SCHEME OF COURSE WORK

Course Details:

Course Title	**: Distribution Automation**		
Course Code	**:13EE2105**	**L T P C**	**:4 1 0 3**
Program:	**: M.Tech.**		
Specialization:	**: Power System Control and Automation**		
Semester	**: First**		
Prerequisites	**: Knowledge of electrical distribution systems is desirable.**		
Courses to which it is a prerequisite	**: -No course in Syllabus**		

Course Outcomes (COs):

1	To acquire the knowledge of DA fundamentals, DA hardware/software, DA Capabilities and Management Processes supported by DA.
2	To acquire the knowledge of DA communication requirements and various communication technologies and select appropriate communication technology for various parts of distribution system for its automation.
3	To acquire the deeper knowledge of technical benefits of DA and able to consider all relevant factors in formulation of benefit estimation equations
4	To acquire the knowledge of procedure of economic evaluation of alternate plans of DA and of different methods of economic evaluation of DA plans.

Program Outcomes (POs):

A graduate of M.Tech (Power System Automation and Control) will be able to

1	Acquire in-depth knowledge in the area of power system control and automation.
2	Attain the ability to think critically and analyze complex engineering problems related to power system control and automation
3	Obtain the capability of problem solving and original thinking to arrive at feasible and optimal solutions considering societal and environmental factors
4	Extract information through literature survey and apply appropriate research methodologies, techniques and tools to solve power system problems.
5	Use the state-of-the-art tools for modeling, simulation and analysis of problems related to power systems
6	Attain the capability to contribute positively to collaborative and multidisciplinary research to achieve common goals
7	Demonstrate knowledge and understanding of power system engineering and management principles and apply the same for efficiently carrying out projects with due consideration to economical and financial factors.
8	Communicate confidently, make effective presentations and write good reports to engineering community and society
9	Recognize the need for life-long learning and have the ability to do it independently
10	Become socially responsible and follow ethical practices to contribute to the community for sustainable development of society.
11	Independently observe and examine critically the outcomes of his actions and reflect on to make corrective measures subsequently and move forward positively by learning through mistakes

Course Outcome Versus **Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	S	M	M			M	M				
CO-2	S	M	M			M					
CO-3	S	M	M			M					
CO-4	S	M	M			M	S				

S - Strongly correlated, *M* - *Moderately* correlated, *Blank* - *No correlation*

Assessment Methods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample Questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Introduction to Distribution Automation (DA), Distribution Automation and the Utility System, Control Systems Interfaces,	CO1	Define the following terms and briefly explain. (i) Distribution Automation System (ii) Utility System	▫ Lecture ▫ Interactive Discussion	
2	Control and Data Requirements Centralized(Vs) Decentralized control, DA System (DAS),	CO1	Compare Centralized and Decentralized Control of Distribution Automation	▫ Lecture ▫ Interactive Discussion	Assignment (Week 2-4)
3	DA Hardware DAS Software,	CO1	Discuss DA Hardware and DAS Software.	▫ Lecture Interactive Discussion	Assignment (Week 2-4)
4	Distribution Automation Functions:, DA Capabilities Automation System Computer facilities,	CO1	What are DA Capabilities? Briefly Explain with examples Draw the flow chart for the following to illustrate the role of computer in managing the DA process. (i) Fault Identification and System Restoration (ii) Computer Volt/Var Control	▫ Lecture ▫ Interactive Discussion	Assignment (Week 2-4)
5	Management Process, Information Management ,System Reliability Management, System Efficient Management, Voltage Management, Load Management	CO1	Explain the following management processes supported by DA (i) System Reliability Management (ii) System Efficiency Management	▫ Lecture Interactive Discussion	Assignment (Week 5-7)
6	Communication System 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 Confirming Architecture of Data Flow	CO2	What are the desirable characteristics of communication systems required for Distribution Automation? Explain them.	▫ Lecture ▫ Interactive Discussion	Assignment (Week 5-7)

7	Communication Systems used in DA: Distribution Line Carrier (Power Line Carrier, Ripple Control , Zero Crossing Technique, Telephone, Cable TV,	CO2	List out the various communication techniques used for DA. Describe them with relevant diagrams.	▫ Lecture Interactive Discussion	Assignment (Week 5-7)
8	Radio : AM Broadcast, FMSCA, VHF, Micro wave, Satellite, Fiber Optics, Hybrid Communication Systems, Communication Systems used in field tests	CO2	What is Hybrid Communication System? Briefly explain with diagram	▫ Lecture ▫ Interactive Discussion	Assignment (Week 5-7)
9	Technical Benefits: DA Benefits Categories, Capital Deferred Savings Operation and maintenance Savings ,Interruption Related Savings ,Customer Related Savings ,Operational Savings, Improved operation,	CO3	What are potential benefit categories of Distribution Automation? Discuss them with benefit examples.	▫ Lecture Interactive Discussion	TEST-I
10	Function Benefits, Potential Benefits for Functions Function Shared Benefits,	CO3	Discuss potential benefits and function shared benefits?	▫ Lecture ▫ Interactive Discussion	
11	Guidelines for formulation of estimation equations,	CO3	Discuss the guidelines for formulation of estimation equations?	▫ Lecture Interactive Discussion	Assignment (Week 11-13)
12	Parameters required ,Economic impact areas, Integration of benefits into economic Evaluation, Resources for determine benefits,	CO3	Briefly discuss Economic impact areas of distribution automation	▫ Lecture ▫ Interactive Discussion	Assignment (Week 11-13)
13	Impact on distribution System,	CO3	Describe the impact of distribution automation on distribution system	▫ Lecture Interactive Discussion	Assignment (Week 11-13)
14	Economic Evaluation Methods, Development and Evaluation of Alternatives Plans ,Select Study Area, Select Study Period, Project Load Growth ,Develop alternatives, Calculate and Operating and Maintenance Costs, Evaluate Alternatives	CO4	Explain, in detail, the procedure for development and evaluation of alternate distribution plans to meet the distribution requirements of a particular geographic area .	▫ Lecture ▫ Interactive Discussion	
15	Economic Comparison of Alternate Plans, Classification of Expenses and capital expenditures, Comparison of revenue requirements of alternatives plans ,Book life and continuing plant analysis	CO4	Distinguish between Expenses and Capital Expenditure with examples.	▫ Lecture Interactive Discussion	
16	Year by Year revenue requirement analysis,Short term Analysis,End of Study Adjustments, Break even Analysis,	CO4	What are the accepted approaches/methods for comparison of revenue requirements of distribution alternate plans. Explain any two of them.	▫ Lecture ▫ Interactive Discussion	
17	Sensitivity analysis, Computational aids	CO4	What do you understand by Sensitivity Analysis in economic evaluation of DA Alternate Plans.	▫ Lecture Interactive Discussion	
18	Major steps in utility economic evaluation of Distribution Automation		Draw a block diagram clearly showing major steps in Utility Economic Evaluation of Distribution Automation	▫ Lecture Interactive Discussion	Test-II
19/20	**END EXAM**				