



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Civil Engineering

Subject Code : DI05006061

Subject Name : Building Services

w. e. f. Academic Year:	2026-27
Semester:	5 th
Category of the Course:	PEC-04

Prerequisite:	Students know Civil Engineering Drawing, Surveying, Building Materials & Construction, Fluid mechanics, design principles, Applied & Structural Mechanics at a basic level, Soil Mechanics.
Rationale:	<p>The building services encompass a wide range of systems, including Electrical, Mechanical and Civil Engineering services. They are essential for various types of buildings, such as residential, industrial, high-rise, hotels, motels, and monumental structures; and they ensure the efficient and effective operation of buildings for their intended purposes</p> <p>No building can be effectively utilized without these services. Building services are the systems installed in buildings to make them comfortable, functional, efficient and safe. They can include Plumbing, lighting, fire safety, IOT (Internet of Things), and so on. Building Services Engineers are the people who make this happen. The knowledge of building services is necessary to maintain the functional requirements of the building by a Civil technologists. As buildings are becoming more complex and more modern, it is essential to include the same in the Civil Engineering curriculum. This course is designed to enhance the skills of diploma students in the domain of building services.</p>

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Manage building services provisions and Synchronize the installation of building services as per the sequence of construction activities.	R & U
02	Select the suitable electrical as well mechanical services for particular requirements of buildings.	R, U & A
03	Ensure Fire Protection, Acoustics and Sound insulation along with green building applications to the new constructions.	R, U & A
04	Ensure the proper system of rain water harvesting and solar water heater system for the given buildings.	R, U & A
05	Suggest the relevant advanced building services system for the given building along with green building applications.	R, U & A



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*Revised Bloom's Taxonomy (RBT)

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.	<p>Introduction: Introduction to building services, Classification of buildings as per national building code, Objective and use of building services, Functional requirements of building. Different types of building services and selection of building services.</p> <p>Plumbing Terminology and fixtures: Importance of plumbing, Terms used in plumbing Different types of plumbing fixtures, valves, shapes/ sizes, capacities, Suitable situation. Use of Water sensors for overhead tanks, Centralized RO system, drinking water cooler system</p> <p>Hot water supply system: Introduction, Requirements, Types, Safety Features, Centralised hot water System.</p> <p>Domestic pipe gas supply- introduction, component parts layout of domestic pipe Gas supply ,advantages and disadvantages</p>	7	14
2.	<p>Electrical Services: electrical services in the building: Technical terms and symbols for electrical installations and Accessories of wiring. Systems of wiring like wooden casing, cleat wiring, CTS wiring, conduit wiring, Types of insulation, Electrical layout for residence, small work shop, show room, school building, etc.</p> <p>Types of light control: (Manual switch, Remote switch, Timer switch and Photo-electric cell switch), Door Bells- Concept, Locations, Types, Need, Applications, Lightning arrester-definition, Uses, Location</p> <p>Smart Home: Uses, Smart Electrical Appliances, Smart Security systems, Smart Building Technologies. Charging points for e-vehicles</p>	10	24



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3.	<p>Mechanical Services in Buildings: Introduction of mechanical services, Lift: Definition, Types of Lifts, Design Considerations, Location, Sizes, Component parts- Lift Well, Travel, Pit, Hoist Way, Machine, Buffer, Door Locks, Suspended Rope, Lift Car, Landing Door, Call Indicators, Call Push Elevators & Escalators: Different types of elevators and Escalators, Freight elevators, Passenger elevators, Hospital elevators, Uses of different types of elevators Escalators. Dumbwaiters: Different types of Dumbwaiters, Uses of different types of Dumbwaiters. HVAC: Overview of HVAC system for building and centralized water-cooling system, Purpose, Principles, Temperature Control, Air Velocity Control, Humidity Control, Air Distribution system, Cleaners, Filters, Spray washers, Electric precipitators,</p>	10	25
4.	<p>Fire Protection, Acoustic and Sound Insulations: Introduction to Fire Safety Definition and importance of fire safety Causes and consequences of fire incident, Fire prevention safety measures in buildings- Fire detectors (smoke/heat), manual pull stations, Fire alarm control panel, alarm system audible & visual alarms, Fire suppression systems (sprinklers) Fire Safety Equipment and Systems -Types of fire extinguishers (foam, gas suppression) and their applications, fire balls, Fire hoses, hydrants, and pumps, Emergency Response and Evacuation Fire Safety Regulations and Standards-National Building Code of India (NBC) fire safety norms, Fire safety rules in residential, and Public buildings Requirement of good Acoustic, Various sound absorber, Factors to be followed for noise control in residential building</p>	10	25
5.	<p>Miscellaneous Services & Green Buildings Provision: Natural and artificial lighting: principles and factors, Arrangement of luminaries, Distribution of illumination, Utilization factors, Necessity of Ventilation Types – Natural and Mechanical Factors to be considered in the design of Ventilation Rain Water Harvesting System: Components of a RWH system (Catchments, gutters, conduits, filters, Storage facility, Recharge structures etc.), Advantage, Application, potential and factors affecting, planning, designing, construction and maintenance of RWH for residential building</p>	8	12



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	<p>Grey water-introduction, Constitutes, Application Management and Distribution Pattern.</p> <p>Rooftop Solar PV Power plant: Overview of Solar PV Technology, overview of Rooftop Solar Sector in India, type of Rooftop Solar PV Power Plants and operating principles.</p> <p>Concept of SWH (Solar water heating): Component parts of various system of SWH (heat transfer, propulsion, passive direct system, active direct system), Layout, design principles, specification, installation and maintenance</p> <p>Surveillance system: Introduction of Domestic surveillance system Uses of IOT in building services</p>		
Total		45	100

Suggested Specification Table with Marks (Theory):

Unit No.	Unit Title	Teaching Hours	Distribution of theory marks			
			R Level	U Level	A Level	Total
1	Introduction to building services	7	2	4	4	10
2	Electrical Services in buildings	10	4	8	8	20
3	Mechanical Services in Buildings	10	4	8	8	20
4	Fire Protection, Acoustic and Sound Insulations	10	2	4	4	10
5	Miscellaneous Services & Green Buildings Provision	8	2	4	4	10
		45	14	28	28	70

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
20	40	40	-	-	-

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



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References/Suggested Learning Resources:

(a) Books:

S. No	Title of Book	Author	Publication with place, year and ISBN
1	The A to Z of Practical Building Construction and its Management	Sandeep Mantri	Satya Prakashan, New Delhi ISBN-139351922629-978 :
2	Plumbing Design and Practice	Deolalikar, S. G.	McGraw-Hill, New Delhi, 2004 ISBN: 9780074620694
3	Fire Services in India: History, Detection, Protection, Management, Environment, Training and Loss Prevention	Bag, S. P.	Mital Publications, New Delhi, 1995, ISBN-13: 978-8170995982
4	Principles of Fire Safety Engineering: Understanding Fire and Fire Protection	Akhil Kumar Das	Prentice Hall India Learning Private Limited, New Delhi, 2014, ISBN-13: 978-8120350380
5	National Building Code of India - 2005	Bureau of Indian Standards	Bureau of Indian Standard, New Delhi
6	IS 12183(Part 1):1987 Code of practice for plumbing in multistoried buildings	Bureau of Indian Standards	Bureau of Indian Standard, New Delhi
7	2022 Uniform plumbing code – India (UPC-I)	Bureau of Indian Standards	Bureau of Indian Standard, New Delhi
8	Building Services	S. M. Patil	Seema Publication, Mumbai Revised edition
9	A text book on Building Services	R. Udaykumar	Eswar Press, Chennai
10	Green Building Fundamentals	G Harihara Iyer	Notion Press, Vanagaram , Chennai

(b) Open source software and website:

1. <https://www.bis.gov.in/>
2. <https://bmsbuildingservice.com/>
3. <https://plumbingservices.com/>
4. <http://www.asce.org/>
5. <https://www.astm.org/>



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Suggested Course Practical List:

The following practical are the sub-components of the COs.

Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
1	*Prepare a report on various components of building services of given building	2	CO1
2	*Prepare a report on observed components of water supply system from the given video/simulation / photographs of any multi-story building/ public building in your area.	2	CO1
3	Prepare a report on observed components parts on the layout of gas supply system for a residential / commercial building by viewing the relevant given video/simulation/photographs.	2	CO1
4	Compute the space requirements for the given type of escalator for the given type of building as per guidelines of national building code	2	CO2
5	*Compute the space requirements for the lift for the given type of building as per guidelines of national building code	2	CO2
6	*Prepare a report on the specifications, supplier name, its capacity, fire rating, dimensions, discharge type etc. along with the method of using it in case of fire hazard	2	CO3
7	Mark the locations of fire safety equipment's installed in a building in your nearby area.	2	CO3
8	*Estimate the rain water harvesting potential for the given plan of the residential building (single story load bearing structure) and considering average annual Rainfall of your locality	2	CO4
9	Design the proposed rain water harvesting system for estimated rain water harvesting potential determined in practical no.8 with necessary sketch, diagram, and specifications.	2	CO4
10	Design the rain water harvesting system for the given area of the multi-story framed structure residential building. .	2	CO4
11	*Design layout of a solar water system with diagram for a residential building with given data	2	CO4
12	Prepare a report on lighting system to be provided for residential /public building in your area.	2	CO5
13	*Prepare the budget on the basis of Estimation of the quantities of the electrical fittings, points, switches and wiring system required etc. for the given type of dwelling unit.	2	CO2
14	*Prepare a report on IOT in building services by viewing video /simulation /photographs	2	CO5



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15	Suggest noise control methods for a given commercial complex.	2	CO5
16	*Topic of seminar shall be given to a group of students not more than three. The students are required to submit report including power point presentation and present/ defended the seminar in the presence of students and teachers.	4	CO1 to CO5

*the **Practicals** are compulsory

List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name with Broad Specifications
1	Model of a civil engineering structure showing various components.
2	Chart showing details of lift, escalator and ramp.

Suggested Project List:

Micro project

- Visit any three buildings near by your institute and classify them in accordance with the provisions made in National Building Code in report form
- Prepare a sketches consisting of components of modern building services (any five).
- Prepare a report on BMS including a case study
- Prepare a report on modern Fire Safety
- Make a model of rain water harvesting showing its components.
- Prepare a report on advance building service

Suggested Activities for Students:

- Visit any three buildings near by your institute and classify them in accordance with the provisions made in National Building Code in report form.
- Identify the components of building services by inspecting the nearby buildings to prepare a detailed report w.r.t. adequacy, deficiency and exceeding the requirement.
- Collect the technical brochures of the different components of building services from the local market/internet to present in report form
- Visit any building certified by Building Management Services to record the important features that has converted it into green building and submit a report.
- Estimate the RWH and SWH potential for your house and institute building.

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