IV Year B.Tech. EEE I-Semester

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ELECTRICAL DISTRIBUTION SYSTEMS
(Professional Elective-III)

Prerequisites: Power Systems , Power System Protection

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
- To study the impacts of distributed generation on distribution systems

UNIT – I (~5 Lecture Hours)

Load Modeling and characteristics.: Introduction to distribution system, Load modeling 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 (~12 Lecture Hours)

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.

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).

UNIT – III (~10 Lecture Hours)

Distributed Generation and System Analysis: Introduction of distributed generation sources like Solar PV, small wind & Hydro ,Bio-mass/Bio-Diesel generators into distribution systems, Their basic models and interfacing

arrangements with low and medium voltage grids, Voltage drop and power loss calculations on distribution systems with and without distributed generators.

UNIT – IV (~9 Lecture Hours)

Co-ordination of Protective Devices: Objectives of distribution system protection, types of common faults and procedure for fault calculations, Principle of operation of Auto-line Sectionalizes.

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. Co-ordination procedure of protective devices with distributed generators.

UNIT – V (~9 Lecture Hours)

Compensation For Power Factor Improvement: - Types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), effect of series capacitors, Calculation of Power factor correction, capacitor allocation - Economic justification of capacitors - best capacitor location.

Voltage Control: Importance of voltage control, methods of voltage control, Equipment for voltage control, effect of Automatic Voltage Booster and Automatic Voltage Regulator, line drop compensation, voltage fluctuations.

Text books:

1. Turan Gonen, "Electric Power Distribution system Engineering", CRC Press, 3 rd Edition 2014.
2. V. Kamaraju, "Electrical Power Distribution Systems", Tata Mc Graw Hill Publishing Company, 2nd edition, 2010.
3. M. K. Khedkar , G. M. Dhole, "Electric Power Distribution Automation", University Science Press, 2010.

Reference Books:

1. G. Ram Murthy, "Electrical Power Distribution hand book", 2nd edition, University press 2004.
2. A.S. Pabla, "Electric Power Distribution", Tata McGraw Hill Publishing company, 6th edition, 2011.
3.J B Gupta, "A Course in Power Systems", S K KATARIA & Sons, 11th edition, 2013

1) N. Malleswara Reddy
2) M. Satyanarayana
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7) A Reddy
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12) G.
13) G R Reddy
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16) R. Balasubramanian

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

1. Acquire the knowledge on Coincidence factor , contribution factor ,Loss factor and characteristics of load.
2. Design and analyze the substations based on the load, geographical data, ratings of the equipment, number of incoming and outgoing feeders and determine the optimal location of substation.
3. Design the basic models of distributed generators and their interfacing arrangements with grid for different sources like solar PV, wind , small hydro and biomass power.
4. Acquire the knowledge on over current protective devices like Fuse, Circuit breaker, Auto-Re-closer and Line sectionalize.
5. Apply the co-ordination procedure on over current protective devices with and without distributed generators included in the distribution system.
6. Apply reactive power compensation techniques in various scenario of the distribution system to limit the voltage drops at the remote ends to the suitable levels.

1) N. Malla Reddy
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7) A Reddy
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12) G. Aruna
13) K Reddy
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15) M Sai
16) R. Balasubramanian