GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Civil and Infrastructure Engineering
Subject Code: 3134002

Semester – III
Subject Name: Building Materials & Construction Engineering

Type of course: Professional Core Course

Prerequisite: No Prerequisite

Rationale: This subject is intended for gaining useful knowledge with respect to facts. Concepts, principles and procedures related to building construction materials and construction system & technologies so that student can effectively able to execute building construction work with safety and quality in construction. Students can Plan effectively various types of buildings according to their utility with reference to different specifications and byelaws.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	2	5	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	**Introduction to building construction:** Definition, types of building as per national building code, components of the buildings. Overview of various traditional and modern building materials.	2
2	**Foundations and Plinth:** Introduction, definitions, types of foundations and their suitability, causes of failure of foundation and its measures, layout and setting out of foundations, plinth filling and soling, underpinning techniques.	6
3	**Temporary structures:** Purpose, types, suitability, failure case study of temporary structures Formwork: Basic requirements of good formwork, types of formworks for concrete construction, method of sequence order and removal of formwork, modern formwork systems: slip formwork, tunnel formwork etc.	4
4	**Masonry construction:** Introduction, purpose, principal terms, material used in various types of masonry works, brick masonry, stone masonry, block masonry, composite masonry, cavity walls, Tools required for masonry construction, masonry construction procedures and supervision.	6
5	**Arches and Lintels:** Arches: Principle of arch action, types of arches, method of arch construction, sequence order of centring and removal of centring. Lintels: purpose of lintel, types of the lintels, chajja or weather shade.	4

6	**Floors and Roofs:** Floors: Functional requirements, suitability, construction details, types of floorings: timber flooring, cement concrete flooring, mosaic flooring ceramic flooring, terrazzo flooring or cast in situ terrazzo flooring, tiled flooring, rubber flooring, cork flooring, epoxy flooring, asphalt flooring or mosaic asphalt flooring, filler materials, floor specifications, flooring materials Roofs and roof coverings: Functional requirements, suitability, method construction details, types of roofs, trusses structures, shell structures, roof coverings.	**6**
7	**Openings of buildings:** Doors: Principle technical terms, installation of doors frames and their size specifications, fixtures and fastenings, types of doors: glazed or sash doors, plastic doors, flush doors, louvered doors, collapsible doors, revolving doors, rolling steel doors, sliding doors, swing doors, folding doors. Essential requirement of good doors. Windows: Principle technical terms, installation of window frames and their size specifications, fixtures and fastenings, types of windows: casement window, double hung window, pivoted window, sliding windows, louvered or venetian window, metal window, sash or glazed window, bay window, corner window, dormer window, gable window, skylight window, circular window, mosquito proof window, curtain wall window. Ventilators: general purpose and types of ventilators.	**4**
8	**Vertical Circulation:** Introduction, classification of vertical circulation, planning and design consideration, types of vertical circulation. Stairs: components of a stairway, classification of stairs based on materials and geometric designs, size specification for staircase and its components. Elevators: components of an elevators, types of elevators, design consideration of elevators. Escalators: components of an escalators, design consideration of escalators. Ramps: components of ramps, types of ramps, design consideration of ramps. Fire protection of vertical circulations.	**5**
9	**Protective Coatings:** Plasters: purpose, type of application, and its types for wall surface, Pointing: purpose and its types, Dampness & Seepage protection techniques: damp proof course and waterproofing techniques, Paints & Varnishes: Types and their applications,	**5**
10	**Miscellaneous Materials:** Properties, types and uses of following materials: lime, polymers, plastic types, mastic, gypsum, clay tiles and glazed wares, Timber: types and properties, seasoning, testing, Aluminum and Aluminum composite panel, Stainless Steel, Glass, Ceramics.	**3**
11	**Safety in Construction:** Safety on site, storage of materials, construction safety, prevention of accidents, fire proof construction.	**3**
12	**Building Planning:** Introduction to Architectural drawing: Line plan, Developed Plan, Elevation, Section, and Scales for various drawings, dimensioning, abbreviations and conventions as per IS 962. Functional requirements of bungalows, twin bungalows, row houses, and apartments. Developed Plan, Elevation and Sectional Elevation of above mentioned categories.	**5**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	**25**	**25**	**10**	**10**	**00**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create 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.

Texts/ Reference Books:

- Building Construction - B.C. Punmia
- Building Materials - S.V.Deodhar, Khanna Publication
- Building Construction - Bindra and Arora
- Civil Engineering Materials - Neil Jackson & Ravindra K. Dhir - Palgrave Macmillan
- Building Materials by S. K. Duggal, New Age International Publishers.
- Civil Engineering Materials by TTTI Chandigrah, Tata McGraw Hill Publications.
- Materials of construction by D.N Ghose, Tata McGraw Hill.
- Building Construction by S.C. Rangwala, Charotdar Publications.
- National Building Code of India 2005.
- The construction of buildings; seventh edition, Vol.1 & Vol.2 by R. Barry, Oxford: Blackwell Science.
- Building Materials Technology by Ruth T. Brantley & L. Reed Brantley, Tata McGraw Hill.
- Properties of Concrete by A. M. Neville, Pearson Education Limited.
- Mitchell's Advanced Building Construction: The Structure by J. Stroud Foster
- Building Drawings with an integrated Approach to Built-Environment by M. G. Shah, C. M. Kale and S. Y. Patki, New Delhi, Tata McGraw Hill. (5th edition.)
- Building science and planning by Dr. S. V. Deodhar, Khanna Publishers.

e-Resources:

- http://nptel.ac.in/syllabus/105102088/
- http://www.theconstructioncivil.org/types-of-brick-bonds
- http://theconstructor.org/building/types-of-partition-walls/3754
- https://www.osha.gov/Publications/OSHA3252/3252.html

- http://www.engineerwing.com/2012/10/tremix-flooring.html
- http://nptel.ac.in/courses/Webcourse.../Composite%20Materials/.../LNm1.pdf
- https://en.wikipedia.org/wiki/Fibre-reinforced_plastic.
- https://cdn.intechopen.com/pdfs-wm/41941.pdf.
- http://home.iitk.ac.in/~mohite/Composite_introduction.pdf
- http://www.vdfflooring.in/faqs.html.
- http://theconstructor.org/building/buildings/eco-friendly-building-materials/720.
- http://nptel.ac.in/courses/105103093/21.
- http://www.grihaindia.org/
- http://new.usgbc.org/
- http://www.hcd.ca.gov/hpd/green_build.pdf
- http://ncict.net/Examples/Examples1.aspx

Course Outcomes: After successful completion of the course the students shall be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Identify types of building and basic requirements of building components.	5 %
CO-2	Understand types of masonry, formwork, casting procedure and necessity of underpinning and scaffolding etc.	20 %
CO-3	Elucidate different types of flooring and roofing materials.	15 %
CO-4	Interpret types of doors, windows, arches and lintel and their suitability	15 %
CO-5	Illuminate means of vertical circulation and protective coatings	15 %
CO-6	Measure the suitability of different materials especially eco-friendly materials and safety measures to be adopted at any construction site.	15 %
CO-7	Design a residential building and develop the plan, elevation and section of load bearing and framed structures	15 %

List of Experiments and term works:

- Testing of bricks
- Testing of cements
- Testing of aggregates
- Testing of water

- Term work: Based on syllabus topics
- Technical assignments:

[1]. Two site visits and technical report on the visit of any on-going Construction Site (visit report should contain: details of the project, stage of construction, sketches of components with cross section & dimensions, materials used and site plan, etc.)

[2]. Collection of advertisements of modern construction materials and tools used in construction.

[3]. Visit to a construction related exhibition

[4]. Drawing Assignment: Measurement drawing exercise of an existing residential building (G+1). Draw a detailed plan, elevation and section using suitable scale on drawing sheet. Students should prepare working drawing of Foundation Plan (on tracing paper) for the above Residential Building Plan. It should contain detailed foundation plan with foundation details. (Use suitable scale 1:50 or 1:100).