

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD

COURSE CURRICULUM
COURSE TITLE: ELECTRIFICATION OF BUILDING COMPLEXES
(COURSE CODE: 3360908)

Diploma Programme in which this course is offered	Semester in which offered
Electrical Engineering	Sixth

1. RATIONALE

With the revolutionary changes in the building construction, advent of new building materials and electrical fittings and accessories there is an increase in demand for specialists in electrification of high rise-multistoried building and commercial complexes. Therefore a limited exposure to electrification of small building is not sufficient and this subject needs to be taught as a specialized subject. This course will provide knowledge about electrification of high rise buildings and complexes. Studying this course will enable the diploma pass outs to plan, design, and estimate and execute the electrification of multistoried buildings and commercial complexes independently and professionally as per IE rules. If proper skills are developed then pass outs may start their own business of electrification of building complexes, which is very profitable and growing business and requires very less investment.

2. COMPETENCY

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

- **Applying IE rules, undertake the electrification of multistory buildings and commercial complexes.**

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:

- Interpret plan and wiring diagrams of electrification of buildings and complexes.
- Calculate the average and peak power requirement of building complexes.
- Test a given wiring installation of a building and prepare test report.
- Test wiring installation of a multistoried building and commercial complexes.
- Estimate the materials and cost of electrification for different buildings.
- Test the safety devices in a multistoried building and commercial complexes.

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	

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 (in Cognitive Domain)	Topics and Sub-topics
Unit – I. Elements of Electrification	1a. Interpret different electrical engineering drawings of an electrical installation. 1b. Measure and verify current, earthing resistance , insulation resistance and continuity of a wiring installation as per IS. 1c. Describe the safety tests as per IS. 1d. Calculate illumination requirements.	1.1 of Electrical installation 1.2 Reading and Interpretation of Electrical Engineering Drawings, diagrams, plans and layout 1.3 Testing of wiring Installation for verification of current, earthing resistance, insulation resistance and continuity as per IS 1.4 Preparation of testing/supervisory report 1.5 Selection of electrical accessories such as main cable, main switches circuit breakers etc. 1.6 Illumination requirements in high rise, Commercial and public Building 1.7 Economical illumination design
Unit– II Electrification of Multistoried Buildings	2a. Prepare wiring layout of Electrical installation. 2b. Calculate total load on electrical distribution work. 2c. Prepare specification of wiring material and accessories required for an electrical installation. 2d. Estimate floor wise electrical material requirements.	2.1 Wiring layout of an electrical installation 2.2 Type of wiring- Concealed /Surface conduit etc 2.3 Calculate number of sub circuits from the total circuit requirement 2.4 Calculation total electrical load on distribution work 2.5 Floor wise estimation of material requirements <ol style="list-style-type: none"> i. Specification of wiring material and accessories. ii. Estimation of total cost of electrification using schedule of rates (SOR). iii. Case Studies 2.6 Requirements of approval from electrical inspection for high rise-multistoried building 2.7 Load calculation for lifts, escalators, air conditioners: wiring diagram, Case studies(Problems)
Unit– III Electrification of Commercial Complexes and Public Buildings	3a. Interpret Installation drawing and layout of electrical wiring of a commercial complex. 3b. Differentiate between electrification of Residential and commercial Installation. 3c. Calculate Load specification	3.1 Concept of commercial Installation 3.2 Comparison of Residential and commercial Installation 3.3 Fundamental considerations for planning of an electrical installation system for commercial/Public building

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
	<p>for service connection and nature of supply.</p> <p>3d. Calculate the correct size of cables, bus bar and bus bar chambers.</p> <p>3e. Select appropriate mounting arrangements and positioning of switchboards, distribution boards, main switch, type of wire and wiring system.</p> <p>3f. Estimate the cost of electrification of commercial installation.</p>	<p>3.4 Special requirements of hotels, theaters, library and cultural halls etc. from electrification points of view</p> <p>3.5 Estimating and Costing of material and total cost of electrification of commercial complexes and Public buildings</p>
Unit – IV Distribution System for Multistoried Buildings	<p>4a. Prepare drawing and layout for an underground service connection.</p> <p>4b. Calculate Load specifications for an underground service connection of multistoried buildings.</p> <p>4c. Calculate the size of bus bar, cables, panels, wiring system, type of wire</p> <p>4d. Decide Mounting arrangements and positioning of switchboards, distribution boards main switch etc.</p> <p>4e. Estimate the cost of multistoried buildings.</p>	<p>4.1 Different Methods of service connection</p> <p>4.2 Incoming supply to substation for multistoried high rise buildings (building height more than 15m.)</p> <p>4.3 Distribution panels and bus bar system</p> <p>4.4 Meter connection-bifurcation of metering-meters as per consumers demand, use of digital – meters for prevention of theft of power</p> <p>4.5 Cable laying in building, special precautions</p> <p>4.6 Estimating and costing of electrification of underground service connection of multistoried building.</p>
Unit – V Electrical Safety and IE Rules	<p>5a. Highlight the significance of safety rules to be followed in a Multistoried building.</p> <p>5b. Conduct safety tests as per IE.</p> <p>5c. Maintain various safety devices in multistoried buildings.</p> <p>5d. Maintain Diesel Generator set as a stand by unit.</p>	<p>5.1 Importance of safety rules.</p> <p>5.2 Safety precaution in electrical installation of multistoried buildings</p> <ul style="list-style-type: none"> i. Fire alarm system ii. Smoke detection system iii. Safety for lifts and escalators iv. Earthing system (IE rules regarding safety) v. Lightning arrestors arrangements vi. Use of ELCB and MCB in an installation vii. Electronic safety locks at the entrance <p>5.3 Use of National Building Code</p>

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
		(electrical service) for safety 5.4 Use of D.G. set as a standby power supply in case of emergency. 5.5 IE rules related to Electrical Installation and Testing

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	Elements of Electrification	6	3	3	3	09
II	Electrification of Multistoried Buildings	10	5	6	6	17
III	Electrification of Complexes and Public Buildings	10	5	6	6	17
IV	Distribution System for Multistoried Buildings.	10	5	6	6	17
V	Electrical Safety and I.E. rules	6	3	3	4	10
	Total	42	21	24	25	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised 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 EXERCISES/PRACTICALS

The practical 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/programme outcomes. Following is the list of practical exercises for guidance.

*Note: Here only outcomes in psychomotor domain are listed as practical. However, if these practical 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 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. required
1	II	Draw a complete wiring diagram, of any one of the commercial complexes. (Cinema, hotel, library, cultural hall, hospital etc. A group of 5 students, having one different complex –per group.	4
2	III	Interpret and prepare electrical test report of a large building or complex.	2
3	III	Calculate load, draw wiring diagram and estimate cost of any given high rise building.	4
4	I	Design Economical illumination system for any complex, building.	4
5	V	Testing of safety Devices in electrical installation in a high rise building.	4
6	II	Calculate Load for lift, escalators, air conditioning in high rise building. (A group of 5 students, having one different complex per group.)	4
7	V	Prepare field visit report (Important observations) of any high-rise building or Complex for electrical installation and wiring.	2
8	I and V	Perform electrical tests for commercial and high rise buildings as per IE.	4
Total Hours			28

8. SUGGESTED STUDENT ACTIVITIES

Following is the list of proposed student activities:

- i. Prepare journals based on practical performed in laboratory.
- ii. Assignments on solving numerical
- iii. Assignments of case studies
- iv. Analyze the standard specifications of various electrical accessories and fittings.
- v. Make comparative table of different types of wiring installations.
- vi. Prepare a sample test report based on test carried out on an installation
- vii. Visit to see the electrification of large multistoried building or commercial building complex

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- i. Arrange lectures by 'A' class contractors engaged in electrification works of building complexes.
- ii. Arrange a visit to a complex, multistory building under construction where electrification work is in progress.
- iii. Show video/animation film to demonstrate the different types of wiring and installations
- iv. Carry out a survey and prepare a report on different type of cables, their sizes and modern electrical accessories and fittings available in local market
- v. Use Flash/Animations to explain the working of different electrical safety devices.
- vi. Give Mini projects (such as planning and estimating of electrification of given building complex) to students.

10. SUGGESTED LEARNING RESOURCES

A) Books

S. No.	Title of Book	Author	Publication
1.	Electrical Design Estimation and Costing	Raina K.B. Bhattacharya S.K.	Willet Estern Ltd., Latest edition
2.	Electrical Estimation and Costing	Uppal S.L.	Khanna Publisher, New Delhi, Latest edition
3.	India Electrical Rules 1956 Hand book	Chudley R.	Butterworth –London New Delhi. Latest Edition, Latest edition
4.	National Building code of India Group 1 and Group 4	Bureau of Indian standard	New Delhi, Book no. 1604, Latest Edition
5.	A Course in Electrical Installation, Estimating and Costing	Gupta J.B.	S.K. Kataria and Sons, Latest edition

B) Major Equipment/Instruments with Broad Specifications

1. Digital Multimeter
2. Clip-on meter
3. MEGGAR
4. EARTH TESTER
5. MULTIMETER
6. Basic wiring tools

Pliers, Screw drivers and nut drivers ,Wire strippers , Utility Knife, Fishing tools, Measuring devices, Labeling machines, Power drills and drivers, hammer/drills, Power saws

C) Software/Learning Websites

- i. www.nptel.iitm.ac.in
- ii. <http://www.edumedia-sciences.com>
- iii. www.youtube
- iv. <http://electrical-engineering-portal.com/>

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. V. R. Kotdawala**, L.E.E, Government Polytechnic, Himmatnagar
- **Prof. A. A. Amin**, L.E.E, Government Polytechnic, Vadnagar

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. (Mrs.) C.S. Rajeshwari**, Professor, Department of Electrical and Electronics Engineering,
- **Prof. A. S. Walkey**, Associate Professor, Department of Electrical and Electronics Engineering,