COURSE TITLE : CONSTRUCTION MATERIALS AND ENGINEERING
COURSE CODE : 3011
COURSE CATEGORY : B
PERIODS/WEEK : 6
PERIODS/SEMESTER: 90
CREDITS : 6

TIME SCHEDULE

Module	Topics	Period
1	Building materials	23
2	Ornamental materials for finishing	21
3	Construction technology	21
4	Building components	25
TOTAL		**90**

COURSE OUTCOME

Sl.	Sub	Student will be able to
1	1	Understand different types of Building materials
	2	Identify various components of buildings and their functions.
	3	Know the procedure for execution of various construction activities.
2	1	Identify & suggest rectification of various defects in civil Engineering works

SPECIFIC OUTCOME:

Upon completion of the study, the student should be able to:

MODULE – I

1.1.0 Know the materials generally used for construction.
1.1.1 Describe the classification of stones and characteristics of good building stone
1.1.2 Explain the varieties, methods of quarrying, and dressing of stones
1.1.3 Explain deferent surface finishes

1.2.0 Know the Clay Products:
1.2.1 Explain the Raw materials used and Composition, manufacturing methods and Characteristic of clay products and IS specifications of it.
1.2.2 Describe the different types of tiles – roofing, floor and wall tiles.

1.2.3 Describe good characteristics of tiles
1.2.4 Explain the uses and qualities of stoneware pipes and earthenware pipes

1.3.0 Know lime.

1.3.1 Describe the sources and their classification and manufacturing methods of lime

1.4.0 Understand characteristics of cement.

1.4.1 Describe the Composition and manufacturing methods of cement
1.4.2 Explain deferent types of cement and Tests on cement – Lab tests & Field tests
1.4.3 Explain the uses of puzzolonas as admixtures.
1.4.4 Explain surkhi, blast furnace slag, fly ash, silica fume and rice husk ash.

1.5.0 Understand the Sources of aggregates, classification & grading

1.5.1 Describe the Limitations of mining of sand from rivers and sea shore and alternatives of sand.
1.5.2 Differentiate the materials used as coarse aggregate and fine aggregate and their sizes for different applications.
1.5.3 Define Bulking of sand. Explain its significance in the field.

1.6.0 Understand the Preparation of lime and cement mortar.

1.6.1 Describe Proportions of Lime and Cement mortar for various items of work.
1.6.2 Explain the tests on cement mortar, Preparation of concrete cubes and their tests.

1.7.0 Know concrete.

1.7.1 Explain the methods of proportioning and ingredients of concrete
1.7.2 Describe the functions and requirements of ingredients of cement concrete
1.7.3 Differentiate between PCC and RCC
1.7.4 Define Water cement ratio – effects on strength and workability.
1.7.5 Describe the factors affecting the workability
1.7.6 Describe the preparation of cement concrete-procedure and methods.
1.7.7 Explain the Types and characteristics of reinforcement and concrete used
1.7.8 Explain the wet state properties of cement concrete – Slump test & Compaction factor test.
1.7.9 Describe the preparation of Concrete cube and perform the compression test.
1.7.10 Explain the chemical admixtures like plasticizers and super plasticizers.

1.8.0 Know the Timber and wood products

1.8.1 Describe the Structural classification of Timber
1.8.2 Describe the methods of seasoning of timber.
1.8.3 Explain the defects and preservation of timber
1.8.4 Explain the characteristics of good preservative
1.8.5 Describe the characteristics of good timber
1.8.6 Describe the wood products like ply wood, MDF and HDF

1.9.0 Know the classes of metals.

1.9.1 Explain the Properties and uses of ferrous metals such as Wrought iron, Cast iron, Mild steel- -Special Steels-High carbon steel, High tensile Steel and stainless steel.

1.9.2 Explain the Properties and uses of nonferrous metals such as Aluminum, Copper, Lead, Zinc, Titanium and alloys.

MODULE – II

2.1.0 Understand Types, Constituents, Preparation, characteristics and application of Plastics, Rubber, Aluminium, Glass, Paints, Varnishes and miscellaneous materials.

2.1.1 Explain the uses and Limitations of plastics.
2.1.2 Describe different types, uses, characteristics and properties of P V C.
2.1.3 Explain the limitations of using plastics on environment.
2.1.4 Explain the Characteristics, properties and uses of Rubber.
2.1.5 Describe the uses of aluminum sections and its use in building construction.
2.1.6 Identify the different types & uses of glass.
2.1.7 Explain the Glass used in building constructions.
2.1.8 Describe the characteristics, constituents and types of paint
2.1.9 Explain the categories, types and requirements of varnishes.
2.1.10 List the properties of distemper.
2.1.11 Describe the uses and properties of Abrasives, Adhesives and Asbestos.
2.1.12 Explain the Uses and properties of Asphalt and Bitumen.
2.1.13 Explain the Uses and properties of insulating materials such as Plaster of Paris, Thermo Cole and Cork.
2.1.14 Explain wood products such as veneers, ply wood, fiber board, and hard board

MODULE – III

3.1.0. Know the Masonry, DPC, Form work, Shoring, Underpinning, Plastering and Pointing

3.1.1 Explain the classification of masonry walls.
3.1.2 Explain some important terms like corbel, coping etc. in masonry walls
3.1.3 Describe general principles and specifications for stone masonry as per I S Code and NBC
3.1.4 Describe specification of brick masonry as per IS Code and N B C.
3.1.4 Explain hollow blocks masonry, solid block and inter locking block masonry.
3.1.5 List the advantages and disadvantages of hollow block masonry with reference to other types of masonry.
3.1.6 Explain the composite masonry-general description.
3.1.7 Explain the use and methods of construction of composite masonry.
3.1.8 Explain the types-use-requirements of a good partition wall
3.1.9 Describe the modern techniques of earth quake resistant masonry construction

3.2.0 Know Dampness and its effects.

3.2.1 Explain the causes and effects of dampness.
3.2.2 Describe methods of damp prevention and surface treatment.
3.2.3 Explain impregnated water proofing treatment
3.2.4 Explain modern methods of DPC construction.

3.2.5 Explain Water proofing of Cement Concrete using waterproofing admixtures.

3.3.0 Understand the concept of pre stressing in concrete

3.3.1 Explain the types and methods of pre stressing

3.4.0 Know the use of form work, materials & requirements of formwork

3.4.1 Explain the requirements of formwork
3.4.2 Explain modern types of form work
3.4.3 List the merits and demerits of steel form work over timber form work

3.5.0 Know the use of Scaffolding, shoring and under pinning

3.5.1 Describe the Types of scaffolding & materials used
3.5.2 Explain the methods of shoring and underpinning

3.6.0 Know Plastering, Pointing types and its Specification.

3.6.1 Explain Plastering and Pointing, types and its specification.
3.6.2 Explain the defects in plastering

MODULE – IV

4.1.0 Know the functions of Components of a building

4.1.1 Explain the functions and types of foundation
4.1.2 Explain the parts of a building
4.1.3 Explain the Floors and Floorings.
4.1.4 Explain the requirements of a good floor
4.1.5 Describe the different types of floors and Floor finishes.

4.2.0 Understand Positioning of Doors and windows with respect to lighting and Ventilation.

4.2.1 Explain the Types and Size as per IS and NBC Specification.
4.2.2 Explain the positioning of doors and windows.
4.2.3 Describe Special types of doors such as Flush, Revolving, collapsible, Rolling and sliding.
4.2.4 Explain Different types of Windows and Ventilators.
4.2.5 Describe Fittings for doors and windows.
4.2.6 Explain component parts of doors and windows

4.3.0 Know types of lintels and arches.

4.3.1 Explain the functions and different types of lintels and Arches

4.4.0 Know sunshades, canopy and sun breakers.

4.4.1 Explain the sunshades canopy and sun breakers.

4.5.0 Know functions of staircase, lift and escalators and ramp

4.5.1 Describe the types and component parts of staircases
4.5.2 Illustrate the planning and location of lifts, staircase and ramp

4.6.0 Know Ceiling and its types.

4.6.1 Explain the different materials and types of ceiling

4.7.0 Know the Roof components

4.7.1 Describe the importance of roofing with respect to climatic conditions.
4.7.2 Explain the classification of roofs.
4.7.3 Explain different types of trusses for pitched roof
4.7.4 Describe roof covering for pitched roof.
4.7.5 Explain the method of arranging and fixing to the battens rafters and purlins.
4.7.6 Explain RCC roof
4.7.7 Describe the weather proof course to flat roof-

CONTENT DETAILS

MODULE – I

Structural building materials: Stone – classification – geological, Physical and chemical classification – characteristics of good building stone – varieties of stones – granite – trap - basalt – sand stone – Laterite. Values of, load bearing capacity of stones. Quarrying of stones – methods – wedging and blasting –explosives used. Dressing of stones.

Clay Products: Bricks: Raw materials used – Composition of brick earth, manufacturing methods (Description only), kiln and clamp burning – IS specifications of bricks – characteristics of good brick used for building purpose.

Tiles: Type of tiles-characteristics-uses-Floor, wal and roofing tiles ,Porcelain, vitrified and glazed tiles. Earthenware and stoneware pipes -uses-qualities.

Lime: Sources of lime-Classification-methods of manufacturing (Description only).

Cement: Composition, Compounds present, Manufacturing methods-characteristics of cement, Types of cement-Properties -Tests on cement-Consistency test, fineness test, Sp.gravity test, Setting time test, Soundness test, and field tests, uses of cement.

Puzzolona: definition, Common puzzolonas used as admixtures in cement. Surkhi, blast furnace Slag, Fly ash, Silica Fume, Rice- husk Ash.

Aggregates: Sand- Sources of sand-River sand, Sea sand and pit sand-Limitations of mining of sand from rivers and sea shore, M-sand, alternatives of sand.

Coarse aggregates: Materials generally used, requirements of good coarse aggregates, commonly used sizes for different applications, grading of coarse and fine aggregate. .
Mortar: Preparation of lime and cement mortar-Proportions of mortar for various items of work,tests on cement mortar.

Cement Concrete: Proportioning, ingredients, PCC and RCC, Water cement ratio- effects on strength and workability, characteristics of Concrete and reinforcements-preparation-workability-Tests on Cement concrete-Laboratory tests and field Tests- Slump test, compaction factor test, qualities of water used for

mixing. Reinforced cement concrete- Qualities of materials-Types of reinforcement used-characteristics of reinforcing material-preparation of concrete cubes and test on cubes. Chemical admixtures-Plasticizers and super plasticizers.

Timber and wood products: Structural classification- Soft wood and hard wood-defects in timber-seasoning of timber-preservation of timber-wood products ply wood, MDF,HDF, Veneer.

Metals: Ferrous metals-Wrought iron, Cast iron, Mild steel- -Special steels-High carbon steel, High tensile steel and stainless steel (Properties and uses only)-Nonferrous metals: Aluminum, Copper, Lead, Zinc and Titanium-important alloys- properties and uses.

MODULE – II

Ornamental materials for finishing: Paints and Varnishes: Types-Constituents-Preparation-characteristics and application**.**

Plastics: Types-characteristics and properties of P V C, uses- Advantages and Limitations of using plastics on environment.

Rubber: Characteristics and properties, uses**.**

Aluminum : Aluminum sections used for building construction- Hand rail and baluster, Doors and windows, Paneling and false ceiling, building façade.

Glass:-Types- floating , laminated, UV resistant, reinforced and reflective glasses-Uses and properties. Glass used for Structural applications.

Miscellaneous: Abrasives-Adhesives-asbestos-asphalt-bitumen-cork-Plaster of Paris. Acoustic and insulating materials- fibre glass- thermo Cole, wood products-veneers, ply wood, particle board-fiberboard, hard board, etc.

MODULE – III

Construction Technology: Masonry: Classification of masonry walls- load bearing, non-load bearing and retaining walls. Stone masonry-Brick masonry-Laterite masonry – composite masonry. Different types of stone masonry-General principles and specifications for stone masonry as per relevant codes.

Brick masonry: Different types of bonds for walls, piers and junctions of walls for equal and unequal thickness - English, Flemish (Single and Double Flemish)-Specification for brick masonry as per relevant codes. Hollow block masonry: Types of hollow blocks used in construction and methods of construction-Advantages and Disadvantages with reference to other types of masonry. Solid block masonry and inter locking block masonry. Partition walls-Types- materials- requirements.

Modern methods of constructions:- Framed – Prefabricated -Earthquake resistant**.**

Damp proof courses: Definition of dampness – causes and effects – methods of prevention –surface treatment – internal water proofing courses.

Pre stressed concrete: Principle of pre stressing- Types- Internal & External and different methods-pre-tensioning & post tensioning. Prestressed slabs and beams.

Form work: Functions- materials used – Requirements of good form work – modern trends in material & technology- slip forms, pvc forms.

Scaffolding, Shoring and Under pinning: Definition – purpose and function – Requirements of materials used.

Plastering and Pointing: Materials and proportion – Functions – general specifications – types.

MODULE – IV

Building Components: Different components of building from foundation to roof and their functions

Foundations: Functions, Classification, Shallow-Deep ,Types- Spread footing- raft-mat-column footing-pile foundation- well foundation.

Flooring: Requirements of a good floor – materials used for flooring, Floor finishes –Types Mosaic, Marble, Granite, Ceramic tiles, Vitrified tiles, Glass, Wooden, and other types of modern floor finishes.

Doors and Windows: Positioning of Doors and windows with respect to lighting and ventilation. Types and Size as per relevant codes -Special types of doors-Flush, Revolving, and collapsible, Rolling and sliding Windows-Different types-Ventilator Different types-Fittings for doors and windows.

Lintels and sunshades: Types of lintels- Wooden, Stone, brick, RCC and RSJ lintels-Sunshades Canopy and sun breakers. Arches- Types, terms used.

Vertical Transportation: Stairs and staircases: Location – Types – Standards for stair case as per KBR – Tread, Rise, Going, Riser, Nosing – Width of stair –– Head room – Flight– Landing – Hand rails. Lift and escalators- Component parts and requirements as per NBC, ramp, Lifts and Escalators - Planning and location – Component parts of staircase and lift – Types of staircase.

Ceiling: Materials used for Ceiling – False ceiling.

Roof: Definition – importance of roofing with respect to climatic conditions – classification – pitched and flat – Couple, couple closed and collar roof. Different types of trusses for pitched roof – wood and steel trusses – roof covering for pitched roof – AC sheets, GI corrugated sheets, Aluminum sheets- PVC sheets – method of arranging and fixing to the battens rafters and purlins – RCC roof – slab with beams – flat and sloped slabs –Flat slab construction- weather proof course to flat roof. Requirements of good floor finish, Selection of materials.
Ceiling: Types, Requirements of good ceiling, Selection of materials.

REFERENCE :

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3. S V Deodhar : Building Science & Planning ; Khanna publications
4. Parbin Singh : Civil Engineering Materials ; S.K Kataria & Sons
5. Rangawala : Engineering Materials ; Charotar Publications
6. NITTTR, Chennai : Building technology and Valuation
7. B C Punmia : Building construction ; Laxmi Publishers.
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9. Jha : Building Technology and foundations ; Khanna publications
10. RajaRao Y N : Planning and design of Residential Buildings ; Standard Publishers Distributers
11. Gurcharan Singh : Building Planning Designing and Scheduling ; Standard Publications.
12. S S Bhavikatti : Building Materials and Construction ; Vikas Publishing House
13. S.K. Duggal : Building Materials ; New Age International publishers