III B.Tech – II Semester
(20EE6320) MODERN DISTRIBUTION SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

Pre-Requisites: Power Systems – I.

Course Objectives

- To Understand and Evaluate different factors of Distribution system design the substations and distribution systems.
- To study, analyse and Evaluate voltage drop and power loss in distribution Systems.
- To study and analyse distribution system protection and its coordination.
- To study the effect and evaluate voltage control and compensation for power factor improvement.
- To Illustrate distributed generation & micro grids.

UNIT–I: General Concepts, Substations and Distribution Feeders

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

Location of substations- Rating of distribution substation – Service area with'n'primaryfeeders – Benefits and methods of optimal location of substations..

Radial and loop types of primary feeders –Voltage levels – Feeder loading – Basic design practice of the secondary distribution system.

UNIT–II: System Analysis

Voltage drop and power–loss calculations**:** Derivation for voltage drop and power loss inlines – Uniformly distributed loads and non-uniformly distributed loads – Numericalproblems - Three phase balanced primary lines.

UNIT–III: Protection & Coordination

Objectives of distribution system protection – Types of common faults and procedure for fault calculations for distribution system – Protective devices**:** Principle of operation of fuses– Circuit reclosures – Line sectionalizes and circuit breakers.

Coordination of protective devices**:** General coordination procedure –Coordinated operation of protective devices.

UNIT–IV: Power Factor Improvement & Voltage Control

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) – Power factorcorrection – Capacitor allocation – Economic justification – Procedure to determine the best capacitor location – Numerical problems.

Voltage Control**:** Equipment for voltage control – Effect of series capacitors – Effect ofAVB/AVR – Line drop compensation – Numerical problems.

UNIT–V: Distributed generation, Micro-grid & Smart Grids

Concept of grid, distributed generation (DG) & microgrid - Renewable energy penetration - typical connection scheme of a microgrid, AC and DC microgrids, modes of operation and control of microgrid: grid

connected and islanded mode, Smart Grids and need for its establishment, Supervisory Control and Data Aquisition.

Course Outcomes:

After successful completion of the course, the students will be able to:

S.No	Course Outcome	BTL
1.	Evaluate different factors of Distribution system design the substations and distribution systems.	L6
2.	Analyse and Evaluate voltage drop and power loss in distribution Systems.	L4
3.	Analyse distribution system protection and its coordination.	L4
4.	Explain the effect and evaluate voltage control and compensation for power factor improvement.	L2
5.	Illustrate distributed generation & micro grids.	L3

Correlation of COs with POs& PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	0	1	0	0	1	0	0	0	1	3	2
CO2	3	2	3	0	1	0	0	1	0	0	0	1	3	2
CO3	3	2	3	0	1	0	0	1	0	0	0	1	3	2
CO4	3	2	3	0	1	0	0	1	0	0	0	1	3	2
CO5	3	2	3	0	1	0	0	1	0	0	0	1	3	2

Text Books:

1. "Electric Power Distribution system, Engineering" – by TuranGonen, McGraw–hill Book Company.
2. Electrical Power Distribution and Automation – S.Sivanagaraju, V.Sankar – Dhanpat Rai & Co.,

Reference Books:

1. Electrical Distribution Systems by Dale R.Patrick and Stephen W.Fardo, CRC press
2. Electric Power Distribution – by A.S. Pabla, Tata McGraw–hill Publishing company, 4th edition, 1997.