

**SUBJECT TITLE : BASIC ELECTRONICS**  
 (Common for EL, EC, EP, EA, TE, AE, BM, MD, CT, CM, IF)  
**SUBJECT CODE :**  
**PERIODS/WEEK : 4**  
**PERIODS/SEMESTER : 72**  
**CREDITS : 4**

**RATIONALE:-**

The subject matter of electronics are classified according to components, techniques (circuits) and systems. Components are basic building blocks that are combined using proper technique to yield the system. The basic components are divided into major groups: passive and active. This subject gives an entry level idea on active and passive devices to aspiring Diploma students in branches commonly known as “Circuit branches”.

**TIME SCHEDULE**

<b>Module</b>	<b>Topic</b>	<b>Periods</b>
I	Passive Components	17
	Test 1	1
II	Semi conductors, PN junction Diodes , Different types of diodes	17
	Test 2	1
III	Rectifiers and filters	17
	Test 3	1
IV	Transistors & UJT	17
	Test 4	1
	<b>Total</b>	<b>72</b>

**OBJECTIVES**

**MODULE – I**

**1.1.0 Study of resistors.**

- 1.1.1 Define the property of resistance
- 1.1.2 List the specifications of resistors and state their importance
- 1.1.3 Explain colour coding of resistors
- 1.1.4 Explain three and four digit coding of chip resistors
- 1.1.4 Classify the type of resistors
- 1.1.5 List the applications of fixed resistors and variable resistors in electronic circuits.

**1.2.0 Familiarization of capacitors**

- 1.2.1 State the charging and discharging of capacitors
- 1.2.2 Classify capacitors - polarized – electrolytic, tantalum, non polarized – paper, ceramic, polyester
- 1.2.3 Mention ultra capacitors, chip capacitors.
- 1.2.4 Explain the working of capacitors
- 1.2.5 Explain the construction details and working of electrolytic capacitors.
- 1.2.6 List the specification of a capacitor and state their importance - Value, voltage rating, temperature rating.
- 1.2.7 Familiarization of standard representation of capacitor – numerical coding.
- 1.2.8 List the uses of capacitors.

### **1.3.0 Understand inductors and transformers**

- 1.3.1 Define self and mutual inductance.
- 1.3.1 List the different types of inductors, their applications
- 1.3.2 Explain the working principle of a transformers
- 1.3.3 List the types and applications of transformers

## **MODULE – II**

### **2.1.0 Study of semiconductor materials & devices**

- 2.1.1 Sketch Energy Band diagrams of conductors, insulators & semiconductors
- 2.1.2 Distinguish between intrinsic & extrinsic semiconductors
- 2.1.3 State the majority & minority carriers in P, N type materials
- 2.1.4 Explain the term doping
- 2.1.5 Explain the formation of PN junction and depletion region
- 2.1.6 Distinguish between drift & diffusion currents
- 2.1.7 Describe potential barrier
- 2.1.8 Sketch V- I characteristics of diode
- 2.1.9 Determine static & dynamic resistance of PN junction diode from V I characteristics
- 2.1.10 Describe Zener & Avalanche Breakdown

### **2.2.0 Study of different types of diodes**

- 2.2.1 Explain the working & V- I characteristics of Zener diode.
- 2.2.2 Explain the application of Zener diode as voltage regulator
- 2.2.3 Draw the symbols of Varactor & Tunnel diodes
- 2.2.4 Brief on Varactor diode working.
- 2.2.4 Brief on Tunnel diode working.
- 2.2.5 List the applications of Varactor & Tunnel diodes.

## **MODULE – III**

### **3.1.0 Appreciate Principle of rectification and filtering**

- 3.1.1 State the working of a diode as rectifier
- 3.1.2 Explain the working of Half wave rectifier with wave forms .
- 3.1.3 Explain the working of full wave centre tapped rectifier with wave forms.
- 3.1.4 Explain the working of full wave bridge rectifier with wave forms.
- 3.1.5 Calculation of average and r.m.s values of voltages and currents for various rectifiers.
- 3.1.6 Define the terms rectification efficiency, ripple factor.
- 3.1.7 Compare half wave, centre tapped and bridge rectifiers.

### **3.2.0 Study of filter circuits**

- 3.2.1 List different types of filter circuits.
- 3.2.2 Explain the working of shunt capacitor filter circuit.
- 3.2.3 Explain the working of series inductor filter circuit.
- 3.2.4 Explain the working of  $\pi$  section filter circuit.

### **3.3.0 Understand voltage multiplier and wave shaping circuits.**

- 3.3.1 Explain the working of voltage doubler.
- 3.3.2 Explain the working of voltage tripler.
- 3.3.3 Explain the working of positive, negative, biased, combinational clipper circuits.
- 3.3.4 Explain the working of positive, negative clamper circuits.

## **MODULE – IV**

### **4.1.0 Study of transistors**

- 4.1.1 Explain the working of PNP transistor.
- 4.1.2 Explain the working of NPN transistor.
- 4.1.3 Sketch the mechanism of current flow in transistors.
- 4.1.4 State the current relation.
- 4.1.5 Brief on leakage current and effect of temperature

#### **4.2.0 Understand different configurations of transistors**

- 4.2.1 Draw the different configuration of transistor.
- 4.2.2 Sketch the input and output characteristics of CB and CE Configuration.
- 4.2.3 Mark three regions of operation on output characteristics.
- 4.2.4 Compare the different configurations of transistor ( CB,CE and CC).
- 4.2.5 Relate the terms alpha, beta and gamma.
- 4.2.6 List the application of transistors.
- 4.2.7 Describe the application of transistor as switch (CE configuration).

#### **4.3.0 Understand UJT**

- 4.3.1 Explain the construction of UJT.
- 4.3.2 Draw the VI characteristics of UJT.
- 4.3.3 Draw the symbol and equivalent circuit of UJT

### **CONTENT DETAILS**

#### **MODULE - I**

##### **PASSIVE COMPONENTS**

Property of resistor – resistance. Specifications - unit, symbol, wattage. Colour coding - four band, five band, tolerance. Three and four digit coding of chip resistors. Type of resistors - Fixed – carbon, metal film, thin film, wire wound, chip resistor, resistor array. Variable – potentiometer - logarithmic, linear. Preset – single and multi turn, their applications.

Capacitors – charging & discharging. Specifications. Classification - polarized – electrolytic, tantalum - non polarized – paper, ceramic, polyester. Ultra capacitors, chip capacitors. Working of capacitors . Construction of electrolytic capacitors. Specification of capacitors - Value, voltage rating, temperature rating. Standard representation of capacitance – Micro, nano, pico farad.

Standard representation of capacitor - numerical coding (like 103, 104, 203, 22, 33 etc ) and their mutual conversion. Variable capacitors - gang condensers, trimmers, padders – brief working and uses.

Inductors - self and mutual inductance. Types of inductors - AFC & RFC – applications.

Transformers -working principle, types of transformers – step up, step down, auto transformer, pulse transformer, toroidal, IFT.

#### **MODULE – II**

##### **SEMI CONDUCTORS, PN JUNCTION DIODES, DIFFERENT TYPES OF DIODES.**

Energy band diagram of conductors, insulators, semiconductors. Intrinsic semiconductors and extrinsic semiconductors. Doping. P type and N type semiconductors, majority & minority carriers. Formation of PN junction - drift & diffusion current - depletion region - potential barrier. Behaviour of PN junction under forward & reverse bias. Break down of diodes - zener and avalanche. VI characteristic of PN junction diode. Determination of static and dynamic resistance. Different applications and specification of diode.

Zener diodes – working - VI characteristics of zener diode. Zener diode as regulator – shunt. Varactor diodes - symbol - working – applications. Tunnel diodes - symbol - working – applications.

## MODULE – III

### RECTIFIERS, FILTERS AND WAVE SHAPING CIRCUITS

Diode as a rectifier. Half wave. Full wave rectifiers – centre tapped, bridge rectifier – wave forms. Relation between D.C output and A.C output voltage. Rectification efficiency, ripple factor, average and r.m.s values of voltage and current for various rectifiers. Comparison of rectifiers.

Filter circuits - shunt capacitor, series inductor and  $\pi$  section filter circuits. Applications.

Voltage multipliers - voltage doubler and tripler circuits – working.

Wave shaping circuits – clipper - positive, negative, biased (slicer), combinational clipper circuits – clamper – positive and negative.

## MODULE – IV

### BIPOLAR AND UNIJUNCTION TRANSISTORS

Transistors – NPN, PNP. Working - current flow - current relation - leakage current - effect of temperature.

Transistor configurations – CB, CE and CC – characteristics of CB and CE – input and output characteristics – comparison - current gain relation – applications – transistor as switch.

UJT – construction – VI characteristics – symbol – equivalent circuit.

### REFERENCE BOOKS:-

1. Basic Electronics and Linear circuits : Kulshreshtha, Bhargava N.M. & S.C.Gupta  
TTTI, Chandigarh
2. Grobs Basic Electronics : Mitchel e Schults, Mc Graw Hill Co.
3. Principles of Electronics : V. K. Mehta, S. Chand and Co.
4. A Text book of Applied Electronics : R S Sedha, Dhanpath Rai Publishers,  
New Delhi
5. Fundamentals of Electrical and : B L Thereja, S Chand and Co.  
Electronics Engineerig
6. Electronic Principles : Malvino
7. Electronic Devices and Circuit Theory : Robert Boylestad and Nashelsky
8. Electronic Devices and Circuits : Allen Mottershead
9. Electronic Devices and circuits : Milman and Halkias