

## **Contents:**

### **PART I – Basic Electronics**

- 1. Introduction to Electronics**
  - Nature and scope of electronics
  - Classification of materials (conductors, insulators, semiconductors)
  - Symbols and units
- 2. Atomic Structure and Semiconductor Theory**
  - Atomic theory and energy bands
  - Intrinsic and extrinsic semiconductors
  - Doping and carrier concentration
- 3. Semiconductor Diodes**
  - PN junction formation and characteristics
  - Biasing of diodes
  - Zener diode and its applications
- 4. Rectifiers and Filters**
  - Half-wave, full-wave and bridge rectifiers
  - Ripple factor and efficiency
  - Capacitor, choke and  $\pi$ -filters
- 5. Special Purpose Diodes**
  - LED, photodiode, varactor diode
  - Tunnel diode, Schottky diode
  - Thermistors and varistors

### **PART II – Transistor and Amplifier Circuits**

- 6. Bipolar Junction Transistor (BJT)**
  - Construction, working and characteristics
  - CB, CE, CC configurations
  - Transistor parameters
- 7. Transistor Biasing and Stabilization**
  - Fixed bias, voltage divider bias
  - Thermal runaway and stability factors
- 8. Transistor Load Line and Operating Point**
  - DC and AC load line
  - Q-point analysis
- 9. Small Signal Amplifiers**
  - RC coupled amplifier
  - Voltage gain, bandwidth, and frequency response
- 10. Power Amplifiers**
  - Class A, B, AB, and C amplifiers
  - Push-pull and complementary symmetry amplifiers

### **PART III – Field Effect and Integrated Devices**

11. **Field Effect Transistors (FET & MOSFET)**
  - Construction and working
  - JFET characteristics and biasing
  - MOSFET enhancement/depletion types
12. **Feedback in Amplifiers**
  - Positive and negative feedback
  - Effects on gain, stability, and distortion
13. **Oscillators**
  - RC, LC and crystal oscillators
  - Barkhausen criterion
14. **Operational Amplifiers (Op-Amps)**
  - Characteristics and parameters
  - Inverting and non-inverting configurations
  - Applications: summing, differentiator, integrator
15. **Wave-Shaping and Multivibrator Circuits**
  - Clipping, clamping, and switching circuits
  - Astable, monostable, and bistable multivibrators

## **PART IV – Power Electronics and Applications**

16. **Regulated Power Supplies**
  - Series and shunt regulators
  - IC voltage regulators
17. **Thyristors and SCR Circuits**
  - Construction and operation of SCR, DIAC, TRIAC
  - Triggering and protection circuits
18. **Power Control and Conversion**
  - Phase control using SCR
  - Inverters, converters, choppers
19. **Transducers and Sensors**
  - Temperature, pressure, displacement sensors
  - Signal conditioning and instrumentation amplifiers

## **PART V – Digital Electronics**

20. **Number Systems and Logic Gates**
  - Binary, octal, hexadecimal systems
  - Logic gates and truth tables
21. **Boolean Algebra and Simplification**
  - Boolean laws and theorems
  - Karnaugh maps
22. **Combinational Logic Circuits**
  - Adders, subtractors, multiplexers, encoders, decoders
23. **Sequential Logic Circuits**
  - Flip-flops, counters, shift registers
24. **Analog to Digital (A/D) and Digital to Analog (D/A) Conversion**
  - Sampling, quantization, and conversion techniques

## **PART VI – Advanced Topics**

**25. Communication Basics**

- Amplitude and frequency modulation
- Demodulation and detectors
- Basics of transmitters and receivers

**26. Electronic Instruments and Measurements**

- CRO (Cathode Ray Oscilloscope)
- Signal generators, multimeters
- Frequency and phase measurement

**27. Troubleshooting and Maintenance**

- Common faults in amplifiers and power supplies
- Testing and safety procedures