PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE
SCHOOL OF ENGINERING
DEPARTAMENT OF CONSTRUCTION ENGINEERING AND MANAGEMENT
ABET COURSE SYLLABI

ICC2104 TECHNOLOGY OF CIVIL ENGINEERING MATERIALS

Credits and contact hours:	10 UC credits / 10 hours (3 hours in lectures; 7 h. individual work hours per week)
Instructor's name:	Ricardo Serpell
Course coordinator's name	Ricardo Serpell
Textbook:	- Mamlouk, M., Zaniewski, J. (2010). Materials for Civil and Construction Engineers (3rd ed.). Upper Saddle River, New Jersey, Pearson Education, Inc. - Young, J. F., Mindess, S., Gray, R., Bentur, A. (1998). The Science and Technology of Civil Engineering Materials. Upper Saddle River, New Jersey, Prentice Hall, Inc. - Somayaji, S. (2001). Civil Engineering Materials. Upper Saddle River, New Jersey, Prentice Hall, Inc. - Laboratory manuals for activities (6 in total), provided by the course.
Course Catalog Description:	Upon finishing this course, the students will be familiar with the principal materials employed in the construction of civil engineering projects. They will be able to recognize the mechanical and physical behavior of these materials, their origin, the characteristic values for their properties and the factors that affect them. They will also be able to select materials according to project requirements. In addition, they will be able to conduct simple tests and correctly interpret their results in order to evaluate specific material properties.
Prerequisite Courses:	ING1024 Properties and Materials Resistance
Co-requisite Courses:	None
Status in the Curriculum:	Required
Course Learning Outcomes:	1. Ability to explain the behavior and properties of civil engineering materials in relation with their microstructure. 2. Ability to select materials for civil engineering projects according to the application and performance requirements. 3. Ability to explain the impact of production processes on the properties of engineering materials. 4. Knowledge of the different techniques commonly employed to test the physical and mechanical properties of civil engineering materials. 5. Laboratory experience required to measure physical and mechanical properties of engineering materials and factors that affect them. 6. Proper writing of: abstracts, descriptions, instructions, and conclusions.

7. Effective work in teams.
8. Tools for continuous self-learning.

Relation of Course to ABET Criteria:

a. Knowledge of mathematics, science and engineering
b. Design and conduct experiments: analyze and interpret data
c. Design a system, component, or process
e. Identify, formulate, and solve engineering problems
g. Effective communication
h. Broad education necessary for global, economic, environmental and societal context
j. Knowledge of contemporary issues
i. Recognition of the need for, and an ability to engage in life-long learning
k. Techniques, skills, and modern tools for engineering practice.

Topics covered:

1. Structure of matter and its relation with physical and mechanical properties of materials
2. Wood: structure of trees, species, types of wood, production processes, wood microstructure, anisotropy of wood, physical and mechanical properties, uses in construction, engineered wood products. Specific tests for wood properties (includes laboratory session).
3. Aggregates: Origin, classification, physical and mechanical properties, uses in construction, special types of aggregates. Specific tests for aggregate properties (includes laboratory session).
4. Cement: Constituents, production, types of cement, supplementary cementitious materials, hydration of cement, physical and mechanical properties, uses in construction, special cements, specific tests for cement.
5. Concrete: Constituents, fabrication, physical and mechanical properties of fresh and hardened concrete, basic concepts on mixture design, durability of concrete, special concretes. Specific tests for fresh and hardened concrete (includes two laboratory sessions).
6. Asphalt: Origin, types, physical properties of asphalt binders, asphalt concrete, mechanical properties of asphalt concrete, uses in construction. Specific tests for asphalt and asphalt concrete (includes laboratory session).
7. Steel: Production process, composition, microstructure, physical and mechanical properties, uses in construction.
8. Aluminum: Production process, alloys, microstructure, physical and mechanical properties, uses in construction.
9. Fiber reinforced polymers (FRP): Origin, composition (matrix and reinforcement), production processes, microstructure, physical and mechanical properties, uses in construction. Concrete reinforcement using FRP (includes laboratory session)
10. Quality control: statistics applied to material properties, sampling, test results analysis, rejection criteria.