

SEMESTER - S6
ELECTRICAL SYSTEM DESIGN AND ESTIMATION

Course Code	PCEET602	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None/ (Course code)	Course Type	Theory

Course Objectives:

1. To create awareness regarding electrical symbols, Indian Standard codes, Indian Electricity acts and NEC norms
2. To enable students to design the various electrical installations with necessary precautions to ensure life safety, risk prevention and continuous operation of the system
3. To help in energy-efficient electrical design in compliance with codes and regulations.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Awareness on IS Codes - IS 732, IS 3043, IS 2026- IS 3646-part 1 & 2 - IS 5216 part 1 & 2 Electricity supply code-2014, IE Act 1910, 2003, NEC LT system wiring components, selection of cables, wires, switches, distribution box, metering system, basics of star rating and labelling Principle of operation of Fuse, MCB, MCCB, ELCB/RCCB, isolator.	7
2	General requirements for electrical installations- Residential/ Commercial/ High rise building, method of load survey for electrical installation, Diversity factor Sizing and selection of wires, MSB, SSB, DB and protection devices. Design steps in electrical wiring, material estimation and development of single line diagrams. Electrical CAD (optional). Pre-commissioning test applicable to domestic installation	12

	<p>Lighting design calculations - Definitions of Luminous flux, Luminous intensity, Illuminance. Illumination calculation, factors affecting Coefficients of Utilisation (CoU) - Light Loss Factor (LLF).</p> <p>Design and Estimation the quantity of material required in Electrical Installation for - Small residential building/Flat/Factory (Micro-Project)</p>	
3	<p>Indoor and Outdoor substation- selection of transformer, switch gears and protective devices, Procedure for HT connection, design and estimation the quantity of material required for substations, Pre-commissioning tests for transformers</p> <p>Industrial loads, selection of starters, cable and switchgears, Power factor improvement – kVAR calculation, correction methods</p> <p>Design of MSB & SSB including Motor Control Centre (MCC) - Selection of bus bars (CU & Al) and Switchgears</p> <p>Specifications of LT Breakers and other LT panel components (Basics only)</p> <p>Selection of industrial UG cables - Calculation of ampacity, voltage drop, short circuit withstand capacity</p>	10
4	<p>Standby DG Systems with AMF panel – Essential protections. UPS system and its design for residential application</p> <p>Selection and installation of elevators and lifts</p> <p>Earthing and Soil Resistivity calculation– Earth electrodes. Methods of earthing - Plate earthing - Pipe earthing - Rod earthing. Methods of improving earth resistance - Size of earth continuity conductor</p> <p>Substation earthing and design (Theory only), substation lightning protection (Theory only)</p> <p>Solar PV Power generation – Design and installation of standalone and grid interactive Solar PV system -Smart meter/Net meter</p>	7

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> 2 Questions from each module. Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ul style="list-style-type: none"> Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the Indian standards and code of practice for efficient and effective energy usage with various electrical system design components.	K2
CO2	Design electrical wiring for residential and commercial consumers as per IS codes and NEC and integration of PV systems	K3
CO3	Design electrical installation for industrial consumers and high rise buildings.	K3
CO4	Analyse electrical system conditioning equipment and power backups.	K4
CO5	Design various earthing methods and protection	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1			2		2	2			2
CO2	3	3	3	1		2	2		2	1		2
CO3	3	3	3	1		2			2	1		2
CO4	3	3	3	1		2			2	1		2
CO5	3	3	3	1		2			2	1		2

Note: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	National Electrical Code, Bureau of Indian Standards.		Bureau of Indian Standards.	
2	Electrical Systems Design	M. K. Giridharan	IK International Publishers, New Delhi	
3	Electrical Design Estimating Costing	K. B. Raina, S. K. Bhattacharya	NEW AGE; Reprint edition	
4	Residential Commercial and Industrial Systems	H. Joshi	McGraw Hill Education	

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	National Lighting Code 2010, Bureau of Indian Standards.			
2	National Building Code of INDIA 2016 - Bureau of Indian Standards.			
3	A Course in Electrical Installation Estimating and Costing.	J. B. Gupta	S.K. Kataria & Sons	Reprint 2013 edition (2013)
4	Electrical estimating and costing	S. Singh, and R. D. Singh	Dhanpat Rai and Co.	1997