GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: WIRING ESTIMATING, COSTING AND CONTRACTING
(COURSE CODE: 3350901)

Diploma Programme in which this course is offered	Semester in which offered
Electrical Engineering	5th Semester

1. RATIONALE

Electrical wiring plays a major role in distributing the electrical energy from electric utilities to consumer. Electrical diploma holders have to 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, tendering/ contracting 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.

2. LIST OF COMPETENCY

The course content should be taught and implemented with the aim to develop required skills so that students are able to acquire following competency:

- **Carry out wiring estimating, costing and contract of various types of installations.**

3. COURSE OUTCOMES

The theory should be taught and practical should be undertaken in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domains to demonstrate the following course outcomes:

i. Prepare an estimate of quantity and cost of the material for a electrical project following IE Act-2003.
ii. Prepare detail estimate and costing of Residential and commercial Electrical Installations following IE Act-2003.
iii. Test Residential, commercial and Industrial Electrical Installation following IE Act-2003.
iv. Prepare detail estimate and costing of a transmission line/Overhead and underground distribution project following IE Act-2003.
v. Prepare estimates for repairs and maintenance of electrical devices and equipment.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
3	0	2	5	70	30	20	30	150

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit, **ESE** - End Semester Examination; **PA** - Progressive Assessment.

5. COURSE CONTENT DETAILS

Unit	Major Learning Outcomes (outcomes in Cognitive Domain)	Topics and Sub-topics
Unit – I Electrical Wiring and IE Rules	1a. Differentiate between different types of wiring system 1b. List the applications of different types of wiring tools 1c. Troubleshoot different types of wiring circuits 1d. Explain the IE rules of wiring	1.1 Types of wires, wiring system. 1.2 Specifications of Different types of wiring materials, Accessories 1.3 Wiring tools. 1.4 Wiring circuits. 1.5 Domestic and industrial panel wiring. 1.6 I.E. rules for wiring, IE Act-2003.
Unit– II Estimating, Costing and Contracting	2a Classify types of estimation and estimation tools 2b Describe Purchase procedure 2c Explain the types of contracts and contractors. 2d Explain the concept of contracts and Tenders 2e Explain the procedure for submission and opening of tenders. 2f Explain the principles of Execution of works 2g Explain the procedure for Billing of executed work	2.1 Estimation and estimation tools. 2.2 Electrical Schedule of rates, catalogues, Survey and source selection, Recording estimates 2.3 Quantity and cost of material required. 2.4 Purchase system, Purchase enquiry and selection of appropriate purchase mode, Comparative statement, Purchase orders, Payment of bills 2.5 Types of contract system. 2.6 Tendering procedure and preparation of simple tender, Earnest Money Deposit, Security Deposit 2.7 Schedule of rates (S.O.R.)
Unit– III Estimating and Costing of Domestic and Industrial Wiring	3a. Prepare Layout and wiring diagram for domestic wiring. 3b. Calculate the Load, quantity and cost of material required for domestic wiring.	3.1 Layout for domestic Wiring, 3.2 Load calculation 3.3 Cable selection 3.4 Earthing 3.5 Selection of switchgear. 3.6 Overall Estimating and costing

Unit	Major Learning Outcomes (outcomes in Cognitive Domain)	Topics and Sub-topics
	3c. Prepare Layout and wiring diagram for industrial wiring. 3d. Calculate the Load, quantity and cost of material required for industrial wiring.	3.7 Layout for domestic Wiring, 3.8 Load calculation 3.9 Cable selection 3.10 Earthing 3.11 Selection of switchgear. 3.12 Overall Estimating and costing
Unit– IV Estimation of Overhead Transmission Line, and Underground Distribution System	4a. Sketch layout of transmission line with specifications 4b. Prepare plan of transmission line project work. 4c. Determine main components and specification of transmission line. 4d. Estimate quantity of material and cost required for a transmission line project work.	4.1 Transmission lines, Line supports, Factors governing height of pole, 4.2 Conductor materials, size of conductor for overhead 4.3 Transmission line: 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, 4.4 Earthing of lines, Guarding of overhead lines, Clearances of conductor from ground, Spacing between supports conductors, 4.5 I.E. rules pertaining to LV Transmission lines
	4e. Draw layout of overhead distribution line. 4f. Prepare plan of overhead distribution project work. 4g. Determine main components and specification of overhead distribution system. 4h. Estimate quantity of material and cost required for a overhead distribution project work. 4i. List Types of service connections	4.6 Describe Method of installation of service connection(1-phase and 3-phase), observing I.E. rules 4.7 Overhead distribution system. 4.8 Materials and accessories required for the overhead distribution system. 4.9 Estimate for 440 V, 3-phase, 4 wires or 3 wires overhead distribution system. 4.10 Types of service connections 4.11 Method of installation of service connection(1-phase and 3-phase), 4.12 I.E. rules pertaining to overhead lines and service connection
	4j. Draw layout of underground distribution system. 4k. Prepare plan of underground distribution project work. 4l. Determine main components and specification	4.13 Underground distribution system. 4.14 Materials and accessories required for underground distribution system. 4.15 Estimate for 440 V, 3-phase, 4 wires or 3 wires underground distribution system. 4.16 I.E. rules pertaining to underground system and service

Unit	Major Learning Outcomes (outcomes in Cognitive Domain)	Topics and Sub-topics
	of underground distribution system. 4m. Estimate quantity of material and cost required for a overhead distribution project work.	connection.
Unit-V Estimating and Costing of Repairs and Maintenance of Electrical Devices and Equipment	5a Survey market for cost of products and parts. 5b Prepare drawing of products 5c Prepare cost table for new product 5d Prepare cost table for repair and maintenance of electric fan, automatic electric iron, single phase transformer, mixer grinder, D.O.L. Starter. 5e List Tools used for repairs & maintenance work	5.1 D.O.L. starter, small motor, mono block pump, automatic electric iron, table/ceiling fan, ICDP/ICTP Switch, etc. 5.2 Preparation of detailed drawing work of the product. 5.3 Preparation of material quantity sheet for the product. 5.4 Materials and cost required for maintenance work. 5.5 Estimation of repairing cost and overall cost. 5.6 Tools used for repairs & maintenance work Preparation of cost schedule for repair and maintenance of electric fan, automatic electric iron, single phase transformer, mixer grinder, D.O.L. Starter.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Electrical Wiring	6	04	04	02	10
II	Elements of Estimating and concepts of contracting.	6	04	04	02	10
III	Estimating and Costing of Domestic and Industrial Wiring	8	04	05	06	15
IV	Estimation of Transmission line, Overhead and Underground Distribution System	14	05	10	10	25
V	Estimating and Costing of Repairs and Maintenance of Electrical Devices and Equipment	8	02	04	04	10
	Total	**42**	**19**	**27**	**24**	**70**

Legends: R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

7. SUGGESTED LIST OF EXERCISES/PRACTICALS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills ***(outcomes in psychomotor and affective domain)*** so that students are able to acquire the competencies/course outcomes. Following is the list of practical exercises for guidance.

Note*: outcomes in psychomotor domain are listed here as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of* ***Course Outcomes*** *related to affective domain. Thus over all development of* ***Programme Outcomes (****as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty members should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical/Exercises (outcomes in psychomotor domain)	Approx. Hrs.
1	I	Undertake following wirings a. Tube light wiring b. Stair case wiring c. Go down wiring d. Parallel loop wiring.	4
2	I	Select appropriate wiring and list materials and accessories for given project	2
3	II	Prepare a tender notice for given project work	2
4	III	Prepare cost estimate of a domestic installation cost (Residential building, laboratory room or Drawing hall etc).	4
5	III	Prepare cost estimate of an industrial installation. (workshop, agriculture, flour mill, etc.)	4
6	IV	Prepare cost estimate of an overhead service connection. (single phase and three phase).	4
7	IV	Prepare cost estimate of an underground service connection (single phase and three phase).	4
8	IV	Estimate of material and specifications required for 220kV/110kV Transmission line.	4
9	IV	Estimate of material and specifications required for overhead, 440 V, 3-phase, 4 wire or 3 wire distribution line.	4
10	V	Estimate of material and specifications of any one Electrical Product	4
11	V	Estimate of material and specifications of repairs and maintenance of any one domestic appliance	4
Total Hours (perform any practical worth 28 hours from above depending upon the availability of resources so that most units are covered)			**40**

8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like:

i. Prepare journals based on practical performed in laboratory.
ii. Assignments on solving numericals
iii. Reads drawing of electrical installation and calculates quantity of material required for various electric installation and power projects
iv. Writes specifications and selection of the material required for various electric projects.
v. Checks bills of contractor (s) for payment by referring schedule of rates described by electricity authorities.
vi. Survey and collect rates for various items of works.
vii. Gather Electrical work tender notices from news paper and read and interpret it.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

Field / industrial visit

10. SUGGESTED LEARNING RESOURCES

A) List of Books

S. No.	Title of Book	Author	Publication
1.	Electrical Design, estimating & Costing	Raina, K. B. and Bhattacharya,S.K.	New Age International (p) Limited, New Delhi
2.	Electrical Estimating & costing	Uppal, S L	New Age International (p) Limited, New Delhi
3.	Electrical Installation Estimating & Costing	Gupta, J.B.	S. K. Kataria & Sons, New Delhi
4.	Relevant IS Code for-service line connection, laying of cable, wiring installation	NBC	National Building Code-Vol. IV
5.	I.E. rules for wiring, Electricity supply act-1948.	Bureau of Indian Standards	Electricity supply act-1948.

B) List of Major Equipment/ Instrument with Broad Specifications

i. Different wiring Tools and wiring material – 1 Set
ii. DOL starter – 1 No.
iii. Star delta starter – 1 No.
iv. Auto transformer starter – 1 No.
v. Monoblock pump – 1 No.
vi. Automatic electric iron – 1 No.
vii. Table/ceiling fan – 1 No.
viii. ICDP/ICTP – 1 No.
ix. Automatic electric iron, – 1 No.
x. Single phase transformer – 1 No.
xi. Mixer grinder – 1 No.

C) List of Software/Learning Websites

i. www.vlab.com
ii. www.nptel.iitm.ac.in

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. V. R. Kotdawala,** Lecturer in Electrical Engineering, Government Polytechnic, Himatnagar
- **Prof. A. A. Amin**, Lecturer in Electrical Engineering, Government Polytechnic, Vadnagar.

Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. Walkey, A.S** Associate Professor, Department of Electrical and Electronics Engineering,
- **Dr. Joshua Earnest,** Professor, Department of Electrical and Electronics Engineering,