ENGINEERING MATERIALS

ENAE 151

Lecture : 2 **Year : I**
Tutorial : 0 **Part : II**
Practical : 2/2

Course Objectives:
After the completion of this course students have better understanding of materials used in construction work, test materials for quality, strength and durability and use of materials in their proper field and state.

1 Introduction (2 hours)

1.1 Classification of engineering materials
1.2 Scope and importance of agricultural engineering materials
1.3 Properties of materials: Physical, chemical, mechanical, electrical, thermal and other properties
1.4 Properties of building materials

2 Timber and Wood Based Products (4 hours)

2.1 Definition: Timber, standing timber, converted timber, dressed timber, structural timber
2.2 Classification of trees
2.3 Structure of trees, hard wood and soft wood and their characteristics
2.4 Qualities of good timber and defects in timber
2.5 Advantage and disadvantages of timber, uses of timber
2.6 Seasoning of timber: Objectives, advantages, methods
2.7 Decay of timber and preservation of timber
2.8 Market forms and wood based products

3 Ceramics Materials (5 hours)

3.1 Introduction
3.2 Brick earth: Composition, function of various constituents of brick earth, harmful constituents
3.3 Classification of bricks and qualities of good bricks
3.4 Tiles: Types, properties and uses of tiles
3.5 Sand: Sources, classification, properties and bulking of sand
3.6 Introduction to aggregates
3.7 Glasses: Classification, properties and uses of glass

4 Cementing Materials (5 hours)

4.1 Introduction to lime and cement
4.2 Lime: Properties, uses, classification and slaking of lime
4.3 Cement: Properties, classification and uses of cement in construction
4.4 Ingredients of cement and their functions
4.5 Composition of cement clinker
4.6 Types of cement
4.7 Various admixtures
4.8 Standard test on cement

5 Metal and Alloys (8 hours)

5.1 Introduction to ferrous and non-ferrous metal (Aluminium and copper)
5.2 Steel, steel classification and steel alloys along with their uses
5.3 Defects in steel
5.4 Mechanical treatment of steel
5.5 Mechanical properties of steel
5.6 Deformation of steel
5.7 Stress strain relationship
5.8 Corrosion: Introduction, factors influencing, classification, control and prevention
5.9 Different microscopic constituents of iron and steel
5.10 Heat treatment of steel: Definition, purpose, theory and heat treatment processes

6 Asphalt Bitumen and Tar (3 hours)

6.1 Asphalt: Definition, properties, uses, classification and forms of asphalt
6.2 Bitumen: Definition, properties, uses and forms of bitumen
6.3 Tar: Definition, properties, uses and types of tar
6.4 Comparison between asphalt, bitumen and tar
6.5 Test on bitumen

7 Miscellaneous Materials (3 hours)

7.1 Paints and varnishes (Function and uses)
7.2 Synthetic polymer (Properties, types and uses)
7.3 Lubricating materials (Introduction and types of lubricants)
7.4 Belting materials and packing Materials
7.5 Prefabricated material (Gypsum board, sandwich panel)

Assignment

1. Microstructure examination of steel, steel alloys, timber
2. Fracture modes of wood and timber

Practical **(15 hours)**

1. Compressive strength and water absorption test of brick
2. Clay content, bulking of sand and fineness modulus test of sand
3. Los Angeles abrasion test on aggregate
4. Cement: Consistency test, fineness test, setting time test and compressive strength test of cement
5. Hardness and toughness test on mild steel, cast iron and steel alloys
6. Test on bitumen: Penetration test, softening point test and ductility test

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	Hours	Marks Distribution*
1	2	2
2	4	4
3	5	5
4	5	5
5	8	8
6	3	3
7	3	3
Total	**30**	**30**

* There may be minor deviation in marks distribution.

References

1. Rangawala, S.C. (2011). Engineering Materials (Material Science). Charotar Publishing House.
2. Rajput, R.K. (2008). Engineering Materials. S. Chand Publishing.
3. Kumar, S. (2021). Engineering Materials. Standard Publications.