

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM COURSE TITLE: BUILDING SERVICES (Code: 3345005)

Diploma Programme in which this course is offered	Semester in which offered
Architectural Assistantship	4 th Semester

1. RATIONALE

This course focuses on students' acquisition of knowledge, skills & practices of essential building services for proper functioning & utility of building as a 'whole' unit/entity. Knowledge about domestic water supply & sanitation system (external & internal) and house drainage & disposal facilities, ventilation and air conditioning, acoustics and creation of movement provisions is imparted. The knowledge and application of such aspects of building is essential in developing a good architectural assistant who can be useful in creating good functional buildings with right kind of building services requiring least and easy maintenance.

2. LIST OF COMPETENCIES

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

- **Plan buildings applying knowledge of essential building services for effective & efficient functioning of buildings.**

3. COURSE OUTCOME

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- i. Identify various sources, uses of water, demand of water and factors affecting the rate of demand, and distribution of water for any city/colony/campus.
- ii. Prepare & give water supply layout with details of required water supply and sanitary fittings and fixtures.
- iii. Draw and interpret water supply and drainage plan of building/s.
- iv. Plan comfortable and functional buildings applying principles of ventilation and acoustics.
- v. Develop basic & functional understanding of various kinds of provisions of air conditioning system and movement facilities like ramps, lifts and escalators

4. TEACHING AND EXAMINATION SCHEME

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

Legends: L-Lecture; S/T- Tutorial/Teacher guided theory Practice – Studio; P - Practical; C – Credit; ESE - End Semester Examination; PA - Progressive Assessment

5. DETAILED COURSE CONTENT

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Domestic water supply	1a. Enlist various sources of water and uses of water. 1b. Calculate demand of water for domestic purpose. 1c. Explain the factors affecting rate of demand of water. 1d. Explain various methods of water distribution and layout of distribution pipes with sketch. 1e. Explain various water supply system 1f. Explain various water supply fittings, fixtures and pipes. 1g. Draw layout of water supply system for a residence.	1.1 Sources of water 1.1.1 Uses of water 1.1.2 Demand of water for domestic purpose only 1.1.3 Factors affecting rate of demand of water 1.2 Methods of water distribution 1.2.1 Systems of supply of water 1.2.2 Methods of layout of distribution pipes 1.3 Water supply fittings & fixtures Air valves, Bib cocks, Fire hydrants, Reflux valves, Relief valves, Sluice valves, Water meters 1.3.1 Pipes of different materials used for water supply 1.4 Simple layout of water supply system for a residence

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit– II Sanitation and house drainage	2a. Explain various purposes and principles of sanitation. 2b. Define Bacteria, Invert, Refuse, Sewer, Sewerage 2c. Explain various system of sewerage. 2d. Explain principles of house drainage. 2e. Define traps and classify them according to shape and function 2f. Explain various system of plumbing and 2g. Define Anti-siphonage pipe, Cowl, Fresh air inlet, Siphonage, Soil pipe, Vent pipe, Waste pipe. 2h. Explain various sanitary fittings and 2i. draw Drainage plan of a building. 2j. Explain maintenance of house drainage system 2k. Explain septic tank, soak pit and manholes with sketch. 2l. Describe objective of manhole 2m. Explain location and classification of manhole.	2.1 Purpose of sanitation 2.1.1 Principles of sanitation 2.1.2 Definitions: Bacteria, Invert, Refuse, Sewer, Sewerage 2.1.3 Systems of sewerage: <ul style="list-style-type: none"> • Separate system • Combined system • Partially separate system 2.2 Principles of house drainage- 2.2.1 Traps: definition, function and requirement of a good trap 2.2.2 Classification of traps according to shape-P,Q and S Traps 2.2.3 Classification of traps according to function- Intercepting traps, Gully traps, Grease traps 2.2.4 Definitions of Anti-siphonage pipe, Cowl, Fresh air inlet, Siphonage, Soil pipe, Vent pipe, Waste pipe 2.2.5 System of Plumbing <ul style="list-style-type: none"> • Single stack system • One pipe system • One pipe system partially ventilated • Two pipe system 2.2.6 Sanitary Fittings-Sinks, Bath tub, Water closets, Flushing cistern, Urinals, wash basin 2.3 Drainage plan of a building 2.4 Maintenance of house drainage system 2.5 Septic tank and soak pit- constructional features, advantages and disadvantages 2.6 Manholes: <ul style="list-style-type: none"> • Definitions • Objective • Location • Classification of manholes • Component parts

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit– II Sanitation and house drainage	2n. Explain various purposes and principles of sanitation. 2o. Define Bacteria, Invert, Refuse, Sewer, Sewerage 2p. Explain various system of sewerage. 2q. Explain principles of house drainage. 2r. Define traps and classify them according to shape and function 2s. Explain various system of plumbing and 2t. Define Anti-siphonage pipe, Cowl, Fresh air inlet, Siphonage, Soil pipe, Vent pipe, Waste pipe. 2u. Explain various sanitary fittings and 2v. draw Drainage plan of a building. 2w. Explain maintenance of house drainage system 2x. Explain septic tank, soak pit and manholes with sketch. 2y. Describe objective of manhole 2z. Explain location and classification of manhole.	2.7 Purpose of sanitation 2.1.4 Principles of sanitation 2.1.5 Definitions: Bacteria, Invert, Refuse, Sewer, Sewerage 2.1.6 Systems of sewerage: <ul style="list-style-type: none"> • Separate system • Combined system • Partially separate system 2.8 Principles of house drainage- 2.2.7 Traps: definition, function and requirement of a good trap 2.2.8 Classification of traps according to shape-P,Q and S Traps 2.2.9 Classification of traps according to function- Intercepting traps, Gully traps, Grease traps 2.2.10 Definitions of Anti-siphonage pipe, Cowl, Fresh air inlet, Siphonage, Soil pipe, Vent pipe, Waste pipe 2.2.11 System of Plumbing <ul style="list-style-type: none"> • Single stack system • One pipe system • One pipe system partially ventilated • Two pipe system 2.2.12 Sanitary Fittings-Sinks, Bath tub, Water closets, Flushing cistern, Urinals, wash basin 2.9 Drainage plan of a building 2.10 Maintenance of house drainage system 2.11 Septic tank and soak pit- constructional features, advantages and disadvantages 2.12 Manholes: <ul style="list-style-type: none"> • Definitions • Objective • Location • Classification of manholes • Component parts

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-3 Ventilation and Air conditioning	3a. Define ventilation and its necessity. Explain the functional requirements and essentials of good ventilation system. 3b. Describe system of ventilation. 3c. Define air conditioning and purpose and classification of air conditioning. 3d. Explain the principles of comfort air conditioning. 3e. Describe the system of air conditioning with sketch.	3.1 Definition of ventilation and its necessity 3.1.1 Functional requirements of ventilation system. 3.1.2 System of ventilation- Natural/mechanical i.e exhaust air supply and combined. 3.1.3 Essentials of good ventilating system. 3.2 Definition of air conditioning 3.2.1 Purpose of air conditioning. 3.2.2 Classification of air conditioning. <ul style="list-style-type: none"> • Comfort A.C • Industrial comfort • Summer, Winter air conditioning. 3.2.3 Principles of comfort air conditioning. <ul style="list-style-type: none"> • Temp control • Air velocity control • Humidity control 3.2.4 System of air conditioning. 3.2.5 Central system 3.2.6 Self contained system unit 3.2.7 Combined system

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – 4 Acoustics	4a. List out and explain characteristics of audible sound 4b. Explain various acoustical defects. 4c. Define insufficient loudness and external noise. 4d. Classify various sound absorbent materials and explain them. 4e. Explain the required conditions of good acoustics. 4f. Explain general principles in acoustical design.	4.1 General discussion 4.2 Characteristics of audible sound <ul style="list-style-type: none"> • Frequency of pitch • Intensity of loudness of sound • Measurement of sound • Principles of acoustics. • Behavior of sound and its effect. 4.3 Acoustical defects <ul style="list-style-type: none"> • Formation of echoes. • Reverberation • Reverberation time • Optimum time of reverberation • Dead spot • Sound foci 4.4 Insufficient loudness and external noise. 4.5 Sound absorbent material and their classification. 4.6 Requirement and conditions of good acoustics. 4.7 General principles in acoustical design <ul style="list-style-type: none"> • Site selection • Volume • Space • Treatment of interior • Surface • Reverberation • Sound absorption • Seats and seating arrangement.
Unit – 5 Movement Facilities	5a. Explain electrical lifts along with its component parts with sketch. 5b. Describe what is an escalator, its types, space required and approaches. 5c. Explain ramps for different	5.1 Electrical lifts, lift wall, lift door and gates and their detail with sketch. 5.2 Escalators – types, space required and approaches. 5.3 Ramp details for different purposes as well as their spaces and locations

6. SUGGESTED SPECIFICATION TABLE WITH HOURS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Domestic water supply	08	02	06	04	12
2.	Sanitation and house drainage	12	02	12	06	20
3.	Ventilation and Air conditioning	09	02	10	04	16
4.	Acoustics	10	01	10	04	15
5.	Movement Facilities	03	00	05	02	07
Total		42	07	43	20	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 LIST OF EXERCISES/PRACTICAL

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

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 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.

Sr. No.	Unit No.	Assignment/Practical/ Exercises	Approx Hours Required
1	I	Draw scheme for water supply for a given building	06
2	II	Draw detailed scheme for house drainage and sanitary fixtures for a given building	06
3	III	Plan and draw in detail ventilation and air-conditioning for a given building	04
4	IV	Design acoustics for a given building.	06
5	V	Plan movement facilities: Lifts, escalators, ramps etc. for a given public building	06
Total Hours			28

8. SUGGESTED LIST OF STUDENT ACTIVITIES

Students should carry out activities like: visit exhibitions held for water supply and sanitary fittings and fixtures and air conditioners, attend workshop on acoustics, ventilation and movements, visit ongoing construction sites, attend presentation on these topics by expert lectures conducted at the institute or any other place, library based/internet based mini projects, etc. These could be either individual or group activities.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If any)

Arrange visits to good residential and commercial buildings including malls, theaters, schools and hospitals and show students features of building services in those buildings. Discuss strengths and shortcomings in design of building services in those buildings.

10. SUGGESTED LEARNING RESOURCES

A. List of Books:

Sr. No.	Title of Book/Journals	Author	Publication
1.	Water supply and sanitary Engineering	S.C. Rangwala	Charotar Publications
2.	Building Construction	S.P Arora & Bindra	Dhanpatrai Publications
3.	Building Construction	Gurucharan Singh	Rajsons Publications

3.	Water supply and sanitary Engineering	Gurucharan Singh & Jagdish Singh	Standard Publishers
4.	Water supply and sanitary Engineering	G.J.Kulkarni	Ahmedabad Book Depot
5.	Building Services and Equipment	Frederick E. Hall	Longman Scientific and Technical

B. List of Major Equipment/ Instrument

Digital Cameras for documenting visits to construction sites, exhibitions, etc.

C. List of Software/Learning Websites

- i. www.niagarafalls.ca/pdf/building/installation-of-plumbing.pdf
- ii. www.level.org.nz/water/water-supply/system-layout-and-pipework
- iii. en.wikipedia.org/wiki/HVAC
- iv. www.otis.com/site/in/pages/AboutElevators.aspx?menuID=2
- v. www.epa.gov/iaq/schooldesign/hvac.html
- vi. en.wikipedia.org/wiki/Elevator

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. A.T Jha**, Lecturer in Civil, Govt. Polytechnic, Vadnagar
- **Prof. A.R. Rathod**, Lecturer in Architecture, Govt. Girls Polytechnic, Ahmedabad

Contributers/ Editors/ Faculty Members from NITTTR Bhopal

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