

M.TECH FIRST SEMESTER

EEPC1T5A

ELECTRICAL DISTRIBUTION SYSTEMS
(ELECTIVE-I)

Credits: 4

Lecture: 4 periods/week

Internal assessment: 30 marks
Semester end examination: 70 marks

Objective: The subject deals electrical distribution systems, planning and designing of distribution substations, distribution feeders, voltage drop and power losses in distribution systems, protective devices and their co-ordination in distribution system, power factor improvement and voltage control in distribution systems.

Learning Outcomes: After completion of study the student

1. May be able to understand characteristics of different loads and importance of various factors in distribution system planning
2. Able to design distribution feeders and design voltage levels and feeder loading of distribution feeders.
3. Able to design substation along with location, rating and service area of distribution substations.
4. Able to calculate voltage drop and power loss occur in distribution networks
5. Able to understand various faults occur in distribution systems and procedure for fault calculation
6. Able to understand operation of various protective devices and coordination of protective devices.
7. Able to understand the importance of power factor control using capacitors and design the capacity and location of capacitors
8. May be able to understand line drop compensation and voltage control using AVB/AVR

Unit 1 : General : Introduction to Distribution systems, an overview of the role of computers in distribution system planning-Load modeling and characteristics: definition of basic terms like demand factor, utilization factor, load factor, plant factor, diversity factor, coincidence factor, contribution factor and loss factor-Relationship between the load factor and loss factor - Classification of loads (Residential, Commercial, Agricultural and Industrial) and their characteristics.

Unit 2 : Distribution Feeders and Substations : Design consideration of Distribution feeders: Radial and loop types of primary feeders, voltage levels, feeder-loading.

Unit 3 : Design practice of the secondary distribution system.

Location of Substations : Rating of a Distribution Substation, service area with primary feeders. Benefits derived through optimal location of substations.

Unit 4 : System analysis : Voltage drop and power loss calculations : Derivation for volt-drop and power loss in lines, manual methods of solution for radial networks, three-phase balanced primary lines, non-three-phase primary lines.

Unit 5 : Protective devices and coordination : Objectives of distribution system protection, types of common faults and procedure for fault calculation.

Unit 6 : Protective Devices: Principle of operation of fuses, circuit reclosers, line sectionalizer and circuit breakers. Coordination of protective devices : General coordination procedure.

Unit 7 : Capacitive compensation for power factor control: Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched) power factor correction, capacitor location. Economic justification. Procedure to determine the best capacitor location.

Unit 8 : Voltage control : Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation.

Reference Books :

1. “Electric Power Distribution System Engineering “ by Turan Gonen, Mc.Graw-Hill Book Company,1986.
2. Electric Power Distribution-by A.S.Pabla, Tata Mc Graw-Hill Publishing Company, 4th edition, 1997.