

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	Electrical Power-III
Course Code:	1ET1090602
Pre-requisite Course:	Elements of Electrical Engineering, Electrical Machine I & II, Electrical Power - I & II

Course Objectives:

1. In this subject, student will learn the basics of types of distribution systems and importance of PU system.
2. To make the students aware of different types of faults occur in transmission and distribution lines
3. Student will aware about analysis of transients in power system.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								
Lecture	Tutorial	Practical	Credit	Theory				Practical				Total
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	-	2	4	28	70	12	30	12	30	08	20	150

Course Contents:

Sr. No.	Topic	Total Hours	Weightage (%)
1	DC and AC distribution: Distribution system, classification of Distribution systems, AC distribution, DC distribution, Connection scheme of distribution system, Types of DC distributors, DC distribution calculations, DC distributor fed at one end, uniformly loaded distributor fed at one end, distributor fed at both ends, Distributor with both concentrated and uniform loading, Ring distributor, Ring main distributors with interconnector, AC distribution calculations, Methods of solving AC distribution problems, 3-phase unbalanced loads – 4 wire, Star connected unbalanced loads, Ground detectors.	8	19
2	Representation of power system component: Introduction, Single phase Representation of balanced three phase networks, The one line diagram and impedance or reactance diagram, Per unit system, Advantages of pu system, Per unit representation of a transformer, Per unit impedance diagram of a power system, Complex power, The steady state model of synchronous Machine, Power factor and power control, Salient pole synchronous generator, Loading capability diagram.	7	17
3	Symmetrical Three-Phase Faults: Transients in RL Series circuits, Short-Circuit currents and the reactance of Synchronous machines, Internal voltages of loaded machines under	7	17

	transient conditions, The bus impedance matrix in fault calculations, A bus impedance matrix equivalent network, The selection of circuit breakers.		
4	Symmetrical Components: Synthesis of Unsymmetrical phasors from their symmetrical components, The symmetrical components of unsymmetrical phasors, Phase shift of symmetrical components in Star- Delta Transformer Banks [2], Power in terms of symmetrical components, Sequence circuits of Y and Δ impedances, Sequence circuits of a symmetrical transmission line, Sequence circuits of the synchronous machine, Sequence circuits of a Y- Δ transformer, Unsymmetrical series impedances, Sequence networks.	7	17
5	Unsymmetrical Faults: Single line to ground fault on an unloaded generator, Line to Line fault on an unloaded generator, Double Line to Ground fault on an unloaded generator, Unsymmetrical faults on power systems, Single line to Ground fault on a power system, Line to Line fault on a power system, Double Line to Ground fault on a power system, Interpretation of the interconnected sequence networks, Analysis of unsymmetrical faults using the bus impedance matrix, Computer calculations of fault currents.	7	17
6	Transients in Power Systems: Transients in Simple Circuits, 3-phase Sudden Short Circuit of an Alternator, The Restripping Voltage after Removal of Short Circuit, Travelling Waves on Transmission Lines, Attenuation of Travelling Waves, Capacitance Switching, Overvoltage due to Arcing Ground.	6	13

Reference Books:

1. Power System Analysis: John J. Grainger, William D. Stevenson Jr., Tata McGraw Hill, 2005.
2. Elements of Power Systems Analysis: W. D. Stevenson Jr., 4th Edition, McGraw Hill International, 2013.
3. Electrical Power systems: C. L .Wadhwa, 5th Edition, New Age International Publishers, 2017.
4. Principles of Power System: V.K.Mehata, S. Chand publications, 1999.
5. Modern Power System Analysis by I J Nagrath, D P Kothari, 4th Edition Tata McGraw Hill, 2006.
6. Power System Analysis by Hadi Saadat, Tata McGraw Hill, 2008.

List of Experiments:

1. Simulation and analysis of feeder fed at one end.
2. Simulation and analysis of feeder fed at both ends.
3. Simulation and analysis of feeder fed at center.
4. Simulation and analysis of ring main system.
5. To write computer program for converting given system in Per Unit system.
6. To analyze L-L-L-G fault for given motor generator system.
7. To write computer program for obtaining symmetrical components for a given set of unbalanced phasors.
8. To analyze L-G fault for small system using interconnection of sequence networks.
9. To analyze L-L-G and L-L fault for small system using interconnection of sequence networks.
10. To simulate transient in series R-L circuit with special attention to change in DC offset current for application of excitation at different instant.

List of Open Source Software/learning website: http://nptel.iitm.ac.in/coursecontents_elec.php

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

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand Different types of power distribution system for AC and DC.	2 Understanding
CLO2	Understand the importance of PU system for representation of power system components.	2 Understanding
CLO3	Analyze different types of faults occur in transmission and distribution lines.	4 Analyze
CLO4	To know the phenomena of transient, occur in power system.	1 Remembering
CLO5	Analyze L-G fault for small system using interconnection of sequence networks	4 Analyze
CLO6	Application of the study of L-L-L-G fault for given motor generator system.	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	PSO4
CLO1		L		L			L			M				L		
CLO2		L	L		L			L				L	M			L
CLO3	M					L	H		L	M					L	
CLO4			L		H			M				M	L			
CLO5	L			M		L					M					M
CLO6		L	M				L					L		L		

H: High, M: Medium, L: Low