

CIVIL-532

Materials and structures

Denarié Emmanuel

Cursus	Sem.	Type
Civil Engineering	MA1, MA3	Opt.
Civil engineering minor	H	Opt.

Language of teaching	English
Credits	3
Session	Winter
Semester	Fall
Exam	Oral
Workload	90h
Weeks	14
Hours	3 weekly
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

Starting with basic knowledge of concrete technology, this course provides an understanding of the relationships between the composition, processing, microstructure and structural properties of "new concretes", with a particular focus on Ultra High Performance Fiber Concretes (UHPFRC).

Content

- Background, motivation and general approach;
- Basic components; binders and mineral additions;
- Rheology of fresh cementitious materials and background of admixtures;
- Property optimization;
- Improved workability (self-compacting concretes);
- Improved mechanical strength (HPC - UHPFRC);
- Improved deformability (addition of fibers - fiber-reinforced concrete and UHPFRC);
- Mechanics of work-hardening fiber-reinforced concrete;
- Improved durability (NC, HPC, UHPFRC);
- Test methods;
- Material specification and quality insurance;
- Environmental performance (LCA);
- Openings to the design of innovative structures.

Keywords

New concretes, Binders, Mineral additions, Fibers, UHPFRC, Concrete, Rheology, LCA, Structures.

Learning Prerequisites**Required courses**

MSE-171, ENV-101, CIVIL-323

Important concepts to start the course

Fundamentals of concrete technology and mechanics and physics of building materials.

Learning Outcomes

By the end of the course, the student must be able to:

- Choose or select appropriate cementitious materials for structural applications.
- Optimize their implementation.
- Justify their choice.
- Infer their properties in structures.
- Model using appropriate mechanical and structural tools.
- Characterize with appropriate test methods.
- Design recipes for cementitious materials.

Transversal skills

- Take responsibility for environmental impacts of her/ his actions and decisions.

Teaching methods

Ex-cathedra, exercises with detailed answer keys, film presentations, application examples, laboratory demonstrations, guest speakers on selected topics.

Expected student activities

Active participation in the course, solving exercises.

Assessment methods

Oral examination.

Supervision

Office hours	Yes
Assistants	No
Forum	No

Resources

Virtual desktop infrastructure (VDI)

No

Moodle Link

- <https://go.epfl.ch/CIVIL-532>

Prerequisite for

CIVIL-511, Construction and Master projects