

Ramgarhia Polytechnic College

Phagwara



Electrical Engineering Department

Head of Department:	Jasvir singh
Name of the Faculty:	Jasvir singh
Discipline:	Electrical Engineering Department
Semester:	5 th
Subject:	Electrical Power -1
Lesson Plan Duration:	16 Weeks

RATIONALE

The majority of the polytechnic pass-outs who get employment in State Electricity Boards have to perform various activities in the field of Generation, Transmission and Distribution of Electrical power. The range of these activities vary from simple operation and maintenance of equipment, lines, fault location, planning and designing of simple distribution schemes, executive and supervisory control in power stations, transmission and distribution networks in addition to administrative jobs including public relations. They should also be made aware of recent developments, current practices in the electricity departments, corporations and boards to keep them abreast with modern techniques in Transmission and Distribution of Electrical Power.

Learning Outcomes

After undergoing this course, the students will be able to:

CO -1- Distinguish and select suitable resource of energy required for a particular area and environment

CO -2 - Calculate effective cost generation

CO -3 - Select suitable supporting structure, insulators, conductors and other accessories for transmission lines and distribution lines

CO -4 - Prepare layout plan for HT and LT lines/distribution system

CO -5 - Prepare estimate for HT and LT (OH and underground cables) lines

CO -6 - Operate and maintain indoor and outdoor substations

CO -7 - Use various methods for improvement of power factor

CO & PO TABLE

PO \Rightarrow	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO \Downarrow							
CO1	✓						
CO2	✓						
CO3			✓				
CO4			✓			✓	
CO5	✓	✓					
CO6				✓		✓	
CO7				✓	✓		✓

Syllabus

Units	Details	Hours
1.	<p>Power Generation</p> <p>1.1 Main resources of energy, conventional and non-conventional</p> <p>1.2 Different types of power stations, thermal, hydro, gas, diesel and nuclear power stations. Flow diagrams and brief details of their operation, comparison of the generating stations on the basis of running cost, site, starting, maintenance etc.</p> <p>1.3 Importance of non-conventional sources of energy in the present scenario. Brief details of solar energy, bio-energy, wind energy</p>	(10hrs)
2.	<p>Economics of Generation</p> <p>2.1 Fixed and running cost, load estimation, load curves, demand factor, load factor, diversity factor, power factor and their effect on cost of generation, simple problems there on.</p> <p>2.2 Base load and peak load power stations, inter-connection of power stations and its advantages, concept of regional and national grid.</p>	(08hrs)
3.	<p>Transmission Systems</p> <p>3.1 Layout of transmission system, selection of voltage for H.T and L.T lines, advantages of high voltage for Transmission both AC and DC</p> <p>3.2 Comparison of different system: AC versus DC for power transmission, conductor material and sizes from standard tables</p> <p>3.3 Constructional features of transmission lines: Types of supports, types of insulators, Types of conductors, Selection of insulators, conductors, earth wire and their accessories, Transposition of conductors and string efficiency of suspension</p>	(20hrs)

	<p>type insulators, Bundle Conductors.</p> <p>3.4 Mechanical features of line: Importance of sag, calculation of sag, effects of wind and ice related problems; Indian electricity rules pertaining to clearance</p> <p>3.5 Electrical features of line: Calculation of resistance, inductance and capacitance without derivation in a.c. transmission line, voltage regulation, and concept of corona. Effects of corona and remedial measures</p> <p>3.6 Transmission Losses</p>	
4.	<p>Distribution System</p> <p>4.1 Lay out of HT and LT distribution system, constructional feature of distribution lines and their erection. LT feeders and service mains; Simple problems on AC radial distribution system, determination of size of conductor</p> <p>4.2 Preparation of estimates of HT and LT lines (OH and Cables).</p> <p>4.3 Constructional features of LT (400 V), HT (11 kV) underground cables, advantages and disadvantages of underground system with respect to overhead system.</p> <p>4.4 Calculation of losses in distribution system 132</p> <p>4.5 Faults in underground cables-determine fault location by Murray Loop Test, Varley Loop Test</p>	(14hrs)
5.	<p>Substations:</p> <p>5.1 Brief idea about substations; out door grid sub-station 220/132 KV, 66/33 KV outdoor substations, pole mounted substations and indoor substation</p> <p>5.2 Layout of 33/11 kV/400V distribution substation and various auxiliaries and equipment associated with in distribution system</p>	(08 hrs)
6.	<p>Power Factor:</p>	(04hrs)

	6.1 Concept of power factor 6.2 Reasons and disadvantages of low power factor 6.3 Methods for improvement of power factor using capacitor banks, VAR ` Static Compensator (SVC)	
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Reference Books:

1. Electrical Power System and Analysis by CL Wadhwa, 3rd edition, New Age International Publishers, New Delhi
2. Substation Design and Equipment by Satnam and PV Gupta, DhanpatRai& Sons, New Delhi
3. Electrical Power –I by SK Sahdev, Uneek Publications, Jalandhar
4. Electrical Power System by VK MehtaS Chand and Co., New Delhi
5. Electrical Power System by JB Gupta, SK Kataria and Sons, New Delhi

Delivery/Instructional Methodologies

Sr.No.	Description
1.	Chalk and Talk
2.	PowerPoint Presentation

Assessment Methodologies

Sr. No.	Description	Type
1.	Student Assignment	Direct
2.	Test	Direct
3.	Board Examination	Direct
4.	Student Feedback	Direct

Gaps in the syllabus - to meet industry/profession requirements

S.NO.	DESCRIPTION	PROPOSED ACTIONS	PO MAPPING
1	Sub- station visit	Going to 11kv/440v poll mounted sub- station	

Topics beyond syllabus/advanced topics

Units	Details	Hours
N/A	N/A	N/A

Web Source References

Sr. No.	URL
1.	https://nptel.ac.in/

Lesson Plan

Week	Theory		Practical	
	Lecture Day		Practical Day	
1 st	1 st	Main resources of energy, conventional and non-conventional	1.	N/A
	2 nd	Definition of hydro of power station and their advantage and disadvantage and small discussion.		
	3 rd	Flow diagrams and brief details of hydro of power station.		
	4 th	Definition of Thermal power station and their advantage and disadvantage and small discussion.		
	5 th	Flow diagrams and brief details of thermal power station.		

2 nd	6 th	Definition of Nuclear power station and their advantage and disadvantage and small discussion.	2.	N/A
	7 th	Flow diagrams and brief details of Nuclear power station.		
	8 th	Definition of Diesel power station and their advantage and disadvantage and small discussion.		
3 rd	9 th	Flow diagrams and brief details Diesel of power station.	3.	N/A
	10 th	Importance of non-conventional sources of energy in the present scenario. Brief details of solar energy, bio-energy, wind energy		
	11 th	Fixed and running cost, load estimation,		
	12 th	load curves, demand factor, load factor, diversity factor,		
	13 th	power factor and their effect on cost of generation,		

4 th	14 th	simple problems there on.	4.	N/A
	15 th	Discussion on Base load and peak load power stations, inter-connection of power stations and its advantages, Concept of regional and national grid.		
	16 th			
5 th	17 th	3.1 Layout of transmission system, selection of voltage for H.T and L.T lines, advantages of high voltage for Transmission both AC and DC.	5.	N/A
	18 th			
	19 th			
	20 th			
6 th	21 st	3.2 Comparison of different system: AC versus DC for power transmission, conductor material and sizes from standard tables	6.	N/A
	22 nd			
	23 rd	REVISION		

	24 th	1st Sessional Test (Tentative)		
7 th	25 th	<p>3.3 Constructional features of transmission lines:</p> <p>Types of supports, types of insulators, Types of conductors, Selection of insulators, conductors, earth wire and their accessories, Transposition of conductors and string efficiency of suspension type insulators, and Bundle Conductors.</p>	7.	N/A
	26 th			
	27 th			
	28 th			
8 th	29 th	<p>3.4 Mechanical features of line:</p>	8.	N/A
	30 th			
	31 st			
	32 nd			
	33 rd	3.4 Mechanical features of line:		

9 th	34 th	3.4 Importance of sag, calculation of sag, effects of wind and ice related problems; Indian electricity rules pertaining to clearance	9.	N/A
	35 th			
	36 th			
10 th	37 th	3.5 Electrical features of line: Calculation of resistance, inductance and capacitance without derivation in a.c. transmission line, voltage regulation, and concept of corona. Effects of corona and remedial measures	10.	N/A
	38 th			
	39 th			
	40 th	3.6 Transmission Losses		
11 th	41 st	4.1 Lay out of HT and LT distribution system, constructional feature of distribution lines and their erection. LT feeders and service mains;	11.	N/A
	42 nd			
	43 rd	Simple problems on AC radial distribution system, determination of size of conductor		

	44 th	REVISION		
12 th	45 th	PTM	12.	N/A
	46 th	2nd Sessional Test (Tentative)		
	47 th	4.2 Preparation of estimates of HT and LT lines (OH and Cables).		
	48 th			
13 th	49 th	4.3 Constructional features of LT (400 V), HT (11 kV) underground cables, advantages and disadvantages of underground system with respect to overhead system.	13.	N/A
	50 th			
	51 st	4.4 Calculation of losses in distribution system.		
	52 nd			

14 th	53 rd	4.5 Faults in underground cables-determine fault location by Murray Loop Test, Varley Loop Test.	14	N/A
	54 th			
	55 th	5.1 Brief idea about substations; out door grid sub-station 220/132 KV, 66/33 KV outdoor substations, pole mounted substations and indoor substation		
56 th				
15 th	57 th	5.2 Layout of 33/11 kV/400V distribution substation and various auxiliaries and equipment associated.	15.	N/A
	58 th			
	59 th			
	60 th			
	61 st	6.1 Concept of power factor 6.2 Reasons and disadvantages of low power factor		

16 th		6.3 Methods for improvement of power factor using capacitor banks, VAR ` Static Compensator (SVC)	16.	N/A
	62 nd			
	63 rd	PTM		
	64 th	3rd Sessional Test (Tentative)		

NBA has defined the following seven POs for an Engineering diploma graduate:

- i) **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
- ii) **Problem analysis:** Identify and analyze well-defined engineering problems using codified standard methods.
- iii) **Design/ development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
- iv) **Engineering Tools, Experimentation and Testing:** Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
- v) **Engineering practices for society, sustainability and environment:** Apply appropriate technology in context of society, sustainability, environment and ethical practices.

vi) **Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.

vii) **Life-long learning:** Ability to analyze individual needs and engage in updating in the context of technological changes.

Program Specific Outcomes (PSOs)

PSOs are a statement that describes what students are expected to know and be able to do in a specialized area of discipline upon graduation from a program. Program may specify 2-4 program specific outcomes, if required.

These are the statements, which are specific to the particular 11 program. They are beyond POs. Program Curriculum and other activities during the program must help in the achievement of PSOs along with POs.