

**EE852PE: ELECTRICAL DISTRIBUTION SYSTEMS**  
(PROFESSIONAL ELECTIVE – V)

**B.Tech. IV Year II Sem.**

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**Prerequisites:** Power Systems – I & Power Systems - II

**Course Objectives:**

- To distinguish between transmission and distribution systems
- To understand design considerations of feeders
- To compute voltage drop and power loss in feeders
- To understand protection of distribution systems
- To examine the power factor improvement and voltage control

**Course Outcomes:** After completion of this course, the student able to

- distinguish between transmission, and distribution line and design the feeders
- compute power loss and voltage drop of the feeders
- design protection of distribution systems
- understand the importance of voltage control and power factor improvement

**UNIT – I**

**General Concepts:** Introduction to distribution system, Distribution system planning, Factors effecting the Distribution system planning, Load modeling and characteristics. Coincidence factor - contribution factor - Loss factor - Relationship between the load factor and loss factor. Load growth, Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

**Distribution Feeders:** Design Considerations of Distribution Feeders: Radial, loop and network types of primary feeders, Introduction to low voltage distribution systems (LVDS) and High voltage distribution systems (HVDS), voltage levels, Factors effecting the feeder voltage level, feeder loading, Application of general circuit constants (A,B,C,D) to radial feeders, basic design practice of the secondary distribution system, secondary banking, secondary network types, secondary mains.

**UNIT – II**

**Substations:** Location of Substations: Rating of distribution substation, service area with 'n' primary feeders. Benefits derived through optimal location of substations. Optimal location of Substations (Perpendicular bisector rule and X, Y co-ordinate method).

**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, analysis of non-three phase systems, method to analyze the distribution feeder cost.

### **UNIT – III**

**Protection:** Objectives of distribution system protection, types of common faults and procedure for fault calculations, over current Protective Devices: Principle of operation of Fuses, Auto-Circuit Recloser - and Auto-line sectionalizers, and circuit breakers.

**COORDINATION:** Coordination of Protective Devices: Objectives of protection coordination, general coordination procedure, Types of protection coordination: Fuse to Fuse, Auto-Recloser to Fuse, Circuit breaker to Fuse, Circuit breaker to Auto-Recloser.

### **UNIT – IV**

**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), effect of series capacitors, difference between shunt and series capacitors, Calculation of Power factor correction, capacitor allocation - Economic justification of capacitors - Procedure to determine the best capacitor location.

### **UNIT – V**

**Voltage Control:** Voltage Control: Importance of voltage control, methods of voltage control, Equipment for voltage control, effect of shunt capacitors, effect of series capacitors, effect of AVB/AVR on voltage control, line drop compensation, voltage fluctuations.

### **TEXT BOOKS:**

1. Turan Gonen, Electric Power Distribution System Engineering, CRC Press, 3<sup>rd</sup> Edition 2014.
2. V. Kamaraju, Electrical Power Distribution Systems, Tata Mc Graw Hill Publishing Company, 2<sup>nd</sup> edition, 2010.

### **REFERENCE BOOKS:**

1. G. Ram Murthy, Electrical Power Distribution hand book, 2<sup>nd</sup> edition, University press 2004.
2. A.S. Pabla, Electric Power Distribution, Tata McGraw Hill Publishing company, 6<sup>th</sup> edition, 2013.