

CONSTRUCTION MATERIALS
BEG 159CI

Year-I

Semester-I

Teaching Schedule Hours/week			Examination Scheme						Total Marks
			Final				Internal Assessment		
Theory		Practical		Theory Marks	Practical Marks				
L	P	T	Duration	Marks	Duration	Marks			
3	2/2	1	3	80	-	-	20	25	125

Course Objective:

Course Contents:

1. Introduction (2.5 hrs)

- 1.1 Scope and types of construction materials
- 1.2 Properties of materials: Physical, Mechanical, Chemical, Thermal and Electrical properties

2. Characteristics of Construction Materials (6 hrs)

- 2.1 Stress/Strain Relationships, modulus of Elasticity and Poisson's Ratio, Comparative stress-strain curves for various engineering materials
- 2.2 Stress-strain diagram for ductile metal
- 2.3 Griffith's theory for brittle fracture
- 2.4 Principles of hardness and impact tests of engineering materials

3. Basic Construction Materials (3 hrs)

- 3.1 Sieve Analysis
- 3.2 Stone, its type and properties
- 3.3 Aggregate (fine & coarse), their quality
- 3.4 Bulking of sand

4. Metals and its Microstructure Study (8 hrs)

- 4.1 Categorization of Metals: Steel, aluminum, Cast Iron
- 4.2 Formation, composition and characteristics of cast iron, wrought iron, steel Aluminum and alloys and their uses
- 4.3 Microstructure study of brittle and ductile metals/ steel
- 4.4 Elastic and plastic behavior
- 4.5 Hardness and toughness
- 4.6 Ductility and resilience
- 4.7 Other mechanical properties (i.e. brittleness, malleability, stiffness, tenacity, creep
- 4.8 fatigue, wear resistance etc)
- 4.9 Deformation of steel
- 4.10 Heat treatment of steel & its thermal properties
- 4.11 Fracture modes of materials
- 4.12 Steel corrosion & its treatment

- 5. Wood** (6 hrs)
- 5.1 Types of wood
 - 5.2 Bamboo as a construction material
 - 5.3 Tree structure and microstructure of wood
 - 5.4 Characteristics of soft & hard wood
 - 5.5 Properties of quality wood
 - 5.6 Advantages and disadvantages of wood over other construction materials
 - 5.7 Commercial forms of wood
 - 5.8 Physical properties (e.g. Defects & seasoning)
 - 5.9 Mechanical and thermal properties
- 6. Properties of Ceramic Materials** (6 hrs)
- 6.1 Definition
 - 6.2 Types of ceramics (ie.traditional & new generation)
 - 6.3 Composition of bricks, its harmful ingredients, qualities of good bricks
 - 6.4 Popular types of tiles, and their uses, Roof tiles, Floor tiles for wall
 - 6.5 Glass, its manufactory types, forms & common properties
- 7. Cementing Materials** (5 hrs)
- 7.1 Clay
 - 7.2 Lime (composition, formation)
 - 7.3 Types and properties of lime
 - 7.4 Cement (composition, formation)
 - 7.5 Types and properties of cement
 - 7.6 Chemical reaction between lime and water & cement and water
 - 7.7 Testing of cement mortar and lime mortar
- 8. Properties of Asphalt Materials** (3 hrs)
- 8.1 Asphalt, bitumen and tar
 - 8.2 Types of asphalt cement, uses
 - 8.3 Introduction to asphalt concrete and properties
- 9. Synthetic Polymers** (3 hrs)
- 9.1 Definition
 - 9.2 Basic types (points, varnishes, plastics)
 - 9.3 Properties of some polymers
 - 9.4 Use of polymers in repairs of structures
- 10. Miscellaneous Materials** (2.5 hrs)
- 10.1 Fuels, Rubber, Adhesives, Additives, Abrasives, Insulating materials

Laboratories:

- (i.) Seven Laboratories will be performed in this course. These are:
- (ii.) Sieve analysis of clay, sand, gravel and crushed rock.
- (iii.) Hardness (Rockwell) tests on mild steel, alloy steel, aluminum alloy and cast iron.
- (iv.) Toughness (Charpy) tests on mild steel, alloy steel, aluminum alloy and cast iron.

- (v.) Microstructure examination of mild steel, alloy steel, aluminum alloy, cast iron and wood, using optical microscopes.
- (vi.) Tests to determine of linear coefficient of thermal expansion of aluminum, steel, wood, lime mortar, asphalt concrete and synthetic polymer
- (vii.) Setting time of cement
- (viii.) Microstructure examination of clay, lime mortar, cements mortar, asphalt concrete and one synthetic polymer.

References:

- “Fundamentals of Engineering Materials”, peter A. Thornton & Vito J. Colangelo, Prentice Hall Publishing Company
- “A Text Book of Material Science and Metallurgy, O.P. Khanna
- Introduction to Engineering Materials, B.K. Agrawal
- Engineering Materials, Gurucharan Singh