

Contents

□ UNIT 1: Circuit Fundamentals & Passive Components

- Basic laws (Ohm's Law, Kirchhoff's Laws)
 - Circuit analysis (nodal & mesh methods)
 - Network theorems (Thevenin, Norton, Superposition)
 - Series and parallel resistances
 - Capacitors and inductors
 - RC, RL, RLC circuits
 - First-order transient response
-

□ UNIT 2: Semiconductors & Diodes

- Intrinsic and extrinsic semiconductors
 - PN junction diode
 - Ideal vs real diode
 - Rectifiers (half-wave, full-wave)
 - Filters (capacitor, LC, π filter)
 - Zener diode regulation
 - Clippers and clampers
-

□ UNIT 3: BJT and FET Transistors

- Structure and operation of BJT
 - Operating regions (cut-off, active, saturation)
 - Biasing and Q-point stability
 - CE, CB, CC configurations
 - FET (JFET and MOSFET basics)
 - Switching applications
-

□ UNIT 4: Small Signal Amplifiers

- Small signal BJT model
- h-parameter model

- Voltage, current, and power gain
 - Input and output impedance
 - Multistage amplifiers
-

☐ **UNIT 5: Frequency Response**

- Low-frequency response
 - Coupling and bypass capacitors effect
 - High-frequency response
 - Bandwidth and cutoff frequencies
-

☐ **UNIT 6: Feedback & Oscillators**

- Positive and negative feedback
 - Feedback amplifier types
 - Oscillator principles
 - Barkhausen criterion
 - RC and LC oscillators (Wien bridge, phase shift)
-

☐ **UNIT 7: Operational Amplifiers (Op-Amp)**

- Ideal vs practical op-amp
 - Inverting and non-inverting amplifiers
 - Summing and difference amplifiers
 - Integrator and differentiator
 - Comparator circuits
 - CMRR, offset voltage, slew rate
-

☐ **UNIT 8: Op-Amp Applications & Timers**

- Active filters
- Multivibrators (astable, monostable, bistable)
- Square wave generators
- Zero-crossing detector
- 555 timer applications