

# Basic of Electronic Circuits

S.E. Sem. III [ETRX]

## EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	3 Hrs.	50
Oral Exam	–	25
Term Work	–	25

## SYLLABUS

### 1. Semiconductor Materials and Diodes

Review of Semiconductor Materials and Properties, The PN Junction, Introduction to Semiconductor Diode Theory. Diode Circuits : DC Analysis and models, AC Equivalent Circuits, Other Diode Types – Solar Cell, Photodiode, Light-Emitting Diode, Schottky Barrier Diode, Pin Diode, Zener Diode, Zener as voltage Regulator, Temperature Effects, Understanding Manufacturer's Specifications.

### 2. Diode Circuits

Design of Rectifier Circuits : Full Wave Rectification with 'C', 'L-C' and 'pi' Filter, Ripple-Voltage and Diode Current, Voltage Doubler and Multiplier circuit, Zener Diode Circuits, Clipper and Clamper Circuits, Multiple-Diode Circuits. Photodiode and LED Circuits.

### 3. The Bipolar Junction Transistor

Basic Bipolar Junction Transistor, PNP and NPN Transistor Structures Device Symbols, Current-Voltage Characteristics, Transistor Biasing – Single Base Resistor Biasing, Voltage Divider Biasing and Bias Stability, DC Analysis of Transistor Circuits in Common Emitter Common Base and Common Collector configurations, Forward-active Mode Operation Load Line considerations, Non-ideal Transistor Leakage Currents and Breakdown, Integrated Circuit Biasing, Multistage Circuits. Transistor Applications – As a Switch.

### 4. Basic BJT Amplifiers

The BJT Linear Amplifier, Graphical Analysis and AC Equivalent Circuit, Small Signal Hybrid –  $\pi$ , ( $g_m r_\pi$ ) Equivalent Circuit of the Bipolar Transistor, Hybrid –  $\pi$  ( $g_m r_\pi$ ) Equivalent Circuit Including the early Effect, Expanded Hybrid –  $\pi$  Equivalent Circuit, Other Small – Signal Parameters and Equivalent Circuits, Basic Transistor Amplifier Configurations, i.e., Common Emitter Common Base and Common Collector (Emitter Follower. AC Load Line Analysis, The Three Basic Amplifier configurations : Summary and Comparison, Design of Single Stage BJT Amplifier.

Multistage Amplifier, Band-Width and Power Considerations, Thermal considerations in Transistor Amplifiers, Manufacturers' Specifications.

### 5. The Field Effect Transistor

Junction Field-Effect Transistor, MOS Field-Effect Transistor, MOSFET, Self Biasing Mid-Point Biasing, Biasing for Zero Drain Current-Drift Potential Divider Biasing and DC Circuit Analysis, Basic MOSFET Applications : Switch, Digital Logic Gate and Amplifier. Temperature effects in MOSFETs, Input Protection in MOSFET. The Power FET (VMOS).

### 6. Basic FET Amplifiers

Basic JFET Amplifier Configurations : Common Source Amplifier, The Source Follower (Common Drain) Amplifier, The Common Gate Configurations, Summary of the Three Basic Amplifier Configurations. AC circuit analysis of common source amplifier, The Source Follower (Common Drain) Amplifier, The Common Gate Amplifier Configurations. Design of Single Stage JFET Amplifier, MOSFET amplifier Biasing and DC Circuit Analysis. AC analysis of Single Stage MOSFET amplifier, single Stage Integrated Circuit MOSFET Amplifier, Multistage Amplifiers.

**Reference :**

1. Electronic Circuit Analysis and Design (*Donald A. Neamen*) – Second edition, McGraw Hill international.
2. Electronic Devices and Circuit theory (*Robert L. Boylestad Louis Nashelsky*) – sixth edition, Pentice Lay India.
3. Electronic Design (*Martin Roden, Gordon Carpenter, William Wieserman*) – Fourth edition, Shroff Publishers.
4. Microelectronics Circuits (Analysis and Design) (*Mohammad Rashid*) Cengage Learning.
5. Electronic Devices and Circuits (*Theodore F. Bograt, Jr. Jeffrey S. Beasle*) Guillermo Rico.
6. Electronic Circuits Discrete and Integrated (*Donald Schilling & Charles Belove*) – Third edition, McGraw Hill.

