

# 0944 -DIPLOMA IN INFORMATION TECHNOLOGY & ENGINEERING

## SEMESTER -I

### 094426 ANALOG ELECTRONICS – I

#### RATIONALE

This subject gives the knowledge of fundamental concepts of basic electronics and aims at providing the students with basic understanding of conductors, semiconductors and insulators, extrinsic and intrinsic semi-conductors, p-n junction, need of rectifiers in electronics, understanding of filters in rectifiers, tunnel diodes, LEDs, varactor diodes, LCD; understanding the working of transistors in various configurations; understanding of FETs and MOSFET etc. for effective functioning in the field of electronic service industry. The teacher should give emphasis on understanding of concepts and explanation of various term used in the subject. Practical exercises will reinforce various concepts. Industrial/field exposure must be given by organizing visit

#### DETAILED CONTENTS

##### 1. Semi conductor physics:)

Review of basic atomic structure and energy levels, concept of insulators, conductors and semi conductors, atomic structure of Ge and Si, covalent bonds  
Concept of intrinsic and extrinsic semi conductor, P and N impurities, doping of impurity. P and N type semiconductors and their conductivity. Effect of temperature on conductivity of intrinsic semi conductor.  
Energy level diagram of conductors, insulators and semi conductors; minority and majority carriers.

##### 2. Semi conductor diode:

PN junction diode, mechanism of current flow in PN junction, Drift and diffusion current, depletion layer, forward and reverse biased PN junction, potential barrier, conc ept of junction capacitance in froward and reverse bias condition.  
V-I characteristics, static and dynamic resistance and their calculation from diode characteristics.  
Diode as half wave, full wave and bridge rectifier. PIV, rectification efficiencies and ripple factor calculations, shunt capacitor filter, series inductor filter, LC filter and ? filter.  
Types of diodes, characteristics and applications of Zenor diodes. Zenor and avalanche breakdown.

##### 3. Introduction to Bipolar transistor:

Concept of bipolar transistor, structure, PNP and NPN transistor, their symbols and mechanism of current flow; Current relations in transistor; concept of leakage current; CB, CE, CC configuration of the transistor; Input and output characteristics in CB and CE configurations; input and output dynamic resistance in CB and CE configurations; Current amplification factors. Comparison of CB CE and CC Configurations;  
Transistors as an amplifier in CE Configurations; d.c load line and calculation of current

gain, voltage gain using d.c load line.

#### 4. Transistor Biasing Circuits:

Concept of transistor biasing and selection of operating point. Need for stabilization of operating point. Different types of biasing circuits

#### 5. Single Stage Transistor Amplifier:)

Single stage transistor amplifier circuit, a.c load line and its use in calculation of currents and voltage gain of a single stage amplifier circuit. Explanation of phase reversal of output voltage with respect to input voltage. H- parameters and their significance. Calculation of current gain, voltage gain, input impedance and output impedance using h-parameter.

#### 6. Field Effect Transistors( FETs)

Construction, operation and characteristics of FET and its application.

- Construction, operation and characteristics of MOSFET in depletion and enhancement modes and its applications.
- C MOS- advantages and applications
- Comparison of JFET, MOSFET and BJT.
- FET amplifier circuit and its working principle. (No analysis).

### LIST OF PRACTICALS

1. Familiarization with operation of following instruments.
2. Multi-meter, CRO, Signal generator, Regulated Power Supply by taking readings of relevant quantities with their help.
3. Plot V-I characteristics for PN junction diode
4. Plot V-I characteristics of Zenor diode
5. Observe the wave shape of following rectifier circuit
  - a. Half wave rectifier
  - b. Full wave rectifier
  - c. Bridge rectifier
6. Plot the wave shape of full wave rectifier with
  - a. Shunt capacitor filter
  - b. Series inductor filter
  - c. ? filter
7. Plot input and output characteristics and calculate parameters of transistors in CE configuration.
8. Plot input and output characteristics and calculate of parameters of transistors in CB configuration.
9. Plot V-I characteristics of FET amplifier.
10. Measure the Q-Point and note the variation of Q-Point.
  - a. By increasing the base resistance in fixed bias circuit.
  - b. By changing out of bias resistance in potential divider circuit.
11. Measure the Voltage Gain, input, output impedance in single state CE amplifier circuit.

### BOOKS RECOMMENDED

1. Basic Electronics and Linear Circuit by NN Bhargava and Kulshreshta, Tata McGraw Hill Publishing Co, New Delhi.
2. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi
3. Electronic Components and Materials by SM Dhir, Tata McGraw Hill Publishing Co, New Delhi
4. Electronics Devices and Circuits by Millman and Halkias; McGraw Hill.
5. Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill Publishing Co, New Delhi.