



SEMESTER-III
COURSE 7: ELECTRONIC DEVICES AND CIRCUITS

Theory

Credits: 3

3 hrs/week

COURSE OBJECTIVE:

The course on Electronic Devices and Circuits aims to provide students with a fundamental understanding of electronic devices and their applications in various circuits.

LEARNING OUTCOMES:

1. Understand the behavior of P-N junction diodes in forward and reverse bias conditions and analyze the impact of junction capacitance on diode characteristics.
2. Analyze and compare the characteristics and operation of different BJT configurations (CB, CE, and CC) and demonstrate proficiency in biasing techniques.
3. Comprehend the operation and characteristics of FETs, including JFETs and MOSFETs, and explain the working principles and characteristics of UJT.
4. Describe the operation and applications of various photoelectric devices such as LEDs, photo diodes, phototransistors, and LDRs.
5. Understand the operation of rectifiers (half-wave, full-wave, and bridge), analyze the ripple factor and efficiency, and demonstrate knowledge of different filter types and three-terminal voltage regulators

UNIT I: PN JUNCTION DIODES

P-N junction Diode, Formation of depletion region, Forward and Reverse bias Ideal Diode, Diode equation – Reverse saturation current – Tunnel Diode- Construction, working, V-I characteristics and Applications, Zener diode – V I characteristics, Applications

UNIT –II: BIPOLAR JUNCTION TRANSISTOR AND ITS BIASING: (D.C)

Transistor construction, working of PNP and NPN Transistors, Active, Cutoff and Saturation conditions, Configurations of Transistor - CB, CE, and CC, Input and Output Characteristics of CB and CE configurations. Hybrid parameters of a Transistor and equivalent circuit, BJT Transistor Biasing – Need for stabilization, Thermal runaway, Stability factor, Biasing methods - Voltage-Divider Bias.

UNIT-III: FIELD EFFECT TRANSISTORS & POWER ELECTRONIC DEVICES –

Difference between JFET and BJT, Construction and working of JFET, Drain and Transfer Characteristics, MOSFET - Depletion-type, and Enhancement-Type MOSFETs. FET Biasing: Voltage Divider Biasing. UJT- Construction, working, V-I characteristics. SCR – Construction, Working and Characteristics



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Single Major B.Sc. Physics (w.e.f:2023-24A.B)

UNIT IV: PHOTO ELECTRIC DEVICES:

Light-Emitting Diodes (LEDs) - Construction, working, characteristics and Applications, IR Emitters, Photo diode - Construction, working characteristics and Applications, Phototransistors - Construction, working and characteristics, Applications, Structure and operation of LDR, Applications

UNIT-V: POWER SUPPLIES:

Rectifiers: Half wave, Full wave and bridge rectifiers - Efficiency (with derivations), ripple factor- Zener diode as Voltage Regulator, Filters- choke input (inductor), L-section, π -section filters. Three terminal fixed voltage IC-regulators (78XX and 79XX)

REFERENCE BOOKS:

1. Electronic Devices and Circuit Theory --- Robert L. Boylestad & Louis Nashelsky.
2. Electronic Devices and Circuits I – T.L.Floyd- PHI Fifth Edition
3. Integrated Electronics – Millmam & Halkias.
4. Electronic Devices & Circuits – Bogart.
5. Sedha R.S., A Text Book Of Applied Electronics, S.Chand & Company Ltd



SEMESTER-III

COURSE 7: ELECTRONIC DEVICES AND CIRCUITS

Practical

Credits: 1

2 hrs/week

COURSE OBJECTIVE:

The course objectives for a practical course in Electronic Devices and Circuits might provide hands-on experience with the fundamental principles of electronic devices and circuits.

LEARNING OUTCOMES:

1. Understand the principles of electronic devices and circuits and their applications in real-world scenarios.
2. Analyze and design electronic circuits using diodes, transistors, and operational amplifiers.
3. Understand the importance of biasing and stability in electronic circuits and how to achieve them.
4. Develop the skills to design and analyze amplifier circuits and to understand the concept of feedback and its application in electronic circuits.
5. Analyze and design simple oscillators, power supplies, and filters.
6. Gain hands-on experience with electronic test equipment such as multimeters, oscilloscopes, and function generators.
7. Develop skills in circuit construction, measurement, and testing.
8. Learn how to troubleshoot and diagnose electronic circuit problems.
9. Understand the safety procedures for working with electronic circuits and equipment.

Minimum of 6 experiments to be done and recorded

1. V-I Characteristics of junction diode
2. V-I Characteristics of Zener diode
3. Transistor characteristics – CB configuration
4. Transistor characteristics – CE configuration
5. FET input and output characteristics
6. UJT characteristics
7. LDR characteristics
8. Full wave and Bridge rectifier with filters

STUDENT ACTIVITIES

UNIT I: PN Junction Diodes

Activity: V-I Characteristic Analysis

Students can analyze the V-I characteristics of a PN junction diode by using a simple circuit setup. They can measure the voltage across the diode for different values of forward and reverse bias currents and plot the corresponding current-voltage graph. They can discuss the behavior of the diode in different bias conditions.



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UNIT II: Bipolar Junction Transistor and Its

Biasing Activity: Transistor Configuration

Analysis

Students can analyze the characteristics of different transistor configurations (CB, CE, CC) using a transistor tester or a circuit setup. They can measure and compare the input/output characteristics, gain, and voltage levels for each configuration. They can discuss the advantages and disadvantages of each configuration.

UNIT III: Field effect transistors & Power electronic

devices Activity: FET Transfer Characteristic Analysis

Students can analyze the transfer characteristics of a FET by measuring the drain current (I_D) for different gate-source voltages (V_{GS}). They can plot the transfer characteristic curve and observe the variations in I_D with V_{GS} . They can discuss the operation modes of FETs based on the transfer characteristics.

Unit IV: Photoelectric Devices

Activity: LED and Photodiode Circuit Demonstration

Students can set up simple LED and photodiode circuits to demonstrate their operation. They can observe the emission of light from an LED when a suitable voltage is applied and measure the current. They can also detect light using a photodiode and measure the output current for different light intensities.

UNIT V: Power Supplies

Activity: Rectifier Efficiency Calculation

Students can analyze the efficiency of different rectifier circuits (half wave, full wave, and bridge rectifiers) by measuring the input and output power. They can calculate the rectifier efficiency and compare the results for different rectifier configurations. They can discuss the factors affecting efficiency and the importance of regulation