



**Semester – IV**

**Subject Name: Electrical Wiring, Estimating, Costing and Contracting**

**Subject Code: 09EE2403**

**Diploma Branch in which this subject is offered:** Electrical Engineering

**Objective:** This subject is classified under technology and skill. The subject also plays a significant role in transmission and distribution of electrical energy from generation to distribution. Diploma electrical engineer works as a technician, supervisor and junior engineer in various companies' installation, testing, operation, & maintenance department. Students will gain knowledge of electrical installation drawings, IE rules, electrical supply code, and IS standard for different installation projects. In addition, the students understand the procedure of contract, contractor work, tendering, and purchasing of any electrical installation. Essential efforts to develop skill in students to acquire wiring, estimating, costing and contract of various types of installations.

**Credits Earned:** 3 Credits

**Course Outcomes:** After completion of this course, the student will be able

1. To understand the basic concept of the wiring system and standards related to the wiring system.
2. To understand and describe the basic term, general rules, circuit design procedure, wiring design for domestic and industrial installation
3. To prepare details estimation and costing of domestic, commercial and industrial electrical installation as per IE
4. To prepare estimation and costing of overhead & underground transmission and distribution line.
5. To understand the concept of contracts, estimation, costing, contracting, tender, EMD, SOR, purchasing and tender document and its detailed procedures.

**Pre-requisite of course:** Basic knowledge of DC and AC Circuits, Electrical Practices, Electrical Control Panel Design, Electrical DC Machine & Transformer and Electrical Software Skill-I.

**Teaching and Examination Scheme**

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term work	
0	0	6	3	00	30	20	25	25	100



**Contents:**

<b>Unit</b>	<b>Topics</b>	<b>Contact hours</b>	<b>Weightage (%)</b>
<b>1</b>	<b>Electrical Wiring System</b> <ul style="list-style-type: none"><li>• Introduction</li><li>• Types of wires and cables</li><li>• Different type of wiring system and methods of wiring procedure</li><li>• Differentiate of different type of wiring</li><li>• Different type and specifications of wiring materials, accessories, equipment and tools used for wiring work</li><li>• Type of wiring connection</li><li>• Diagram/Drawing of electrical wiring</li><li>• Lighting circuits</li><li>• Service mains and meter board connection</li><li>• Domestic and industrial panel wiring</li><li>• Earthing resistance and its value</li><li>• Testing of domestic installation</li><li>• Safety regulations regarding domestic wiring</li><li>• Indian electricity rules for wiring</li><li>• Electricity supply act</li><li>• Standard symbols as per IS</li><li>• Electrical accessories</li></ul>	<b>08</b>	<b>09</b>
<b>2</b>	<b>Elements of Estimating and Costing</b> <ul style="list-style-type: none"><li>• Introduction</li><li>• Estimating</li><li>• Purpose of estimating and costing</li><li>• Important function of estimation</li><li>• Types of estimation and it's comparison</li><li>• Factors to be considered for scientific estimation</li><li>• Tools used for estimating</li><li>• Total cost</li><li>• Various type of cost and special/service charges</li><li>• Estimation of total cost</li><li>• Special charges for estimation</li><li>• Purchase procedure</li><li>• Type/List of purchase procedure</li></ul>	<b>04</b>	<b>05</b>
<b>3</b>	<b>Estimating and contracting of Domestic and Industrial Installation/wiring</b>	<b>24</b>	<b>29</b>



	<ul style="list-style-type: none"><li>• Introduction</li><li>• Principal of lighting &amp; power circuit design for domestic electrical installation</li><li>• Layout and wiring diagram for residential and industrial wiring</li><li>• Power wiring diagram</li><li>• Requirement of good wiring system</li><li>• Calculation of load</li><li>• Selection of number of circuits and sub-circuits for wiring as per IE rules</li><li>• Selection of size of cable and wire</li><li>• Selection of switch-gears for domestic installation</li><li>• Estimation for domestic wiring</li><li>• General rules for domestic wiring</li><li>• Procedure and steps for domestics wiring estimation</li><li>• Wiring in a building complexes</li><li>• Estimation for industrial wiring</li><li>• Method of industrial wiring systems</li><li>• Salient features of industrial wiring</li><li>• Procedure and steps for industrial wiring estimation</li><li>• Modern trends in electrical wiring – MCB, ELCB, RCCB</li><li>• IE rules for domestics and industrial wiring</li></ul>		
<b>4</b>	<b>Installation, Estimating &amp; Costing of Service connections</b> <ul style="list-style-type: none"><li>• Introduction</li><li>• Meaning of Service connection and its types</li><li>• Survey of service connection and its types</li><li>• Methods of providing overhead and underground service connections</li><li>• Methods of estimation for overhead service lines and underground service lines</li><li>• List of materials and accessories for service connections</li><li>• Methods of installation of 1 phase and 3 phase service lines</li></ul>	<b>06</b>	<b>07</b>
<b>5</b>	<b>Estimating of Overhead Transmission and Underground Distribution line</b> <ul style="list-style-type: none"><li>• Introduction</li><li>• Typical AC electrical power system</li><li>• Main components of overhead line</li><li>• Line support and its properties</li><li>• Steel tower for transmission line</li><li>• Factors governing height of poles</li><li>• Conductor materials</li><li>• Determination of size of conductor for overhead transmission line</li><li>• Cross-Arms, Pole brackets and Clamps</li><li>• Guys and stays</li></ul>	<b>24</b>	<b>29</b>



	<ul style="list-style-type: none"><li>• Conductor configuration, spacing and clearances</li><li>• Span length</li><li>• Insulators for overhead line</li><li>• Insulator materials</li><li>• Types of insulators</li><li>• Lightning Arresters</li><li>• Phase plate, Danger plate, Anti-Climbing devices, Bird guards, Beads of Jumpers and Muffs</li><li>• Point to be considered at the time of erection of overhead line</li><li>• Erection of supports, Setting of stays</li><li>• Fixing of cross-arms and insulators</li><li>• Conductor erection and Jumpers</li><li>• Earthing and guarding of overhead line</li><li>• Clearance of conductors from ground</li><li>• Spacing between conductor</li><li>• Important specification and sketches</li><li>• Estimations of materials and cost for a transmission line project work</li><li>• Main components, specification and layout of overhead distribution line</li><li>• Materials and accessories required for overhead distribution line</li><li>• Estimate and costing for 440 volts, 3 phase 3/4 wire overhead distribution line</li><li>• Underground distribution system/line</li><li>• Material, accessories and its specification for underground distribution system</li><li>• Estimate of total cost of different type of underground distribution system</li></ul>		
<b>6</b>	<b>Estimating and Costing of Electrical Accessories and Equipments</b> <ul style="list-style-type: none"><li>• Introduction</li><li>• Market survey for the cost of various electrical products and equipment</li><li>• Relation between the cost and quality of electrical products</li><li>• Preparation of detailed drawing work of the products</li><li>• Preparation of material quantity sheet for products</li><li>• Preparation of cost schedule of products</li><li>• Validation of cost schedule</li></ul>	<b>04</b>	<b>05</b>
<b>7</b>	<b>Estimating and Costing of Maintenance of Electrical Devises and Equipments</b> <ul style="list-style-type: none"><li>• Introduction</li><li>• Conditions for normal working of electrical equipment</li><li>• Preventive maintenance and Trouble shooting</li></ul>	<b>08</b>	<b>09</b>



	<ul style="list-style-type: none"> <li>• Maintenance of electrical equipment and its importance</li> <li>• Material and cost for maintenance work</li> <li>• Estimation and costing of repair and maintenance of electrical equipment</li> <li>• To know different electrical equipment and location of fault</li> <li>• Need and procedure of testing after repair and maintenance</li> </ul>		
<b>8</b>	<p><b>Contracts, Tenders and Execution</b></p> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Definition and concept of contract and tender</li> <li>• The meaning and definition of the term contract</li> <li>• Difference between an agreement and contract</li> <li>• Valid contract, contract documents</li> <li>• Type of contract and contractors.</li> <li>• Conditions of contract</li> <li>• Definition of tender</li> <li>• Tender as a standing offer, Tender notices</li> <li>• Terms and conditions of tender</li> <li>• Preparation of tender</li> <li>• Procedure for inviting, submission and opening tenders.</li> <li>• Comparative statement , criteria for selection contractors, general condition in order form</li> <li>• Causes of invalid tender</li> <li>• Method of scrutinizing a tender</li> <li>• Procedure of accepting a tender, acceptance letter and it's important</li> <li>• Necessity and function of purchase committee</li> <li>• EMD – Earnest money deposit</li> <li>• Exemption to pay EMD</li> <li>• Security deposit</li> <li>• Schedule of rate – SOR and its necessity</li> </ul>	<b>06</b>	<b>07</b>

**Suggested List of Practical/Exercise:**

<b>Sr. No.</b>	<b>Unit No.</b>	<b>Name of Topics</b>	<b>Contact Hours</b>
1	1	To draw and prepare staircase wiring, godown, corridor, and tube-light wiring. Also, the study related to supply code and IE rules.	6
2	3	To draw a blueprint of a given model/project for domestic installation.	4
3	1/3	Draw and select appropriate wiring, material and accessories for given model/project.	6
4	2/3	Draw the wiring installation plan, estimate the materials required	10



		and calculate total cost of domestic installation, like building room installation / commercial installation / central hall of polytechnic installation / laboratory room installation etc.	
5	2/3	Draw installation diagram and prepared estimation and costing of an industrial installation, like big maintenance workshop / large factory shed / small chemical factory / food factory etc.	10
6	4	Draw installation diagram and prepare estimate and costing of single and three phase overhead / underground service connection.	6
7	5	To prepare estimation of material, specification and costing for 440V / 6.6KV / 11KV, 3phase, 3/4 wire distribution line/system. (Overhead / Underground)	12
8	5	To prepare estimation of material, specification and costing for 66KV/132KV/220KV/400KV Transmission line.	12
9	6 & 7	To prepared estimate of material, costing and specification of any one electrical equipment. Also prepare estimate of material, costing and specification of repair and maintenance of same equipment.	12
10	8	To prepared a tender for any one from below Domestic installation, Industrial installation Distribution line, Transmission line, Service line and Meter connection, Repair and maintenance of any electrical equipment.	6

**Instructional Method:**

- The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.
- Show video or animation of working of various types of wiring system and electrical transmission and distribution network

**References:**

- J.B. Gupta, "A Course in Electrical Installation Estimating & Costing", S. K. Kataria & Sons, 2012



2. K.B. Raina and S.K. Bhattacharya, “*Electrical Design, Estimating and Costing*”, New Age International Publishers, 2012
3. Surjit Singh, “*Electrical Estimating and Costing*”, Dhanpat Rai & Co. LTD., 2016.
4. S.L. Uppal, “*Electrical Wiring, Estimating and Costing*”, New Age International Publishers, 2011
5. B.D. Arora, “*Electrical Wiring, Estimating and Costing*”, R.B. Publication, New Delhi

**Supplementary Resources:**

<https://powermin.nic.in/en/content/electricity-act-2003>

<http://www.cercind.gov.in/ElectSupplyAct1948.pdf>

[http://www.bis.org.in/sf/ced/CED46\(8068\)\\_26112015.pdf](http://www.bis.org.in/sf/ced/CED46(8068)_26112015.pdf)

<http://nitp.ac.in/php/electrical/EE152%20Electrical%20Wiring%20Drawing,%20Estimation%20and%20Costing.docx>

<http://www.pgvcl.com/download/REGULATION/RecoveryofExpenses.pdf>

<http://www.pgvcl.com/consumer/consumerguide.php>

[http://www.getcogujarat.com/getco\\_new/pages/live%20tenders.php](http://www.getcogujarat.com/getco_new/pages/live%20tenders.php)

<http://www.gseb.com/guvnl/TenderView.aspx?tid=5713>

<http://www.gseb.com/guvnl/TenderView.aspx?tid=5713>

<https://electrical-engineering-portal.com/maintenance-of-electrical-equipment-in-buildings>

<https://electricalnotes.wordpress.com/author/jiguparmar/>