CIPE4001 CIVIL ENGINEERING MATERIALS & CONSTRUCTION (3-0-0)

Course objective

- To provide detailed illustration of engineering properties of various materials used in civil engineering construction & their applications,
- To explore various cementitious products, their composition, production and testing methods.
- To have an idea about various types of masonry and foundations adopted in construction work
- To foster practical understanding of building components and enhance students' ability to select required type of the building components for construction.

Module I (10 hours)

Stones: Characteristics of good stones, Deterioration and preservation of stones. Bricks & Clay Products: Manufacturing process, composition of good brick earth, testing (compressive strength, water absorption), and types of tiles. Metals with reference to Structural Steel: Structure and its role in properties of steel. Strengthening mechanism in metals. Behaviour in service and corrosion. Uses of metals in civil engineering. Plastics and Polymers in construction, sealants and adhesives. Water proofing materials, Geosynthetics, Timber and plywood and glasses, Tiles: Manufacturing Process, Tests on Tiles

Module II(10 hours)

Cement: Hydration of cement, Chemical reaction, Structure of cement paste, Consistency and setting. Lime and supplementary cementations materials. Aggregates, types of aggregates (fine and coarse), different tests of aggregates and its gradation as per IS code. mortar, types of mortar, Properties of mortar, Testing of mortars. Concrete: ingredients and Production Process. Fresh concrete properties, workability Tests, Segregation and bleeding, compressive strength of concrete, Tensile strength, Modulus of elasticity and their tests, different Non Destructive Testing of concrete. Durability and long term performance of concrete, Sulphate attack, corrosion of reinforcements, Mix design of concrete of Plain and Reinforced Cement Concrete.

Module III (10 hours)

Stone Masonry: Terms used in stone masonry- facing, backing, hearting, through stone, corner stone, cornice, Type of stone masonry: Rubble masonry, Ashlar Masonry and their types. Brick masonry: Terms used in brick masonry- header, stretcher, closer, quoins, course, face, back, hearting, bat bond, joints, lap, frog, line, level and plumb. Bonds in brick masonry header bond, stretcher bond, English bond and Flemish bond. Precautions to be observed in Brick Masonry Construction. Walls, Floors: Introduction, Types, Roofs: Components, Types. Foundation: Functions, Types: Shallow Foundation and Deep Foundation. Introduction to Formwork and scaffolding

Module IV (10 hours)

Doors: Components of Doors, Types of Doors: Fully Paneled Doors, Partly Paneled and Glazed Doors, Collapsible Doors, Rolling Shutters, Revolving Doors, Glazed Doors. Windows - Component of windows, Types of Windows: Fully Paneled, Partly Paneled and Glazed, Wooden, Steel, Aluminum Windows, Sliding Windows. – Stair Case, Ramps, Lift, Elevator and Escalators. Terms used in staircase, Types of staircases- Straight, doglegged, open well, Circular, Quarter turn. Plastering, painting and damp proofing: Purpose of plastering, Methods of plastering, Materials of plastering. Paints, Constituents of paints & types. Purpose of Painting, Application of Paints to new and old surfaces. Damp Proofing - Causes of Dampness, Effects of Dampness, Methods of Damp Proofing

Course outcomes

After successfully studying this course, students will able to:

- Evaluate and understand the making process of building materials like stones, bricks, and blocks for construction
- Understand manufacturing process and classification of the construction materials such as steel, and glass, tiles, lime and their applications in buildings.
- Determine the different properties and functions of materials used in concrete and will also be able to design and analyze plain and reinforced concrete mixes for structural use.
- Understand different building systems and foundations, focusing on masonry techniques.
- Understand the types and selection criteria for different building components i.e. walls, roofs, doors, formwork, scaffolding, and damp proofing in construction.

Books

- Gambhir M.L., Jamwal N., Building materials products, properties and systems, McGraw Hill Education. 1st edition, 2017.
- Mehta M., Scarborough W., Armpriest A. Building Construction: Principles, Materials and Systems. Pearson Education India, second edition, 2016
- Subramanian N., Building Materials, testing and sustainability, Oxford University Press, 1st edition, 2019.

- Bhavikatti S.S. Building Materials, Vikas Publishing House, 1st edition, 2012
- Punmia B. C., Jain a., and Jain A.K., Building Construction, Laxmi Publication, 2005
- Varghese P. C, Building Materials, Prentice Hall of India, 2015
- Duggal S. K. Building Materials, New Age International Pvt. Ltd, 2012
- Ghose D. N. Material of Construction, Tata McGraw Hill, 2001
- Rangwala S. C., Building Construction, Charotar Publishing House Pvt. Ltd, 2019
- Rangwala S. C., Engineering materials, Charotar Publishing House Pvt. Ltd, 2019