



Course Syllabus

Course Code	Course Title	ECTS Credits
CEE-152	Construction Materials	7
Prerequisites	Department	Semester
None	Department of Engineering	Fall/Spring
Type of Course	Field	Language of Instruction
Required	Civil and Environmental Engineering	English
Level of Course	Lecturer(s)	Year of Study
1 st Cycle	Dr Rogiros Illampas	1 st
Mode of Delivery	Work Placement	Co-requisites
Face to face	N/A	None

Course Objectives:

The main objectives of the course are to:

- Acquire fundamental knowledge about the nature and behaviour of the most common construction materials.
- Develop the judgment to select the suitable materials that fulfil the basic design requirements for the structures.
- Get familiar with laboratory and field-testing procedures for the verification of the physical and mechanical properties of the various construction materials.
- Provide a foundation for the application and practice of materials technology science.

Learning Outcomes:

After completion of the course students are expected to be able to:

- Demonstrate understanding of the basic mechanical properties of solids.
- Identify the physical and mechanical properties for the most common building materials, as well as for some contemporary advanced construction materials.
- Describe and conduct the necessary experimental work and laboratory tests for the quality control and the verification of certain material properties
- Evaluate, analyse and interpret the data obtained through standard laboratory testing procedures.
- Identify the advantages and disadvantages regarding the use and performance of each provided construction material.

- Identify and suggest typical and potential applications of these materials
- Efficiently select the suitable material for a given application, considering the various factors that affect or/and determine this selection.

Course Content:

- Classification and basic requirement of the various construction materials.
- Physical and mechanical properties of solids.
- Cement types, manufacturing methods and chemical composition. Hydration of cement, structure and strength of the hardened cement paste. Cement additions and their effects.
- Admixtures. Plasticisers, Superplasticisers, Accelerators, Retarders, Air-entraining agents. Mode of action of each admixture. Benefits and drawbacks. Applications.
- Aggregates. Types of aggregates and classification. Shape and size classification methods. Sieve analysis test. Definition of specific gravity, bulk density, porosity and absorption of aggregates.
- Concrete. Properties of fresh concrete and related tests. Early age properties, plastic settlement, drying shrinkage, curing, strength gain and temperature effects. Creep in concrete. Strength and failure of concrete. Laboratory tests. Non-destructive and in-situ testing. Factors influencing strength. Concrete mix design. Durability issues. Special concretes.
- Steel. Raw materials and manufacturing processes. Types of steel used in construction: Hot-rolled and Cold-formed steel, Reinforcing steel. Major properties. Grading of steel. Durability issues. Corrosion.
- Bituminous materials. Applications, with emphasis in road construction. Sources of bitumen. Main characteristics of bitumen. Types of bitumen products. Viscosity and rheology of binders. Grades of bitumen. Tests for assessing the properties of bitumen. Requirements and testing of aggregates used in asphaltic mixtures. Types of bituminous mixtures. Production methods. Durability. Ageing tests.
- Masonry. Forms of masonry construction. Major types of masonry units. Fired clay, concrete and aircrete units. Mortars. Mechanical properties and structural performance of masonry structures. Reinforced masonry.
- Timber. Types of wood and production process. Structure of timber. Defects in wood. Effects of moisture. Physical and mechanical properties. Common tests. Grades of timber. Durability issues and preservation techniques.
- Composites. Types: Macroscopic, Microscopic, Fiber-Reinforced, Particle-Reinforced composites. Properties. Application examples. Advantages and disadvantages.
- Selection and sustainable use of construction materials. Factors affecting the selection of appropriate construction materials. Environmental issues. Sustainable use of construction

- materials. Life-cycle assessment. Green construction.
- Laboratory work: The laboratory sections are designed to provide students a hand-on experience on various material testing concepts and procedures. A list of such laboratory tests that are designed for this course is provided below:
 - Sieve analysis and grading of aggregates
 - Concrete mixing
 - Fresh concrete slump test
 - Making and curing specimens for strength test
 - Non-destructive testing of concrete strength
 - Compression test of concrete specimens and masonry units
 - Flexure test of concrete specimens

Learning Activities and Teaching Methods:

Lectures, in-class examples and exercises, laboratory work and assignments, discussion

Assessment Methods:

Homework assignments, laboratory reports, mid-term exam, final exam (comprehensive).

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Construction: Materials, 4th Edition	Peter Domone and John Illston	CRC Press	2010	9780203927571 (e-book)

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Materials for Civil and Construction Engineers	M. Mamlouk & J. Zaniewski	Pearson	2014	9781292032948
Building Materials in Civil Engineering	Haimei Zhang	Woodhead Publishing	2001	9781845699550
Building Materials	P.C. Varghese	PHI Learning	2005	9788120328488 (e-book)