COURSE TITLE : BASIC ELECTRONICS
COURSE CODE : 2041
COURSE CATEGORY : B
PERIODS/WEEK : 4
PERIODS/SEMESTER : 60/2
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 General 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

On completion of this course the student will be able:

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.

CONTENTS

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

Reference:

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