INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

DPT GENIE CIVIL ET URBANISME
CIVIL ENGINEERING AND URBANISM
INSA Campus LyonTech - 8 rue des Sports
Batiment Eugène Freyssinet - 69621 VILLEURBANNE
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Mechanical Design

Structural Materials

IDENTIFICATION

CODE : GCU-3-S1-EC-MA
ECTS : 2.0

HOURS

Lectures :	14.0 h
Seminars :	0.0 h
Laboratory :	10.0 h
Project :	0.0 h
Teacher-student contact :	24.0 h
Personal work :	26.0 h
Total :	50.0 h

ASSESSMENT METHOD

Written exam 3h
Report of practical works

TEACHING AIDS

Duplicated documents
On-line documents

TEACHING LANGUAGE

French

CONTACT

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AIMS

This module is part of the course unit GCU-S5-STRUCT-1 [Materials & Structures - 1] and contributes to:

Competences in Engineering Science:
A3- Implement an experimental approach
A4- Design a system that meets specifications

Competences in Humanities, Documentation and Physical and Sports Education:
B3- Interact with others, work as a team

Competences specific to the specialty:
C7- Building structure [design, dimension and control a...]
C8- Civil Engineering Structures [design, dimension and control a...]
C25- Contribute to sustainable urban developments and sustainable construction

Allows the student to work and be evaluated on the following knowledge:
- Basic science concepts that underlie each property of the materials.
- Properties of cementitious materials, metallic, polymers, composites, natural, and their limits.
- Concrete formulation according to EN 206 standard.
- Influential factors of sustainability within the meaning of the standard.

Allows the student to work and be evaluated on the following abilities:
- Evaluate the relevance of the use of this or that material.
- Know how to choose a material according to the required properties.
- Know how to establish the general composition of a concrete according to the exposure environment from the norm.
- Understand the link between macroscopic properties of a concrete and its microscopic characteristics.
- Write as a team a critical report on the formulation of cementitious materials [SHS-3].

CONTENT

Generally, aims are to :

- Introduce the main materials in the civil engineering practice,
- Deffine the main material properties, througout characterisation,
- Exhibition of relations between structure and material in order to underline benefits from the material science,
- Quality and normalisation,
- Cement, concrete, steel, wood, composite, alternative binder for sustainable construction : fabrication, product type, implementation, practice, properties, durability, activity fields: production/recycling/energy
- Practical works: Raw materials characterization [cements, aggregates, ...], Normalisation, Concretes formulation, Experimental mechanical characteristics identification of concrete, Introduction to different concretes [High-performance, Self-levelling, ...].

BIBLIOGRAPHY

MEHTA et MONTERO. Concrete: Structure, Properties and Materials. Prentice Hall, Ed. - USA - 2°éd, 1993.
DORLOT, BAILON et MASOUNAVE. Des Matériaux. Editions de l'école Polytechnique de Montréal - 2° éd, 1991.
KURTZ, MERCIER et ZAMBELLI. Introduction à la science des matériaux. Presses Polytechniques Romandes. LAUSANNE-2°éd, 1995.
DUPAIN, LANCHON et SAINT-ARROMAN. Granulats, sols, ciments et bétons. Ed Casteilla, Paris, 1995.
ASHBY et JONES, Matériaux, tomes 1 et 2. Dunod, Paris, 1998.

PRE-REQUISITE

Background on solid mechanics and physics.

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