DISTRIBUTION AUTOMATION

Course Code: 13EE2105 **L P C**
4 0 3

Pre requisites: Basic knowledge of electrical power distribution systems.

Course Educational Objectives:

1. To gain the awareness of the problems and challenges of the present day distribution sector
2. To gain the knowledge of Principles of Distribution Automation (DA)
3. To gain the knowledge of various communication technologies available for DA
4. To clearly understand the Technical Benefits of automation of distribution system
5. To gain the knowledge of principles of various Economic Evaluation Methods of DA.

Course Outcomes: At the end of the course, the student will be able to

1. Select appropriate Communication Technology for various parts of Distribution System for their automation.
2. Consider all factors for formulation of the Benefit Estimation Equation for estimating DA Benefits.
3. Choose appropriate method for Economic Evaluation of DA plans.

UNIT-I

DISTRIBUTION AUTOMATION AND THE UTILITY SYSTEM:

Introduction to Distribution Automation (DA), Control System Interfaces, Control and Data Requirements, Centralized (Vs) Decentralized Control, DA System (DAS), DA Hardware, DAS Software.

UNIT-II DISTRIBUTION AUTOMATION FUNCTIONS:

DA Capabilities, Automation System Computer Facilities, Management Processes, Information Management, System Reliability Management,

System Efficiency Management, Voltage Management, Load Management, Management Process (Function) Interaction, Operating and Objective Priorities.

UNIT-III COMMUNICATION SYSTEMS FOR DA:

DA Communication Requirements - Communication Reliability, Cost Effectiveness, Data Rate Requirements, Two Way Capability, Ability to communicate during outages and faults, Ease of Operation and Maintenance, Conforming to the Architecture of Data Flow. Communication Systems used in DA - Distribution Line Carrier (Power line carrier), Ripple Control, Zero Crossing Technique, Telephone, Cable TV, Radio, AM Broadcast, FM SCA, VHF Radio, UHF Radio, Microwave, Satellite, Fibre Optics, Hybrid Communication Systems, Communication Systems used in Field Tests.

UNIT-IV TECHNICAL BENEFITS:

DA Benefit Categories, Capital Deferred Savings, Operation and Maintenance Savings, Interruption Related Savings, Customer-related Savings, Operational Savings, Improved Operation, Function Benefits, Potential Benefits for Functions, Function-shared Benefits, Guidelines for Formulation of Estimating Equations, Parameters Required, Economic Impact Areas, Resources for determining benefits, Integration of System Benefits into Economic Evaluation, Impact of DA on Distribution System.

UNIT-V ECONOMIC EVALUATION METHODS:

Development and Evaluation of Alternate Plans, Select Study Area, Select Study Period, Project Load Growth, Develop Alternatives, Calculate Operation and Maintenance Costs, Evaluate Alternatives. Economic Comparison of Alternate Plans: Classification of Expenses and Capital Expenditures, Comparison of Revenue Requirements of Alternative Plans, Book Life and Continuing Plant Analysis, Year-by-Year Revenue Requirement Analysis, Short Term Analysis, End of Study Adjustment, Break-Even Analysis, Sensitivity Analysis, Major Steps in Utility Economic Evaluation of DA (Flow-Chart)

Computational Aids.

Text Book:

1. D. Bassett, K. Clinard, J. Grainger, S. Purucker, and D. Ward, "*Tutorial Course: Distribution Automation*", *IEEE Tutorial Publication 88EH0280-8-PWR*, 1988.

Reference Books:

1) James Northcote-Green, Robert Wilson "*Control and Automation of Electrical Power Distribution Systems*" CRC Press, Taylor and Francis Group, 2007.

2) James A. Momoh "*Electric Power Distribution, Automation, Protection, and Control*", CRC Press, Taylor and Francis Group, '07.

3) S Dr.M.K. Khedkar and Dr.G.M.Dhole," *A Textbook of Electric Power Distribution Automation"*, University Science Press (Laxmi Publications Pvt. Ltd.), 2011.