

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	Electrical Power System-II
Course Code:	2ET1090601T
Pre-requisite Course:	Electrical Power System-I

Course Objectives:

1. In this subject student will learn the basic principles and operation of distribution systems.
2. The major objective of the subject is to Understand the requirements of substation equipment and earthing.
3. Understand and analyze the behavior of the symmetrical and unsymmetrical fault conditions.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Course Contents:

Sr. No.	Topic	Total Hours	Weightage (%)
1	D.C. Distribution: Types of dc distributors, DC distribution calculations, DC distributors fed at one end, Distributor fed at both the ends with concentrated loads and uniformly distributed loads, Ring distributor, Ring main distributor with inter connectors, Current distribution in three wire and four wire DC systems, Comparison between 3 and 2 wire distributor.	05	12
2	A.C. Distribution: AC distribution calculation, Methods of solving AC distribution problems, 3-phase unbalanced loads, 4-wires star connected unbalanced load, Ground detectors, Overview of distribution automation.	04	10
3	Underground Cables: Underground cables, Construction of cables, Insulating materials for cable, Classification of cables, Cables for three phase services, Most economical conductor size in cable, Grading of cable, Capacitance grading, Capacitance of 3-core cable, Current carrying capacity of underground cable, Thermal resistance, Thermal resistance of dielectric of single core cable, Permissible current loading, Types of cable faults, Loop tests for location of faults in underground cables, Murray loop test, Varley loop test.	06	13
4	Substations: Substation, Classification of substations, Comparison between outdoor and indoor substation, Transformer substations, Pole mounted substation, Underground substation, Equipment used in a substation, Equipment in a transformer substation, Bus bar arrangements in substations, Line diagram of different substation.	04	10

5	Power System Earthing: Introduction, Isolated neutral, Neutral earthing systems, Solid grounding, Resistance grounding, Reactance grounding & arc suppression coil, Earthing systems, Soil resistivity, Earth resistance, Step and Touch voltage, Design of earthing grid, Tower footing resistance.	04	10
6	Representation of Power System Components: Introduction, Single phase solution of balanced three phase networks, One line diagram and impedance or reactance diagram, Per-unit system, Complex power, Representation of loads.	05	12
7	Symmetrical Fault Analysis: Introduction, Steady state model of synchronous machine, Transient on a transmission line, Short circuit of a synchronous machine on no load, Short circuit of a loaded synchronous machine, Reactor control of short circuit currents, Location of reactors, Balanced three phase fault, Short circuit capacity, Fault analysis using bus impedance matrix, Selection of protective equipment.	10	20
8	Unsymmetrical Fault Analysis: Symmetrical component analysis of unsymmetrical faults, Sequence impedance and sequence network of power system components, Single line to ground (LG) fault, Line to line (LL) fault, Double line to ground (LLG) fault, Open conductor faults, Bus impedance matrix method for analysis of unsymmetrical faults.	07	13

Text Books:

1. V. K. Mehta, "Electrical Power System", S. Chand Publication, 2nd edition, 2016.
2. Nagrath & Kothari, "Power System Engineering", TMH publishing Company Ltd, 6th edition, 2009.

Reference Books:

1. D. Das, "Electrical Power System", New Age International Publishers, 3rd edition-2014.
2. B.R. Gupta, "Power System Analysis and Design", S. Chand Publication, 2018.
3. C.L. Wadhwa, "Electric Power System", New Age International Ltd, 2009.
4. W. D. Stevenson, "Element of Power System Analysis", McGraw Hil, 4th edition-2013.
5. J. B. Gupta, "Electrical Power", S. K. Kataria Publications, 15th edition, 2018.

ICT/MOOCs Reference:

1. <https://nptel.ac.in/courses/108/102/108102047/>
2. <https://nptel.ac.in/courses/108/104/108104051/>
3. <https://nptel.ac.in/courses/108/105/108105104/>
4. <https://nptel.ac.in/courses/117/105/117105140/>

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

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the basic principles and operation of distribution systems.	2 Understanding

CLO2	Analyze the performance of the underground cable	4 Analyzing
CLO3	Understand the requirements of substation equipment and earthing.	2 Understanding
CLO4	Apply the per unit calculation to different power system models.	3 Applying
CLO5	Understand and analyze the behavior of the symmetrical and unsymmetrical fault conditions in electrical power system.	2 Understanding 4 Analyzing

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	PSO4
CLO1	H	L	L	L	L		L	L	M			L	L	L		L
CLO2	H	H	M	L	L		L		M		L	L	H	L		
CLO3	H	L	L	L	L		L		M	L	L	L	L	L	M	M
CLO4	H	H	H	M	L						L	L	H	L		L
CLO5	H	H	M	M	H						L	L	H	L		H

H: High, M: Medium, L: Low