CONSTRUCTION TECHNOLOGY AND STRUCTURE

Subject Aim:

This subject is intended to:

1. Equip students with an understanding of scientific and engineering principles governing the construction of buildings.
2. Be aware of the range of building materials available for construction and gain an understanding of the key concepts determining classification, properties and applications.
3. Encourage an appreciation of the structure of buildings.
4. Develop concepts of structural action, leading to an ability to model, analyse and design common elements and structural frames by understanding simple structural framing.
5. Explore common modes of failure of building elements in laboratory sessions.

Learning Outcomes:

Students will demonstrate their ability to:

1. Use and understand the basic vocabulary and terminology of construction
2. Prepare real drawings, sketch and use computer-aided-drawing as a means of communicating information about buildings.
3. Appreciate the function of various building elements, their inter-relationship with each other.
4. Understand and appreciate the basic structure of buildings.
5. Employ mathematical modeling to explain the behaviour of building materials and structures.
6. Apply the concepts of structural mechanics to solve structural problems involving beams, columns and statically determinate truss.
7. Design simple structural elements to withstand these forces in their respective loading conditions.
8. Employ structural, mechanical and mathematical principles to design simple structure.
9. Recognize the failure modes and characteristics of simple structural elements.

Brief Syllabus Content:

The construction/building industry: the changing nature of the design and construction processes and roles and the effects on engineering-technology and professional responsibilities.

Building vocabulary.

Types of simple foundation and construction methods.

An introduction to the main structural forms for the superstructure and their behaviour: framed, crosswall, boxform, corewall, large panel and surface structure.


Structural engineering concepts and qualitative appreciation of structural behaviour, loading, stress and strain, structural statics and dynamics, equilibrium and elasticity of materials, simple bending and shear concepts.

Drawing and sketching skills.

An introduction to the various structural forms, resistance to load, definition of terms, and, factors of safety.

Teaching activities: Lecture (LT)/Tutorial (TU)/Seminar (SM)/Drawing (DW)/Laboratory or Practical (LB)/Studio (ST)/Workshop (WS)/Project (PJ)/Field Study (FS)/Guided Study (GS)/Visit (VS)
Brief Syllabus Content:

Point and distributed static loading, (quasi-static) wind loading, load transfer in common building structures of various forms.

Computation of internal forces of statically determinate truss using the Method of Joints and Method of Section.

Reaction of structural materials to imposed loads (with induced stresses and deformation).

Simple beam flexural theory, computation of bending stresses, shearing force and bending moment distribution, deformation and deflection of beams, sizing of simple reinforced concrete and steel beams to current codes.

Simple buckling theory of columns, effective length and slenderness ratio in relation to fixity conditions, combined stresses as subjected to eccentric axial load, sizing of simple reinforced concrete and steel columns to current British Standard.

Computation and design of simple bolted and welded steelwork connections.

Experimental work:

Materials: 4 experiments each of 2 hours duration from the following list.
1. Tests on aggregates: grading, organic matter content, and silt content.
2. Effects of constituents ratio and admixtures on workability and compressive strength of concrete.
3. Electrochemical corrosion of ferrous metal.
5. Identification of plastic materials used in building.
6. Paint tests.
7. Ignitability of fire propagation index of building materials.

Structure: 3 experiments each of 1 hour duration from the following list.
1. Statically determinate truss test.
2. Beam bending test.
3. Column buckling test.

Learning and Teaching Approach:

Teaching periods will adopt a wide range of different methods, for example: lectures, tutorials, practical and laboratory work in Technology Laboratory and Industrial Training Centre, group and individual work; student presentations, and site visits. Tutorials are to include problem-solving exercises where applicable. Wherever it is applicable, safety precautions and measures during the construction will be emphasized.

Assessment:

Examination and coursework will constitute 50% and 50% of the overall marks for the subject respectively. The coursework mark will be based on the mid-term test, assignments, seminar discussions, laboratory and site visit reports.

Reading List:

Recommended:


**Supplementary:**


*Structural Use of Steelwork in Building - BS 5950: Part I:2000*. British Standards Institution,

*Steelwork Design Guide to BS 5950: Parts 1 and 2*