

4/4 B.Tech. FIRST SEMESTER

EE7T6A

ELECTRICAL DISTRIBUTION SYSTEMS

Credits: 4

Lecture: 4 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

Objectives:

This course gives the basic fundamentals of the distribution systems planning and automation. It enhances the practical knowledge about electrical distribution systems for the student. This subject also provides the knowledge about the transmission of power from the generating stations to distribution substation. Apart from this, it also deals the voltage control.

Learning outcomes

1. Upon completion of study of the course, student should be able to understand different loads and their characteristics and design the distribution feeders.
2. Upon completion of study of the course, students should be able to design substations and their optimal location
3. Upon completion of study of the course, students should be able to know functioning of various protective devices and their co-ordination in distribution system.
4. Upon completion of study of the course students should be able to control power factor and voltage

Unit I General Concepts

Introduction to distribution systems, Load modelling and characteristics. Coincidence factor, contribution factor loss factor - Relationship between the load factor and loss factor. Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

Unit II Distribution Feeders

Design Considerations of Distribution Feeders: Radial and loop types of primary feeders, voltage levels, feeder loading; basic design practice of the secondary distribution system, secondary banking.

Unit III Substations

Location of Substations: Rating of distribution substation, service area within primary feeders. Benefits derived through optimal location of substations.

Unit IV System Analysis

Voltage drop and power-loss calculations: Derivation for voltage drop and power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines.

Unit V Protection

Objectives of distribution system protection, types of common faults and procedure for fault current calculations. Protective Devices: Principle of operation of Fuses, Circuit Reclosers, line sectionalizers, and circuit breakers.

Unit VI Coordination

Coordination of Protective Devices: General coordination procedure, fuse-to-fuse coordination, fuse-to-circuit breaker, recloser-to-recloser, recloser-to-fuse, recloser-to-circuit breaker coordination.

Unit VII Compensation for Power Factor Improvement

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

Unit VIII Voltage Control

Importance of Voltage Control, methods of voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation.

Learning resources

Text books:

1. "Electric Power Distribution system, Engineering" – by Turan Gonen, Mc Graw-hill Book Company.
2. Electric Power Distribution – by A.S. Pabla, Tata Mc Graw-hill Publishing company, 4th edition, 1997.

Reference books:

1. Electrical Power Distribution and Automation by S.Sivanagaraju, V.Sankar, Dhanpat Rai & Co, 2006
2. Electrical Power Distribution Systems by V.Kamaraju, Right Publishers.