BCE401- MATERIALS, TESTING & CONSTRUCTION PRACTICES

Course Outcomes: At the end of this course the student will be able to-

1. Explain various building materials based on their properties.
2. Explain use of non-conventional civil engineering materials.
3. Select suitable type of flooring and roofing in the construction process.
4. Characterize the concept of plastering, pointing and various other building services.
5. Exemplify the various building services and modern construction practices.

Unit 1

Scope of Study of building Materials, economics of the building materials.

Stones: Classification of Stones–Properties of stones in structural requirements

Bricks: Composition of good brick earth, Various methods of manufacturing of bricks & Testing of Bricks.

Blocks: Cement and Concrete hollow blocks, Light weight concrete blocks

Cement: chemical composition, Manufacturing process, Types and Grades, Properties of cement and Cement mortar, Hydration, Compressive strength, Tensile strength, Soundness and consistency, Setting time

Concrete: compositions and grades of concrete various steps in concrete construction – batching, mixing, transporting, compacting, curing, shuttering, jointing. tests and quality control of concrete.

Aggregates –Natural stone aggregates, Industrial by-products (EAF Slag, Steel Slag), Crushing strength, Impact strength, Flakiness, Abrasion Resistance, Grading

Wood- Structure–Properties–Seasoning of timber–Classification of various types of woods used in buildings – Defects in timber.

UNIT II Paints varnishes and distempers: Common constituents, types and desirable properties, Cement paints.

Glass: Ingredients, properties types and use in construction.

Insulating Materials Thermal and sound insulating material, desirable properties and types.

Paints: Purpose, types, technical terms, ingredients and defects, Preparation and applications of paints to new and old plastered surfaces, wooden and steel surfaces.

Supplementary cementitious materials: Fly ash, GGBS, Silica fume, Rice husk ash, Calcinated ash (Basic properties and their contribution to concrete strength)

Modern Materials: Glass and plastic composites, Plywood, laminates, wall and roof panels, **Introduction to noise barrier materials for bridges**.

UNIT III Building Construction:

Components of building area considerations, Principles of building Planning

Foundation: Preliminary investigation of soil, safe bearing capacity of soil, Function and requirements of good foundation , types of foundation

Masonry: Definition and terms used in masonry. Brick and stone masonry, Bonds in brick and stone masonry work.

Types of walls; load bearing, partition walls, cavity walls.

Floors: Requirement of good floor, Components of ground floor, Selection of flooring material Procedure for laying of Concrete (VDF), Mosaic, Kota, Slate, Marble, Granite, Tile flooring,

Stairs: Definitions, technical terms and types of stairs, requirements of good stairs; Geometrical

design of RCC dog legged and open-well stairs.
Construction Principle and Methods for layout.
Introduction to Smart Building construction

Unit IV Building Components
Lintels, arches, stair cases – types. Different types of floors – Concrete, Mosaic, Terrazzo floors, **Pitched, flat roofs**. Lean to roof, Coupled Roofs. Trussed roofs – King and Queen post Trusses. R.C.C Roofs, Madras Terrace and Pre fabricated roofs.
Doors and Windows: Construction details, types of doors and windows
Formwork: Introduction to form work, scaffolding, shoring, under pinning.

Unit V: Plumbing Services: Water Distribution, Sanitary – Lines & Fittings;
Ventilations: Functional requirements systems of ventilations. Air-conditioning - Essentials and Types; **Acoustics** – characteristic-absorption – Acoustic design;
Fire protection – Fire Hazards – Classification of fire resistant materials and constructions.
Plastering and Pointing: Mortar and its types. Purpose, materials and methods of plastering and pointing: Sand faced plastering, Stucco plastering, lathe plastering, and defects in plastering. Water proofing with various thicknesses.
Damp proofing: causes, effects and methods. Principles & Methods of building maintenance
Introduction to current construction practices such as :Expanded Polystyrene (EPS), 3D Printing, Pre-Fabricated Panel System

Books and References

1. SK Duggal, “Building Materials” New Age International
2. Purushothama Raj, “Building Construction Materials & Techniques” Pearson Edu.
3. PC Varghese, “Building Materials” PHI
4. Rangwala, “Building Materials” Charotar Publishing House.
5. Sushil Kumar, “Building Construction” Standard Publisher.
6. Domone, “Construction Materials” 4/e, CRC Press Taylor & Francis Group.
7. Adams, “Adams’ Building Construction Adams” CRC Press Taylor & Francis Group.
8. BC Punmia, “Building Construction” Laxmi Publication.
9. Jha & Sinha, “Building Construction” Khanna Publishers
10. Sahu, “Building Materials and Construction” Mc Grew Hill Education
11. Deodhar, “Civil Engineering Materials” Khanna Publishers
12. Mehta, “Building Construction Principles, Materials & Systems” 2/e, Pearson Education Noida.
13. Sandeep Mantri, “Practical building Construction and its Management” Satya Publisher, New Delhi.
14. Khanna S. K., Justo C.E.G, & Veeraragavan A., “Highway Materials and Pavement Testing”, Nem Chand and Bros.
15. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO etc.
16. Chudley, R. Greeno, Building Construction Handbook, Butterworth
17. Building Construction : Dr Rinku Kumar **(Avilable on aicte ekumbh portal)**
    Link for aicte book portal : https://ekumbh.aicte-india.org/allbook.php