

**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD,
GUJARAT**

**COURSE CURRICULUM
COURSE TITLE: ELECTRIFICATION OF BUILDING AND 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 a increase in demand for specialists in electrification of high rise-multistoried building and 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 insight on electrification of high rise buildings and complexes. Studying this subject will enable the diploma pass out student to independently, professionally plan, design, estimate and execute the electrification of multistoried buildings and commercial complexes as per IE rules.

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:

- **Undertake/Carry out electrification of multistory buildings and commercial complexes as per IE rules.**

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. Interpret plan and wiring diagrams of electrification of buildings and complexes.
- ii. Test a given wiring installation of a building and prepare test report.
- iii. Test wiring installation of a multistory, commercial building and complexes.
- iv. Estimate the materials and cost of different electrification.
- v. Test the safety devices in a multistoried buildings.

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 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, insulation resistance and continuity of a wiring installation as per IS. 1c. Perform safety tests as per IS. 1d. Calculate illumination requirement.	1.1 Classification of Electrical Installation. 1.2 General requirement of Electrical installation. 1.3 Reading and Interpretation of Electrical Engineering Drawings, diagrams, plans and layout 1.4 Testing of wiring Installation for verification of current; earthing, insulation resistance and continuity as per IS 1.5 Preparation of testing/supervisory report 1.6 Selection of main cable, main switches, circuit breakers, etc. 1.7 Illumination requirements in high rise, Commercial and public Building. 1.8 Economical consideration in the illumination design.
Unit– II Electrification of multistory 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 2.1 Electrification of wiring supply-location from nearby substation, Type of wiring- Concealed, conduit or Surface conduit. 2.2 Decision on number of sub circuits from the total circuit requirement. 2.3 Calculation of total load on electrical distribution work. 2.4 Estimation of material requirements floor wise. 2.4.1 Specification of wiring material and accessories. 2.4.2 Estimation of total cost of electrification using Schedule Of Rates. 2.5 Case studies. 2.6 Requirements of approval from electrical inspection for high rise building. 2.7 Load calculation for lifts, escalators, air conditioners and their simplified wiring diagram

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
		2.7.1 Problems 2.7.2 Case studies.
Unit– III Electrification of complexes and public buildings	3a Interpret Installation drawing and layout of a commercial building. 3b Differentiate between electrification of Residential and commercial Installation. 3c Calculate Load and prepare specification for service connection and nature of supply. 3d Choose the correct size of cables, bus bar and bus bar chambers. 3e Select appropriate mounting arrangements and positioning of switchboards, distribution boards, main switch, type of wire and wiring system. 3f Estimate the cost of commercial installation.	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 building. 3.4 Special requirements of hotels, theaters, library and cultural halls etc. from electrification points of view. 3.5 Estimation of material requirement, unit cost and total cost of electrification of complexes. 3.6 Case studies.
Unit – IV Distribution system for multistoried buildings	4a. Prepare drawing and layout for an underground service connection. 4b. Calculate Load and prepare specification for multistoried high rise buildings 4c. Decide the size of cables, panels and bus bar. 4d. Decide Mounting arrangements and positioning of switchboards, distribution boards main switch etc. 4e. Decide type of wire, wiring system & layout. 4f. Estimate the cost of commercial installation	4.1 Methods and Estimation of underground service connection. 4.2 Incoming supply to substation for multistoried high rise buildings (building height more than 15m.) 4.3 Distribution panels and bus bar system. 4.4 Meter connection- bifurcation of metering-meters as per consumers demand, use of digital – meters for prevention of theft of power. 4.5 Cable laying in building, special precautions
Unit – V Electrical safety and IE rules	5a. Highlight the significance of safety rules to be followed in a Multistoried building. 5b. Conduct safety tests as per IE. 5c. Maintain various safety devices in multistoried buildings. 5d. Maintain Diesel Generator	5.1 Importance of safety rules. 5.2 Safety precaution in electrical installation of multistoried buildings. 5.2.1 Fire alarm system. 5.2.2 Smoke detection system. 5.2.3 Safety for lifts and escalators.

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
	set as a stand by unit.	5.2.4 Earthing system (IE rules regarding safety). 5.2.5 Lightning arrestors arrangements. 5.2.6 Use of ELeB and MCB in an installation. 5.2.7 Electronic safety locks at the entrance. 5.3 Use of national building code (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 = 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 tutorial/practical/exercises should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills (**Outcomes in cognitive, psychomotor and affective domain**) so that students are able to acquire the competencies.

Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Hrs. required
1	I	Design Economical illumination system for any complex, building.	4
2	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
3	II	Calculate Load for lift, escalators, air conditioning in high rise building. (A group of 5 students, having one different complex per group.)	4
4	III	Interpret and prepare electrical test report of a large building or complex.	2
5	III	Calculate load, draw wiring diagram and estimate cost of any given high rise building.	4
6	V	Testing of safety Devices in electrical installation in a high rise building.	4
7	V	Prepare field visit report (Important observations) of any high-rise building or Complex for electrical installation & wiring.	2
8	I & V	Perform electrical tests for commercial and high rise buildings as per IE.	4

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. Arrange a visit to see the electrification of large multistoried building or commercial building complex

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- i. Show video/animation film to demonstrate the different types of wiring and installations
- ii. Carry out a survey and prepare a report on modern electrical accessories and fittings available in local market
- iii. Use Flash/Animations to explain the working of different electrical safety devices.
- iv. Give Mini projects to students

10. SUGGESTED LEARNING RESOURCES

A) Books

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

B) Major Equipment/Instruments with Broad Specifications

1. Digital Multimeter	: Hand held, 5 digit display contact Type, 60 to 50000 r.p.m.
2. Clip-on meter	Bandwidth:200MHz, Power supply:230V \pm 10% tolerance,50 Hz AC supply
3.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, Electrical and Electronics Engineering, NITTTR, Bhopal
- Prof. A. S. Walkey, Associate Professor, , Electrical and Electronics Engineering, NITTTR, Bhopal