

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	Power System Planning and Design
Course Code:	1ET1090802
Pre-requisite Course:	Electrical power generation and Electrical power system.

Course Objectives:

1. The students will acquire the knowledge regarding electrical and mechanical design of power system.
2. It highlights the basic concepts of generation, planning, transmission and distribution planning.
3. Students can also get knowledge of insulation co-ordination.

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.	
4	-	2	5	28	70	12	30	12	30	08	20	150

Course Contents:

Sr. No.	Topic	Total Hours	Weightage (%)
1	Transmission lines design: Requirements of transmission lines, selection of voltage for high-voltage transmission lines, choice of conductors, spacing of conductors, corona, insulators, specifications of transmission lines, surge impedance loading of transmission lines, electrical design of transmission lines, main considerations in the mechanical design of transmission lines, sag-tension relation, stringing of transmission lines, towers Design of EHV transmission lines : transmission of electric power at extra high voltage, design considerations of EHV lines, selection and spacing of conductors, corona, radio and television interference, insulation coordination, towers.	14	26%
2	Design of distribution systems: Development of a distribution plan, transmission and distribution systems, types of distribution systems arrangements, primary distribution design, secondary distribution design, distribution substations, calculation of distributor sizes: voltage drops, voltage regulation, Lamp flicker.	10	19%
3	Design of power system: Introduction, selection of sizes and location of generating stations, selection and specifications of transmission lines, sizes and location of substations, interconnection.	06	12%

4	Insulation Co-ordination: Introduction, definitions, determination of line insulation, B.I.L and insulation levels of sub-station equipment, lightning arrester selection, power system over voltages, tentative selection of arrestor voltage ratings, selection of arrestor discharge currents, arrestor discharge voltage, establishment of impulse voltage level of equipment, protective margin, establishment of separation limits, location of lightening arrestor.	10	19%
5	Power system improvement: Introduction, methods of power system improvement, power system improvement scheme, determination of the voltage regulation and losses in a power system, shifting of distribution transformer center, financial aspects of the power system improvement scheme.	06	12%
6	Power system planning: Introduction, methods of power system planning, forecasting load and energy requirements, generation planning, transmission system planning, distribution system planning, reliability of electrical power systems, methods of measuring power system reliability.	06	12%

Reference Books:

1. Electrical Power System Design – M. V. Deshpande, TMH publication, 2016.
2. A course in Electrical Power- Soni, Gupta and Bhatnagar, Dhanpat Rai & Sons, 2013.
3. Electrical Power System Design – B. R. Gupta, S. CHAND, 2005.
4. Substation Design – Satnam & Gupta, Dhanpat Rai and Co, 2018.
5. Electrical Power System Planning – A. S. Pabla, TMH publication, 2010.

List of Experiments:

1. Design of transmission line.
2. Visit of substation and draw its lay out plan.
3. Design of transmission line towers.
4. Survey of rural electrification and draw Single Line Diagram.
 - Visit to a village.
 - Supply is taken from pole mounted transformer and distributed in various part of village.
 - Load calculation, loading capacity of different equipments.
 - Verification of 3-phase balanced loading.
 - Finding transformer rating based on loading.
- 5 Survey of industrial distribution system and draw Single Line Diagram SLD.
6. Students should learn Indian standards related to design problems.

List of Open Source Software/learning website:

- <https://law.resource.org/pub/in/bis/> (useful website to download Indian standards)
- <http://www.electrical-engineering-portal.com/>

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

CLO	Description	Bloom's Taxonomy Level
CLO1	Learn and understand Electrical and Mechanical Design aspects of transmission lines.	2 Understanding
CLO2	Design transmission line (electrical and mechanical aspects).	5 Evaluating
CLO3	Design primary and secondary distribution.	5 Evaluating
CLO4	Selection of sizes and location of generating stations, substations.	4 Analyze
CLO5	To understand the basic concepts of insulation co-ordination.	2 Understanding
CLO6	To know the basic concepts of generation planning, transmission planning and distribution planning.	1 Remembering

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	M		L	H					L	H			L	L
CLO2	M			L			M	L						L		
CLO3			L					L	M							
CLO4		M	L	L		M				L		M	M		L	
CLO5	L								L		M		L	L		
CLO6		H		H	M		L					M				L

H: High, M: Medium, L: Low