BUILDING MATERIAL I

ENAR 103

Lecture : 3 **Year : I**
Tutorial : 1 **Part : I**
Practical : 0

Course Objectives:
The course objective is to enable the students to select and use suitable building materials for various construction projects. The course covers different materials and their characteristics, production, quality, testing and application along with market survey and analysis techniques of the latest market scenario of building material.

1 Introduction (2 hours)

1.1 Building materials and its importance in architecture and engineering
1.2 Objective of building material study

2 Stone (8 hours)

2.1 Introduction
2.2 Sources of stone
- 2.2.1. General knowledge on types of rocks according to geological formation
  - 2.2.1.1. Igneous rock
  - 2.2.1.2. Sedimentary rock
  - 2.2.1.3. Metamorphic rock
- 2.2.2. Types of rocks by physical properties
- 2.2.3. Types of rocks by chemical properties
- 2.2.4. Types of rocks by hardness

2.3. Quarrying of stone
- 2.3.1. Types of quarrying
  - 2.3.1.1. Quarry by hand
  - 2.3.1.2. Quarry by machine
  - 2.3.1.3. Quarry by blasts

2.4. Seasoning, defects and preservation of stone
2.5. Dressing of stone
- 2.5.1. Hammer dressing
- 2.5.2. Chisel drafted margin
- 2.5.3. Tooling and axing
- 2.5.4. Fine tooling
- 2.5.5. Rubbed and polished work
- 2.5.6. Other new technologies

2.6. Stone masonry
- 2.6.1. Types

2.6.2. General principles to be observed in the construction
2.6.3. Comparison between brick and stone masonry
2.7. Selection and uses of stone for engineering and architectural works
2.8. Artificial stones

3 Brick (7 hours)

3.1 Introduction
3.2 Types of bricks (Traditional/modern)
3.3 Constituents of brick earth
3.4 Brick making process
3.4.1. Hand making process
3.4.2. Machine making process
3.5. Characteristics of good bricks and sizes
3.5.1. A class brick
3.5.2. B class brick
3.5.3. C class brick and so on
3.6. Testing of brick
3.6.1. Water absorption test
3.6.2. Compressive strength test
3.6.3. Tensile strength test
3.6.4. Lab and field test

4 Lime (3 hours)

4.1 Introduction, constituents of lime
4.2 Classification of lime
4.3 Types of lime and their comparisons
4.4 Properties of lime
4.5 Uses of lime

5 Sand (3 hours)

5.1 Introduction
5.2 Classification and uses
5.3 Bulking of sand
5.4 Characteristics of good sand
5.5 Substitutes of sand

6. Cement (10 hours)

6.1 Introduction and constituents of cement
6.2 Properties of good cement
6.3 Manufacturing process of cement
6.3.1. Dry process
6.3.2. Wet process
6.4 Testing of cement
6.4.1. Fineness

6.4.2. Soundness
6.4.3. Tensile strength
6.4.4. Compressive strength
6.4.5. Rough and ready method of examining cement (Field test)

6.5 Properties of cement mortar, its types and uses
6.5.1. Cement plaster
6.5.2. Cement paints

6.6 Storage of cement

6.7 Lab and field test

7. Concrete **(12 hours)**

7.1 Introduction

7.2 Constituents and mixing ratios

7.3 Properties of concrete
7.3.1 Plastic stage
7.3.2. Hardened stage

7.4 Operations of concrete
7.4.1. Concrete Mixing – Hand mixing, machine mixing/batch mixture
7.4.2. Transportation and placing of concrete
7.4.3. Compaction of concrete
7.4.4. Curing of concrete

7.5 Types of concrete
7.5.1. Reinforced cement concrete: Properties, advantages and disadvantages, causes of failure of RCC, materials used in RCC, corrosion of steel in concrete, quality control of concrete

7.6 Concrete admixtures

7.7 Lab testing of concrete
7.7.1. Tensile strength
7.7.2. Compressive strength

Field Work: Visit to ongoing project site and market survey of different building materials

Tutorials **(15 hours)**

There shall be various exercises, assignments, lab reports, site visit reports and market survey reports. Any one of the following site visits can be conducted:

1. Quarry site visit
2. Brick factory visit
3. Cement factory visit

References

1. Duggal, S. K. (2019). Building materials. New Delhi, India: New Age International.
2. Kansakar, D. H. (n.d.). Course manual – Building Material I. Department of Architecture, Institute of Engineering, Pulchowk Campus.

3. Singh, G. (2008). Building materials. Delhi, India: Standard Publishers.
4. Bhavikatti, S. S. (2012). Building materials. Bengaluru, India: Vikas Publishing House.