

Civil Engineering Materials

Course Code	Credit Hours
CE-115	2-1

Course Description

This course is concerned with introductory overview of various properties and applications of common construction materials that provides bridge between engineering mechanics and design. Materials include cement, sand, natural stones, concrete, wood, steel, and roadway materials. Conception of various concrete materials and techniques of mixing, pouring and curing is also presented. For pavement materials, various topics comprising of basic properties of asphalt, bitumen and aggregates are discussed. After this course, student will gain comprehensive knowledge of selection criteria, applications and proper use of materials in civil infrastructure projects and in building construction.

Text Book:

1. Engineering Materials by R.K. Rajput.
2. Engineering Materials by Surrendra Singh.
3. Building Materials by S.K Duggal.

Reference Book:

1. Materials of Construction by R.C. Smith.
2. Materials of Construction by ZH Syed.

Prerequisites Nil

ASSESSMENT SYSTEM FOR THEORY

	Without Project (%)	With Project/Complex Engineering Problems (%)
Quizzes	15	10-15
Assignments	10	5-10
Mid Terms	25	25
Project	-	5-10
End Semester Exam	50	45-50

ASSESSMENT SYSTEM FOR LAB

Lab Work/ Psychomotor Assessment/ Lab Reports	70%
Lab Project/ Open Ended Lab Report/ Assignment/ Quiz	10%
Final Assesment/ Viva	20%

Teaching Plan

Week No	Topics/Learning Outcomes
1-2	Materials and their Properties <ul style="list-style-type: none">• Introduction of materials• Construction materials• Physical, mechanical, and chemical properties• Electrical and thermal properties
3-4	Binding Materials (Cement and Lime) <ul style="list-style-type: none">• Introduction and manufacture of Ordinary Portland Cement• Constituents of cement• Types of cement and their use• Properties and field tests of cement• Special cements• Introduction and preparation of lime• Setting and hardening of lime• Applications of lime• Comparison (cost and characteristics) of lime and cement
5-6	Fine & Coarse Aggregates and Stones <ul style="list-style-type: none">• Definition and introduction of aggregates• Mechanical and physical properties of aggregates• Importance and methods of grading of aggregates• Introduction, types, applications, characteristics of good building stones

	<ul style="list-style-type: none"> • Artificial stones
7-8	<p>4. Cementitious materials</p> <ul style="list-style-type: none"> • Introduction and methods of preparation of paste • Properties and application of paste • Introduction and methods of preparation of mortars • Properties and application of mortars • Introduction about concrete • Components and manufacture of concrete, properties of concrete • Types of concrete
9	Mid Semester Exam
10-11	<p>Metals (Steel and Aluminum)</p> <ul style="list-style-type: none"> • Introduction to steel • Mechanical and physical properties of steel • Application of steel in civil engineering projects • Introduction to aluminum • Mechanical and physical properties of aluminum • Application of aluminum in civil engineering projects
12-13	<p>Ceramics, Bricks and Blocks</p> <ul style="list-style-type: none"> • History and evolution of ceramics • Manufacture of ceramics • Properties and applications of ceramics in buildings • History and evolution of bricks • Properties and applications of bricks • Dimensions, manufacture and classification of bricks • History and evolution of blocks • Properties and applications of blocks • Dimensions, manufacture and classification of blocks

14-15	<p>Glass and Wood</p> <ul style="list-style-type: none"> • Constituents of glass and methods of manufacture. • Types, use and significance of glass in civil engineering • Advantages and drawbacks of glass • Structure of tree and general characteristics • Types, seasoning and preservation of wood • Lamination of wood
16	<p>Pavement Materials</p> <ul style="list-style-type: none"> • Bitumen • Asphalt • Road Metals
13-14	<p>Miscellaneous Construction Materials</p> <ul style="list-style-type: none"> • Asbestos, Plaster of Paris, Abrasives • Rubber, Cork, Plastics • Paint • Thermometry and acoustics • Bamboo • Natural, artificial, and steel fibers • Modern Materials (Fiber reinforced polymer etc.)
17-18	End Semester Exam

Practical

Experiment No	Description
1	To determine consistency, initial and final setting time of various samples of cement and then to discuss the results.
2	To determine the hydraulic properties of lime.
3	To determine different densities of coarse aggregate.
4	To carry out sieve analysis of various samples of coarse aggregates, draw gradation curves for those and to discuss its effects on the properties of

	concrete.
5	To determine different densities of fine aggregate.
6	To carry out sieve analysis of various samples of fine aggregates, draw gradation curves for those and to discuss its effects on the properties of concrete.
7	To determine the compressive strength of mortar with various mix ratios.
8	To determine water absorption of bricks and to discuss the results.
9	To determine compressive strength of bricks and to discuss the results.
10	To identify various types of wood samples by observation
11	To determine flexural strength of provided samples of timber.