

Savitribai Phule Pune University, Pune
S.E. (Civil Engineering) 2015 Course

201001: Building Technology and Materials

Credits: 04+01

Teaching Scheme:

Theory : 04 hrs/week

Practical : 02 hrs/week

Examination Scheme:

In-Semester (Online) : 50 Marks

End-Semester : 50 Marks

Term Work : 50 Marks

Prerequisites: Fundamentals of Basic Civil Engineering and Engineering Graphics.

Course Objectives:

- 1) To enumerate different types of structure and their requirement as building components.
- 2) To describe all basic activities of construction from foundation to finishing.
- 3) To study different types of materials used in construction for civil engineering projects.

Course Outcomes:

On completion of the course, learner will be able to:

- 1) Identify types of building and basic requirements of building components.
- 2) Explain types of masonry, formwork, casting procedure and necessity of underpinning and scaffolding.
- 3) Elucidate different types of flooring and roofing materials.
- 4) Describe types of doors, windows, arches and lintel.
- 5) Illuminate means of vertical circulation and protective coatings.
- 6) Explain different materials especially eco-friendly materials and safety measures to be adopted at any construction site.

Course Contents

Unit I: Introduction to Building Construction and Masonry.	(08 Hrs)
a) Introduction to building construction– definition, types of building as per National Building Code. Building components and their basic requirements i.e substructure and superstructure requirements. Superstructure: Concept and advantages of a framed structure, types: light framed structures, Timber framed, RCC framed structures. Substructure - shallow and deep foundations and their suitability. General procedure in foundation design, Failure of foundation and its causes, Foundation in black cotton soil, Foundations near existing adjacent old structures. Damp Proof Course, plinth filling and soling. b) Masonry– Stone masonry: Principal terms, types of stone masonry. Brick masonry: characteristics of good building bricks, IS specification and tests, classification of bricks: silica, refractory, fire and fly ash bricks. Brick work, types of bonds: English, Flemish, Header, Stretcher, construction procedure, supervision.	
Unit II: Block Masonry and Form work	(08 Hrs)
a) Block Masonry – Cellular lightweight concrete blocks, hollow blocks, concrete blocks, glass blocks, solid blocks, cavity wall construction. Requirement of a good partition wall: metal partitions, asbestos cement partition, wooden partition. Reinforced brick masonry: applications, advantages, materials required and construction procedure. Composite masonry: types, advantages, applications, materials required and construction procedure. b) Form work and casting procedure for reinforced concrete columns, R.C.C. beams and girders, R.C.C. slabs, curing methods, precast and pre-stressed concrete construction and joints in concrete work. Slip form work: component parts- design criteria, underpinning, Scaffolding: purpose, types and suitability.	
Unit III: Flooring and Roofing Materials.	(08 Hrs)
a) Flooring and Flooring Materials – Functional requirement of flooring, types of floor finishes and their suitability, construction details for concrete, tiles and stone flooring. Types of flooring: timber flooring, cement concrete flooring, mosaic flooring, ceramic flooring, terrazzo flooring, tiled flooring, rubber flooring, cork flooring, epoxy asphalt flooring, hollow block and rib floors, Industrial flooring: tremix or Vacuum Dewatered Flooring (VDF). b) Roofing Materials – galvanized iron pre-coated aluminum sheets, fiber sheets, and Mangalore tiles. Roof construction: types and their suitability, method of construction, types of trusses, types of shell structure:dome, translation shells, space and frame structure: pneumatic structures, grain storage structures, prefabricated structures, fixing details of roof covering.	

Unit IV: Doors, Windows, Arches and Lintels.**(08 Hrs)**

a) Doors and Windows – definition of technical terms, installation of doors and window 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. 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: purpose and types.

b) Arches and Lintels – principle of arch action, types of arches, method of arch construction, centering and removal of centering. Lintels: necessity and types, chajja or weather shade necessity and types.

Unit V: Vertical Circulation and Protective Coatings**(08 Hrs)**

a) Vertical Circulation – Consideration in planning, design considerations, Staircase: types, and details of ramps. Ladders, lifts, and escalator. Types of staircase: straight stairs, open well stairs, quarter turn stairs, half turn stairs, turning stairs, dog-legged stairs, circular stairs, geometrical stairs, bifurcated stairs, and spiral stairs.

b) Protective Coatings – plastering types : lime plaster, cement plaster, gypsum plaster used in spray fire proofing, plaster of Paris and application, pointing: purpose & types, mortar preparation and types, painting and varnishing, types and application, white washing, distempering, oil paints. Wall cladding: materials, method, wall papering and glazing work.

Unit VI: Miscellaneous Materials and Safety in Construction**(08 Hrs)**

a) Miscellaneous Materials – Properties, types and uses of following materials: lime, polymers, plastic types, mastic, gypsum, clay tiles and glazed wares, Timber: types and properties, advantages and applications of aluminum, stainless steel, fibrous, laminated, particulate, combinations of composite materials: laminated fiber reinforced polymers. Glass: uses, types and properties, application and ingredients, market forms, glass claddings, aluminum composite panel cladding. Ceramic products: ceramic sanitary application, water closet, urinals, washes basins, their common sizes, pipes and fittings. Eco-friendly materials: eco-friendly decorating materials, eco-friendly flooring, thatch, bamboo, linoleum, cork.

b) Safety in Construction – safety on site, storage of materials, construction safety, prevention of accidents, fire proof construction. Repairs and maintenance: addition, and alteration, strutting and shoring.

Books:

Text:

1. Building Construction by B.C. Punmia, Laxmi Publications.
2. Building Materials by S.V.Deodhar, Khanna Publication.
3. Building Construction by Bindra and Arora, Dhanpat Rai Publications.
4. Civil Engineering Materials by Neil Jackson & Ravindra K. Dhir, Palgrave Macmillan.

Reference:

1. Building Materials by S. K. Duggal, New Age International Publishers.
2. Civil Engineering Materials by TTTI Chandigrah, Tata McGraw Hill Publications.
3. Materials of construction by D.N Ghose, Tata McGraw Hill.
4. Building Construction by S.C. Rangwala, Charotdar Publications.
5. National Building Code of India 2005.
6. The construction of buildings; seventh edition, Vol.1 & Vol.2 by R. Barry, Oxford: Blackwell Science.
7. Building Materials Technology by Ruth T. Brantley & L. Reed Brantley, Tata McGraw Hill.
8. Properties of Concrete by A. M. Neville, Pearson Education Limited.
9. Mitchell's Advanced Building Construction: The Structure by J. Stroud Foster

e-Resources:

1. <http://nptel.ac.in/syllabus/105102088/>
2. <http://www.theconstructioncivil.org/types-of-brick-bonds>
3. <http://theconstructor.org/building/types-of-partition-walls/3754>
4. <https://www.osha.gov/Publications/OSHA3252/3252.html>
5. <http://www.engineerwing.com/2012/10/tremix-flooring.html>
6. <http://nptel.ac.in/courses/Webcourse.../Composite%20Materials/.../LNM1.pdf>
7. https://en.wikipedia.org/wiki/Fibre-reinforced_plastic.
8. <https://cdn.intechopen.com/pdfs-wm/41941.pdf>.
9. http://home.iitk.ac.in/~mohite/Composite_introduction.pdf
10. <http://www.vdfflooring.in/faqs.html>.
11. <http://theconstructor.org/building/buildings/eco-friendly-building-materials/720>.
12. <http://nptel.ac.in/courses/105103093/21>.

List of Laboratory Assignments

It shall consist of the following exercises and seminar.

A) Measurement drawing exercise of an existing residential building (G+1)

Draw a detailed plan, elevation and section using suitable scale on same sheet.

Following sketches pertaining to the above plan (with Standard Dimensions).

- a. Door- Panelled door
- b. Window
- c. Stair.

B) 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).

C) Draw sketches using computer software of the following:

1. Details of the shallow footings.
2. Details of arch showing different components

D) Two site visits and technical report on the visit.

1. Site visit based on existing residential building (G+1) as noted in part A above.
2. 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.)

E) 1. Collection of advertisements of modern construction materials and tools used in construction.

2. Visit to a construction related exhibition.

Term work: Based on above syllabus.