Program : **Diploma in Electrical and Electronics Engineering**	
Course Code : **4032**	Course Title: **Electrical Installation Design & Estimation**
Semester : **4**	Credits: **4**
Course Category: **Program Core**	
Periods per week: **4 (L: 3 T: 1 P: 0)**	Periods per semester: **60**

Course Objectives:

- To acquire knowledge about electrification schemes for the industrial and non-industrial buildings.
- To prepare schedule of materials with specifications and estimates for the electrical installations.

Course Prerequisites:

Topic/Description	Course code	Course Title	Semester
Electric Lamps		Elementary concepts of Electrical Systems	2
Basic concepts of wiring		Fundamentals of Electrical & Electronics Engineering	2
Knowledge of basic idea of design & estimation of installation.		Electrical Workshop Practice	3

Course Outcomes

On completion of the course, the students will be able to:-

COn	Description	Duration (Hours)	Cognitive Level
1	Prepare estimations for electrification of domestic installations	16	Applying
2	Prepare lighting design schemes for non-industrial installations	14	Applying
3	Prepare design schemes and estimations for Industrial installations.	14	Applying

4	Prepare layout and estimations for the erection of distribution lines and substations.	14	Applying
	Series Test	2	

CO-PO Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3						
CO2	3						
CO3	3						
CO4	3						

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline

On completion of the course, the students will be able to:-

Module Outcome	Description	Duration (Hours)	Cognitive Level
CO1	**Prepare estimations for electrification of domestic installations**		
M1.01	Select suitable components for power and light circuit wiring in electrical installations.	4	Applying
M1.02	Prepare estimates for the electrification of residential buildings.	7	Applying
M1.03	Prepare estimates for the electrification of commercial buildings.	4	Applying
M1.04	Outline the rules regarding electrification of high rise buildings	1	Understanding

Contents:
Relevant standards used for internal wiring - IS 732-various wiring methods as per IS 732-General rules for wiring - Relevant sections of CEA regulations regarding internal wiring. - review only

Estimation – definition – essential elements -specifications and symbols of various wiring accessories. Classification of Circuits-Light and Power circuits. Sub circuits- light sub circuit- power sub circuits. - Capacity of sub circuits- determination of sub circuits - problems. Switch boards-Main switchboard-sub switch board-Distribution board-Function – classification- specification.

Selection of cables for internal wiring-cable size calculation-simple problems. Selection criteria for control switches-main switch.-protective gears-RCCB-MCB-fuse. Coordination between fuses or MCBs at different circuit levels- size of earth continuity conductor and earthing conductor.

Estimation of domestic (non-industrial) Installations -Estimation of electrification in domestic buildings- preparation of layout, wiring, diagram and estimates - house, office buildings, auditorium.

Electrification of High rise buildings- definition –relevant rules regarding electrification of high rise buildings

CO2	**Prepare lighting design schemes for non-industrial installations.**		
M2.01	Choose relevant standards for illumination of residential buildings	4	Applying
M2.02	Select luminaires and lighting schemes for proper illumination at various places	4	Applying
M2.03	Design lighting scheme for domestic buildings	5	Applying
M2.04	Choose appropriate schemes for street lighting	1	Applying
	Series Test I	1	

Contents:

Relevant standards used for illumination - IS-3646 (1)-IS 6665 - review only

Illumination: Define terms used in illumination – laws of illumination (statement & proof) -problems- various lighting schemes-(Direct, indirect, semi direct and semi indirect.) – Recommended levels of illumination for various places (as per standards) – Space Height ratio – Utilization Factor - Depreciation Factor, Maintenance Factor-problems.
Lamps and luminaries-classification-luminous flux of various lamps- life span -applications.

Design of lighting schemes for domestic buildings-design considerations of good lighting schemes -calculation of number of lamps required-preparation of layout of lamp fittings -

problems

Industrial lighting- requirement-methods-street lighting-flood lighting

CO3	**Prepare design schemes and estimations for Industrial installations.**		
M3.01	Prepare the estimate and cost of materials used for a standard earthing.	2	Applying
M3.02	Prepare estimates for the electrification of industrial installations.	4	Applying
M3.03	Prepare schedule of electrical materials for the installation of domestic and irrigation pump sets	4	Applying
M3.04	Prepare the estimate and cost of materials used for service connection	4	Applying

Contents:
Relevant standards for earthing - IS 3043- review only-IE rules regarding earthing systems

Earthing - purpose-classification-rules regarding earthing as per IS 3043 – estimation of materials used for a standard pipe earthing and plate earthing.

Estimation of Industrial Installations
Single and three phase motors- -need of starter- selection of starters-rating of back up fuse-rating of cables- rating of earthing conductor-Prepare estimate for the electrification of small workshops below 50kW connected load- layout- main switch board/ sub switch board-design-single line diagram for the power wiring.

Estimation of Pump Sets -Preparation of estimate and schematic diagram for the installation of domestic and irrigation pump sets

Service connection- definition-classification-cables for service connections- -estimation and costing of service overhead and underground service connections- single phase and three phase.

CO4	**Prepare layout and estimations for the erection of distribution lines and substations.**		
M4.01	Make use of relevant rules for design & estimation of distribution lines and Substations.	3	Understanding
M4.02	Prepare the schedule of materials with specifications for single phase and three phase overhead distribution lines	4	Applying
M4.03	Prepare the estimate for extending an existing 11 kV overhead line	4	Applying

M4.04	Prepare estimate for the erection of 11kV substation	3	Understanding
	Series Test II	1	

Contents:

Distribution Lines and LT Substation
Overhead line construction- relevant sections of CEA regulations regarding overhead line construction.-review only

Over Head Line: construction Materials-OH line conductors - classification - specifications - applications. Line Insulators-classification-specifications-applications.
Line supports-classification-specifications-applications. stays, guys and guarding
Estimation problems for theextension of single phase and three phase distribution lines with and without street light.

Extension of distribution lines: Estimation problems on the extension of 11kV lines.

Substation- definition-classification-components of 11kV substation-estimation of 11kV pole mounted substation.

Text /Reference:

T/R	Book Title/Author
T1	Electrical Design Estimating and Costing - Raina, K.B.; Dr. S. K. Bhattacharya New Age International
T2	Electrical Estimating and Costing Allagappan, N. S. Ekambarram, Tata Mc-Graw Hill Publishing Co. Ltd,
T3	Electrical Wiring, Estimating and Costing. Dr.S.L.Uppal, New age international (p) limited
T4	Electrical Estimating and Costing _Singh, Surjit Ravi Deep Singh, DhanpatRai and Sons
T5	A Course in Electrical Installation Estimating and Costing - Gupta, J.B. S.K. Kataria and Sons
R1	Bureau of Indian Standard. SP-30:2011, National Electrical Code 2011
R2	Bureau of Indian Standard. IS: 732-1989, Code of Practice for Electrical Wiring Installation

Online resources

Sl.No	Website Link
1	https://bis.gov.in/index.php/standards/technical-department/electrotechnical/
2	http://www.electricaltechnology.org/2015/05/earthing-and-electrical-grounding-types-ofearthing.html
3	http://www.cpwd.gov.in/Publication/Internal2013.pdf
4	http://www.ceikerala.gov.in/
5	http://www.kseb.in/index.php?lang=en