



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Electrical Engineering

Course / Subject Code : DI03009011

Course / Subject Name : Electrical Wiring Estimating & Contracting

w. e. f. Academic Year:	2024-25
Semester:	3 rd
Category of the Course:	PCC

Prerequisite:	Knowledge of basic electrical concepts, wiring methods, safety regulations, circuit diagrams.
Rationale:	Electrical wiring plays a major role in distributing the electrical energy from electric utilities to consumer. Electrical diploma holders may work as Technicians and Supervisors for planning, installing, and testing various electrical wiring Installations such as residential, commercial and Industrial electrification schemes. They should be able to prepare costing and estimates for these schemes with a thorough understanding of the methods/procedure of estimating is desired. Knowledge of IE rules for different types of electrical Installation, their planning considerations equips the students with the capability to plan and prepare different Installation projects. Essential efforts are made in this course to develop above skills in the students.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Identify different wiring systems and recall IE regulations for electrical wiring estimation.	R
02	Describe domestic wiring layouts and explain estimation methods for electrical installations.	U
03	Interpret industrial wiring requirements and apply estimation techniques for electrical installations.	A
04	Summarize the estimation process for overhead and underground distribution systems.	U
05	Apply basic estimation techniques to service connection installations.	A

**Revised Bloom's Taxonomy (RBT)*



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Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA(M)	PA(I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Electrical Wiring, Estimation, and IE Regulations Contents: (1) Types of Electrical Wires and Cables (2) Casing-Capping and Conduit Wiring Systems (3) Specifications of Wiring Materials and Accessories (4) Wiring Tools and Their Applications (5) Basic Electrical Wiring Circuits (6) IE Rules for Wiring and Overview of the IE Act-2003 (7) Estimation and types of Estimation. (8) Schedule of Rates (SOR) (9) Total Cost	08	18 %
2.	Estimation and Costing of Domestic Electrical Wiring Contents: (1) General Rules and Standards for Domestic Wiring (2) Wiring Layout and Planning for Domestic Installations (3) Calculation of Electrical Load and Number of Sub-Circuits (4) Determination of Wiring Points (Lights, Fans, Socket Outlets, etc.) (5) Selection of Conductor Size Based on Load Requirements (6) Rating and Selection of Main Switch and Distribution Board (7) Types and Procedures of Domestic Electrical Installation Testing (8) Prepare an Electrical Test Report of Domestic Electrical	09	20 %



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	Installation (9) IE Rules and Safety Regulations for Domestic Wiring (10) Case Studies: Preparation of Estimation and Costing for Domestic Wiring		
3.	Estimation and Costing of Industrial Electrical Wiring Contents: (1) Key Considerations for Industrial Wiring and Motor Installations (2) Calculation of Input Current Requirements for Motors (3) Selection and Rating of Cables and Safety Accessories (4) Determination of Conduit Size for Industrial Wiring (5) Selection and Rating of Distribution Board, Main Switch, and Starters (6) Control Panel Wiring for various Motor Starters. (7) IE Rules and Safety Regulations for Industrial Wiring (8) Case Studies: Preparation of Estimation and Costing for Industrial Wiring	09	20 %
4.	Estimation and Costing of Overhead and Underground Distribution Systems Contents: (1) Overview of Overhead and Underground Distribution Systems (2) Materials and Accessories Required for Overhead Distribution Systems <ul style="list-style-type: none">• Conductor materials, size of conductor for overhead• Cross arms, pole brackets and clamps• Guys and stays, conductors configuration spacing and clearances,• Span lengths, overhead line insulators, insulator• Materials lightning arrestors,• Erection of supports, setting of stays• Earthing of lines,• Guarding of overhead lines,• Clearances of conductor from ground• Spacing between supports conductors	11	24 %



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	(3) Case Studies: Estimation of 3-Phase, 4-Wire or 3-Wire Overhead Distribution System (4) Materials and Accessories Required for Underground Distribution Systems (5) Case Studies: Estimation of 3-Phase, 4-Wire or 3-Wire Underground Distribution System (6) I.E. Rules and safety regulation for Overhead and Underground Distribution Systems		
5.	Estimation and Costing of Service Connections Contents: (1) Types of Electrical Service Connections <ul style="list-style-type: none">Residential Service ConnectionIndustrial Service ConnectionAgriculture Service Connection (2) Factors Affecting Service Connection Design and Costing (3) Materials and Accessories required for Service Connection (4) Methods of Installing Service Connections (Single-Phase and Three-Phase) <ul style="list-style-type: none">Overhead Service ConnectionUnderground Service Connection (5) IE Rules and Safety Regulations for Overhead, Underground, and Service Connections (6) Case Studies: Preparation of Estimation and Costing for Service Connections	08	18 %
	Total	45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
25 %	35 %	40 %	-	-	-



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Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Electrical Wiring, Estimating and Costing – Dr. S.L. Uppal, G.C. Garg, Edition: Sixth Edition (1987), ISBN: 978-8174092403, Publisher: Khanna Publishers
2. A Course in Electrical Installation, Estimating & Costing – J.B. Gupta, Edition: Ninth Edition (2012), ISBN: 978-9350142790, Publisher: S.K. Kataria & Sons
3. Electrical Design, Estimating & Costing – K.B. Raina, S.K. Bhattacharya, Edition: Second Edition (2010), ISBN: 978-8121923735, Publisher: New Age International Publishers
4. Indian Electricity Rules, 2003 (Latest Edition) – Government of India, Edition: Latest Edition, ISBN: 978-8121105513, Publisher: Universal Law Publishing
5. National Electrical Code (NEC) – Bureau of Indian Standards (BIS), Edition: 2011, ISBN: 978-8120417068, Publisher: Bureau of Indian Standards
6. Practical Guide to Electrical Estimating – Craig Schumann, Edition: First Edition (2009), ISBN: 978-1434375331, Publisher: Author House Goodreads
7. Description: Focuses on practical estimation techniques used in the industry.

(b) Open-source software and website:

- <https://archive.nptel.ac.in/courses/108/105/108105155/>
- <https://www.electrical4u.com/electrical-engineering-articles/transformer/>
- <https://electrical4u.in/dc-machines/>
- <https://lectures.gtu.ac.in/>
- <https://circuitglobe.com/>
- <https://www.electricaltechnology.org/>
- www.vlab.co.in
- www.khanacademy.org

Suggested Course Practical List:

Sr. No.	Practical Outcome/Title of Experiment	CO1	CO2	CO3	CO4	CO5
1	Demonstrate different types of electrical wires and cables	√				
2	Identify and use different wiring tools	√				



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3	Estimate wiring requirements for a simple domestic installation		√			
4	Plan and layout domestic wiring as per standards		√			
5	Estimate and cost industrial electrical wiring requirements			√		
6	Prepare an estimation report for an overhead distribution system				√	
7	Compare different service connection methods and estimate cost					√
8	Determine conductor size based on load requirements				√	√
9	Selection and rating of main switch and distribution board		√	√		
10	Test different wiring accessories and their applications	√				
11	Analyze wiring faults and suggest rectifications	√				
12	Prepare estimation for a small commercial building		√			
13	Design and estimate lighting layout for an office		√			
14	Conduct earthing and grounding measurements			√		
15	Prepare a cost estimation report for an industrial project			√		
16	Analyze and compare different types of wiring systems	√				
17	Analyze a simple control panel wiring for an industrial setup			√		
18	Prepare a cost estimation for underground cable laying				√	
19	Calculate load distribution and sub-circuit planning for a small building		√			
20	Case study on cost estimation of a real-world domestic Installation		√			



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21	Prepare Electrical Test Report of Domestic Electrical Installation		√			
22	Prepare Electrical Test Report of Industrial Electrical Installation			√		
23	Prepare a basic cost estimate for an overhead distribution line.				√	
24	Calculate the cost of an underground distribution system for a given data				√	
25	Prepare a cost estimate for an overhead service connection.					√
26	Compute the cost of an underground service connection for a small commercial setup.					√

List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name with Broad Specifications
01	Wiring Tools and Accessories Wire Strippers Cutting range: 0.5mm ² to 6mm ² , Pliers Size: 6-8 inches, Chrome Vanadium Steel, Screwdrivers Magnetic tip, Length: 100mm to 250mm, Hammer Claw type, Weight: 0.5-1 kg, Measuring Tape Length: 5m to 30m, Accuracy: ±1mm, Drilling Machine Power: 500-800W, Chuck size: 10-13mm Electrical Tester Voltage range: 100V to 500V,
2	Electrical Wires and Cables PVC Insulated Copper Wire Size: 1.5mm ² to 10mm ² , Voltage rating: 1100V, Aluminum Conductors, Size: 16mm ² to 150mm ² , Voltage rating: 11kV-33kV Armoured Cable Type: XLPE insulated, 4-core, Voltage rating: 11Kv, Flexible Cables 3-core, 2.5mm ² , PVC insulated
3	Electrical Distribution and Protection Devices Miniature Circuit Breakers (MCB), Rating: 6A-63A, Voltage: 240V/415V, Breaking Capacity: 10kA Residual Current Circuit Breaker (RCCB), Rating: 25A-100A, Sensitivity: 30mA-300mA Fuses Type: HRC/Cartridge, Rating: 10A-100A



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	Isolators Rating: 32A-125A, Voltage: 240V/415V Contactors Coil Voltage: 230V AC, Load Rating: 9A-100A Relays 5-pin SPDT, Coil Voltage: 12V-230V Switches Rating: 6A-16A, Voltage: 240V AC
4	Wiring Accessories Sockets Type: 3-pin, Voltage: 240V, Industrial: 3-phase 440V Lamp Holders, B22/E27 screw type, Material: Bakelite/Porcelain Junction Boxes PVC/Metal, IP55 rated Conduits PVC, Diameter: 20mm-32mm, Earthing and Grounding Equipment, Earth Resistance Tester Digital, Range: 0.01Ω to 2000Ω , Earthing Rod Copper, Length: 1.5m-3m, Diameter: 16mm-25mm, Copper Earthing Plate Size: 600mm \times 600mm \times 3mm, GI Wire for Earthing 8 SWG, Zinc-coated

Suggested Project List:

1. Electrical Diagrams: Prepare report on existing electrical drawings.
2. Domestic and commercial Installations: Collect civil drawing plan and prepare estimation for the same.
3. Industrial Installations: Collect industrial installation plan and prepare estimation for the same.
4. Distribution lines: Collect existing installation plan of distribution lines and prepare estimation for the same.
5. Service Connection: Collect existing installation plan of service lines and prepare estimation for the same.

Suggested Activities for Students:

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course. Students should perform following activities in group (or individual) and prepare reports of about 5 pages for each activity. They should also collect/record physical evidence for their (student's) portfolio which may be useful for their placement interviews:

- a) Prepare abstract of Indian standards related to industrial and non-industrial installations.



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- b) Summarize given section of National Electrical Code (NEC), 2011 required for electrical installation.
- c) Prepare report on market survey of various electrical accessories, wires, and cables (specification, manufacture, quality, cost)
- d) Collect any one electrical drawing of existing electrical installation and prepare for the same.
- e) Collect information of tender published in newspaper of e-tender related to industrial or non-industrial electrical installation and fill necessary documents.
- f) Prepare power point presentation for acquiring electrical installation work.
