

SEMESTER 1st

MAJOR / MINOR COURSE

EEM122M: ELECTRONICS EQUIPMENT MAINTENANCE (EEM) (PRINCIPLES OF ELECTRONICS AND TESTING) (Credits: Theory-04, Practicals-02)

Learning Objectives:

- To prepare the students to have a basic knowledge of passive components and transducers.
- To understand the basics of semiconductors and diodes.
- To understand the operation of BJT, JFET and MOSFET.
- To know about the basics of amplifiers and oscillators.

UNIT- I: PASSIVE DEVICES & SEMICONDUCTOR DIODES

Introduction to Components: Passive components (Resistor, Capacitor, Inductor), Transformer, Relay, Fuses, Switches and Cable Connectors, Transducers (LDR, Thermistor, Photodiode, IR Diode, LVDT). Conductor, semiconductor, Insulator, Intrinsic and Extrinsic Semi-Conductors (P, N type), Semiconductor Diodes, Diffused junctions, Depletion layer, Barrier Potential, Energy Band diagram. Rectifiers, Forward and Reverse Bias Characteristics, switching diode, Varactor diode, photo diode, light emitting diode, IR source and Detectors, Optical Isolators, Zener diode. **Fault detection and testing of diodes.**

UNIT-II: TRANSISTORS & AMPLIFIERS

Bipolar Junction Transistors: CB, CE, CC Configurations, Operating point, Biasing Circuits, Bias Stability, Thermal runaway and thermal stability. Field Effect Transistors: FET & MOSFET, Characteristics, biasing and small signal low frequency analysis of CD, CS and CG configurations. Amplifiers: Different terms used in Amplifiers (Signal, Source, Input Output voltage, Current Gain, Power Gain, Decibel, Input and Output Impedances), Amplifier Classifications according to Frequency response, RC coupled common emitter amplifier. **Testing of Transistors.**

UNIT-III: POWER AMPLIFIERS

Power Amplifiers: Transistor Power Amplifier- Circuits and operations of Class-A, Class -B and Class - C amplifiers, Push-Pull amplifiers. Uni-junction Transistors: Basic Working Principle (Qualitative), Characteristics, Applications as switch. Power Control Devices: Silicon Controlled Rectifier (SCR), Triacs, Diacs, Principles and Characteristics. **Trouble shooting of amplifiers.**

UNIT-IV OSCILLATORS

Feedback in Amplifiers and Oscillators: Concept of negative feedback, Voltage series, Voltage Shunt, Current series and Current Shunt feedbacks. Oscillators: Concept of positive feedback, Barkhausen Criterion, RC Phase Shift Oscillator, Hartley, Colpitt and Crystal oscillators. Power Supplies: Regulated Power Supply, Zener Regulated Power Supply, Series and Shunt Regulated Power Supply, 78xx and 79xx regulator series, Block diagram of IC 723 Regulated Power Supply, Study of Power Supply w.r. to variation in Load and Line Voltages). **Trouble shooting in power supplies.**

RECOMMENDED BOOKS:

1. Electronic Devices and Circuits by Robert. Bolystead
2. Getting Started in Electronics by Forrest M. Mims.
3. Make Electronics by Charles Platt
4. All New Electronics — Self Teaching Guide by Hany ICybett and Earl Boy seen
5. Analog Circuits by Robert Pease
6. Microelectronic circuits by A.S Sedra and IC C Smith

LABORATORY (2 Credits)

Practical work includes the detailed explanation of all the circuit components and blocks of the system. A full demonstration of the system is necessary before proceeding with the hands-on experimentation. At least 10 experiments from the following:

Practicals:

1. Study of Electronic components and analog multimeter.
2. Verification of KVL and KCL.
3. Study of CRO and determination of amplitude, frequency and time period of observed voltage waveform.
4. Verification of superposition theorem.
5. Verification of Thevenin's theorem.
6. Verification of Nortons' theorem.
7. Study of maximum power transfer theorem and determination of internal resistance of a source.
8. Study of P-N junction diode characteristics and determination of bulk resistance.
9. Study of zener diode characteristics and determination of breakdown voltage.
10. Study of Applications of diode as Clippers and Clampers.
11. Study of common-emitter transistors characteristics and determination of β_{dc} .
12. Study of series resonance circuit and determination of its bandwidth and Q factor.
13. Study of Half wave rectifier and determination of ripple factor and efficiency (η).
14. Study of Full wave rectifier and determination of ripple factor and efficiency (η).
15. Study of Zener shunt regulator, line and load regulation characteristics.
16. Study the I-V characters of JFET & MOSFET.