

CIVIL-443

Advanced composites in engineering structures

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

1. Introduce topics in properties, processing, mechanical behavior, characterization, analysis and structural design of Fiber Reinforced Composites
 2. Help students develop their research skills through independent investigations on research topics

Content

1. Introduction-Basic ideas about composite materials, fibers, resins, applications
2. Manufacturing of composite materials-composite components
3. Basic mechanics of composites-Anisotropic theory of elasticity
4. Mechanics of laminates
5. Project report/Group meeting with teacher
6. Classical lamination theory
7. Failure of composite materials
8. Laboratory experience: Fabrication of composite laminates
9. Durability and long-term performance of composites
10. Laboratory experience: Experimental investigation of the behavior of composites
11. Project report/Group meeting with teacher #2
12. Strengthening of existing structures with composites
13. Fatigue of composites
14. Project hand out

Keywords

Composites, structures, design, analysis, matrix, fiber, project based

Learning Prerequisites**Required courses**

Basic knowledge of physics, mechanics of materials, mathematics

Recommended courses

Basic knowledge of physics, mechanics of materials, mathematics

Learning Outcomes

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

- Produce project ideas and a schedule to achieve the objectives
- Choose a relevant to their interests project

- Manage the schedule and the working group
- Synthesize the work and the group capabilities

Transversal skills

- Assess progress against the plan, and adapt the plan as appropriate.
- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Communicate effectively, being understood, including across different languages and cultures.
- Give feedback (critique) in an appropriate fashion.
- Take responsibility for environmental impacts of her/ his actions and decisions.
- Take feedback (critique) and respond in an appropriate manner.
- Manage priorities.
- Make an oral presentation.

Teaching methods

The material is presented by lectures and visits to the laboratory. Student evaluation is based on class participation and presentation of a project.

Expected student activities

Students are expected to participate, create groups and develop a group project. They need to work during the semester, show and discuss the group progress with the teacher to follow up on the work plan. Finally they must derive a project report and a presentation for the exam.

Assessment methods

Project report delivered at the end of the semester, project presentation, class participation.

Supervision

Office hours	No
Assistants	No
Forum	Yes

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

Plenty of books on composites and composites' design available at the EPFL library

Notes/Handbook

No textbook required. Lecture notes are distributed.

Moodle Link

- <https://go.epfl.ch/CIVIL-443>