majority and minority carriers in P and N type materials.
- 2.1.4 To explain doping.
- 2.1.5 To explain the formation of PN junction and depletion region.
- 2.1.6 To define drift and diffusion currents.
- 2.1.7 To define potential barrier.
- 2.1.8 To explain the principle of operation of PN junction diode.
- 2.1.9 To draw the V - I characteristics of diode.
- 2.1.10 To identify diode as a switch.
- 2.1.11 To state knee voltage, static and dynamic resistances of a PN junction diode.
- 2.1.12 To describe zener and avalanche breakdown
- 2.1.13 To list different types of diodes.
- 2.1.14 To explain the working of Zener diode.
- 2.1.15 To draw the V - I characteristics of Zener diode.
- 2.1.16 To explain the application of Zener diode as voltage regulator.
- 2.1.17 To explain the working of Varactor diode and Tunnel diode.
- 2.1.18 To list the applications of Varactor and Tunnel diodes.

MODULE III Diode Circuits - Rectifiers, Wave Shaping Circuits.

3.1.0 To understand the working of rectifier and filter circuits.

- 3.1.1 To define rectification.
- 3.1.2 To explain the working of half wave rectifier with waveforms.
- 3.1.3 To explain the working of full wave centre tapped rectifier with waveforms.
- 3.1.4 To explain the working of full wave bridge rectifier with wave forms.

- 3.1.5 To compute average and r.m.s values of voltages and currents for various rectifiers.
- 3.1.6 To define the terms TUF, rectification efficiency and ripple factor.
- 3.1.7 To compare half wave, centre tapped and bridge rectifiers.
- 3.1.8 To list different types of filter circuits.
- 3.1.9 To explain the working of shunt capacitor filter.
- 3.1.10 To explain the working of series inductor filter.
- 3.1.11 To explain the working of π section filter.

3.2.0 To understand voltage multipliers and wave shaping circuit.

- 3.2.1 To explain the working of half wave and full wave voltage doublers.
- 3.2.2 To explain the working of voltage tripler.
- 3.2.3 To explain the working of positive, negative, biased and combinational clipper / slicer circuits.
- 3.2.4 To explain the working of positive and negative diode clamper (voltage level shifting) Circuits.

MODULE IV Bipolar Junction Transistors.

4.1.0 To understand transistors

- 4.1.1 To describe the physical structure of BJT.
- 4.1.2 To explain the working principle of PNP and NPN transistor with symbols.
- 4.1.3 To explain the mechanism of current flow in transistors.
- 4.1.4 To identify transistor configurations.
- 4.1.5 To state the transistor current equation.
- 4.1.6 To state the effect of temperature in leakage current.
- 4.1.7 To explain input and output characteristics of BJT in CE and CB configurations.
- 4.1.8 To identify Cut off, Active and Saturation Regions in characteristic curve of CE configuration.
- 4.1.9 To define input and output resistances in different configurations and their comparison.
- 4.1.10 To define current gain in different configurations and its comparison.
- 4.1.11 To derive relation between α , β and γ .

CONTENT DETAILS

Module I - Introduction to Electronics , Passive Components

Introduction to electronics - applications of electronics - types of electronic components - active and passive - types of passive components - resistors, capacitors and inductors - resistors - definition of resistance, symbol, specifications - classification of resistors - fixed, variable - resistor colour coding - capacitors – definition of capacitance, symbol, specifications, classification - fixed and variable - inductors – definition of inductance, symbol, specifications, classification - fixed and variable inductors - transformers - working principle and application.

Module II - Semiconductors & PN junction

Semiconductor diode P-N junction - concept of hole, majority and minority charge carriers - formation of depletion layer in P-N junction - barrier voltage - biasing the P-N junction - forward bias, reverse bias, P-N junction diode - symbol V-I characteristics - forward and reverse

characteristics - ideal characteristics - static and dynamic resistance of a diode - knee voltage - diode specifications - forward voltage, peak inverse voltage, maximum forward current, reverse saturation current - types of diodes - zener diode - symbol, operating principle, V-I characteristics - zener breakdown voltage - zener as a voltage regulator - tunnel diode - symbol, operating principle, V-I characteristics, applications - varactor diode - symbol, operating principle, V-I characteristics, applications.

Module III - Diode Circuits - Rectifiers and Wave shaping Circuits.

Rectifier - definition - need for rectification types of rectifiers - half wave rectifier, full wave rectifier - centre tapped and bridge - circuit diagram, operation - input / output waveforms (no derivations) - definition of ripple factor, efficiency, PIV - comparison of rectifiers - filters - definition - need for filters - types of filters - capacitor, inductor, π section - circuit diagram, principle of working, input - output waveform - comparison of filters - half wave and full wave voltage doublers, tripler - circuit diagram, operation and input - output waveforms (no derivations), clipper circuits - positive, negative, biased and combinational - circuit diagram, operation - input / output waveforms - diode clamper circuits - positive and negative clambers - working principles – waveforms.

Module IV - Bipolar Junction Transistor.

Bipolar junction transistors - concept, physical structure, types -pnp and npn - symbol, working principle - types of transistor configuration CE,CB,CC (only circuit diagrams) - transistor current equation - leakage current - characteristics of CE and CB configuration - input / output characteristics - identification of cut off, active and saturation regions - input and output resistance - current gain in different configurations - α , β and γ - relation between α , β and γ .

Text Books:

1. R S Sedha - A Textbook of Applied Electronics - S Chand.
2. N N Bhargava, D C Kulshreshtha, S C Gupta -Basic Electronics and Linear Circuits - Tata McGraw Hill Education Private Limited.

Reference:

1. K Venkata Ramanan - Functional Electronics - Mc-Graw Hill Inc.
2. A K Maini - Electronics Projects for Beginners - Pusthak Mahal
3. Bernard Grob - Basic Electronics - Mc-Graw Hill Inc. - 8th Edition
4. Robert Boylestad, L Nashelsky – Electronic Devices and Circuit Theory - Prentice Hall
5. Basics of Electronics Engineering Publisher WILEY