

Branch Name:	Electrical Engineering
Program Code:	ET403
Course Name:	Distribution and Utilization of Electrical Power
Course Code:	2ET4030402
Pre-requisite Course:	

Course Objectives:

1. Identify basic components of power system distribution.
2. Interpret cable specifications, site selection process and layout of substations.
3. Acquire knowledge about tariff structures and power factor improvement.
4. Select appropriate lighting source on the basis of different parameters related to illumination.
5. Compare electrical drives and Elevators working.

TEACHING AND EVALUATION SCHEME:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)			
Lecture	Tutorial	Practical	Credit	Theory		Practical	
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment
3	-	2	4	60	40	20	30

DETAILS OF COURSE CONTENTS:

Sr No	Topics and Sub-topics	Total Hours	% Weightage
1	Distribution System Components 1.1 AC distribution and its Requirements. 1.2 Classification of Distribution system. 1.3 Various Connection schemes of AC primary & secondary distribution system. 1.4 Issues of Distributed Generation Integrated to distribution Grid. 1.5 Impact a renewable energy on Distribution system. 1.6 Solution to challenges due to distribution generation integrated to distribution grid. 1.7 Consequences of disconnecting neutral in a 3-Phase 4-wire System. 1.8 Methods of solving A.C. Single phase and three phase connected (balanced) distribution system.	10	14

2	Sub-Station And Cable 2.1 Importance and Classification of substation. 2.2 Selection of site for substation. 2.3 Single line diagram of substation of 220/66/11 kV Substation. 2.4 Pole mounted substation 2.5 Different types of Busbar arrangement: Single Bus, Main and Transfer Bus, Breaker and Half Bus and Double bus & transfer bus. 2.6 Types of earthing used in substation. 2.7 General Construction of cable. 2.8 Insulating materials for cable. 2.9 Classification of cables. 2.10 Recycling of Cables.	10	14
3	Tariff and Power Factor improvement 3.1 Objectives and desirable characteristics of tariffs. 3.2 Types of consumers and Types of tariffs: Flat Rate, Block Rate, Three part, KVA maximum demand. 3.3 Prepare Energy Bill based on energy consumption of residence/ Institute. 3.4 Problems based on tariff 3.5 Power factor: Disadvantages of low power factor and their causes, Advantages of improved power factor. 3.6 Power factor improvement by: Static capacitor, Synchronous Condenser, Location of power factor correction equipment.	06	08
4	Illumination 4.1 Illumination terminology: Solid and plane angle, Luminous Flux, Luminous Intensity, Lumen, Candle Power, Lux, Lamp Efficiency, Specific Consumption, Glare, Space Height Ratio, Utilization Factor, Maintenance Factor, Absorption Factor, Reflection Factor. 4.2 Law of Inverse Squares and Lambert's Cosine Law 4.3 Various lighting schemes: features and applications 4.4 Construction and working of Incandescent Lamp, Halogen Lamps, Sodium Vapour Lamps, Compact Fluorescent Lamps (C.F.L.), L.E.D lamps and its comparative advantages.	08	12
5	Electric Drives and Elevators 5.1 Electric Drives 5.2 A. C and D.C Drives 5.3 Factors affecting selection of Electric motor 5.4 Group and Individual Drive 5.5 Types of load and its characteristics 5.6 Speed-Torque Characteristics of different motors 5.7 Elevators : Types of Elevators 5.8 Hydraulic Elevators 5.9 Traction Elevators 5.10 Power transmission gear and braking. 5.11 Safety in elevators	08	12

LIST OF REFERENCES:

SR. No.	Title of Books	Author	Publication
1	Sub-Station Engineering Design, Concepts & Computer Applications	Dahiya R. S.	S. K. Kataria & Sons, New Delhi, 2013, ISBN:978-9380027579,
2	Utilization of Electric Power & Electric Traction	Gupta J. B.	S. K. Kataria & Sons, New Delhi, 2012, ISBN:978-9350142585,
3	Utilization of Electric Power & Electric Traction	Garg G. C.	Khanna publication, New Delhi, 2019, ISBN:978-9386173355
4	Fundamentals of Electrical Drive	Dubey G. K.	Narosa Publishing, New Delhi, 2001, ISBN: 978-8173194283
5	Art & Science of Utilization of Electrical Energy	Partab H.	Dhanpat Rai & Sons, New Delhi,
6	A Course In Power Systems	Gupta J. B.	S.K.Kataria & Sons, New Delhi, 2013, ISBN: 978-9350143735
7	Electric Power Transmission and Distribution	Sivanagaraju S. Satyanarayana S.	Pearson Learning, New Delhi, 2008, ISBN: 978-8131707913,
8	Electrical Power Systems	Uppal S.L	Khanna publication, New Delhi, 2011, ISBN:978-8174092380
9	Electrical Power System	Wadhwa C. L.	New Age International Publishers, New Delhi, 2018 ISBN: 978-9393159175,
10	Principles of power system	Mehta V. K.	S. Chand and Co., New Delhi, 2020, ISBN: 978-8121924962,
11	Handbook of Electrical Power Distribution	Ramamurthy G.	Universities press, Hyderabad

LIST OF LEARNING WEBSITES

1. <https://www.google.com>
2. <https://www.youtube.com>

LIST OF PRACTICAL:

- 1 To Solve problem related to voltage drop and sending/ receiving end voltage of distribution line.
- 2 To study performance characteristics of typical AC distribution system in radial & ring main configuration.
- 3 Prepare a report after studying distribution system of a residential colony.
- 4 Interpret the Blue Print of a Sub-Station.
- 5 Prepare a report on substation with its layout after visiting a nearby substation.
- 6 Improve the power factor of available inductive load using static capacitor.
- 7 Prepare a report on pole mounted substation.
- 8 Perform power factor correction using synchronous condenser.
- 9 Prepare a report based on comparative study of various tariff structures of Gujarat state.
- 10 Prepare Energy Bill based on energy consumption of residence/ Institute.
- 11 Measure Illumination at different places in college using luxmeter.
- 12 Analytical comparison between Electrical & Mechanical Drive.
- 13 Visit a small manufacturing unit to observe various electrical drives and prepare a technical report.
- 14 Study about IE safety rules.
- 15 Study about recycle cables and electrical/electronic waste.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Identify basic components of power system distribution.	3 Applying, 2 Understanding
CLO2	Interpret cable specifications, site selection process and layout of substations	2 Understanding, 4 Analyze
CLO3	Acquire knowledge about tariff structures and power factor improvement	3 Applying, 4 Analyze
CLO4	Select appropriate lighting source on the basis of different parameters related to illumination.	1 Remembering, 2 Understanding
CLO5	Compare electrical drives and Elevators working	5 Evaluating, 3 Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	H							L		L		L	M	L	L
CLO2	H	M	M									L	M	M	L
CLO3	H	M	M		M	M	M					L	L		H
CLO4	L	H	M		L	M	M	L				L	M		H
CLO5	H				M							L	L		

H:High, M:Medium, L:Low