

CIVIL-443

**Advanced composites in engineering structures**

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Cursus	Sem.	Type
Civil & Environmental Engineering		Opt.
Civil Engineering	MA1, MA3	Opt.

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

**Summary**

The objective of the course is to: 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 the use of 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. Classical lamination theory.
6. Introduction to structural design.
7. Laboratory experience: Fabrication and testing of laminates.
8. Failure of FRP laminates.
9. Fatigue of composite materials.
10. Joints and joining techniques.

**Keywords**

Composites, engineering structures, mechanics of composites, laminates analysis.

**Learning Prerequisites****Required courses**

No obligation.

**Recommended courses**

Basic knowledge of physics, mechanics of materials, mathematics.

**Learning Outcomes**

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

- Analyze the behavior of composite structures.
- Design composite structures.
- Assess / Evaluate the strength of composite structures.
- Manage design projects.
- Express their opinion on design projects.

- Define needs and set priorities.
- Organize their work (especially when working in a team).
- Create complete technical reports.

### Transversal skills

- Take feedback (critique) and respond in an appropriate manner.
- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Give feedback (critique) in an appropriate fashion.
- Continue to work through difficulties or initial failure to find optimal solutions.
- Use both general and domain specific IT resources and tools
- Evaluate one's own performance in the team, receive and respond appropriately to feedback.
- Keep appropriate documentation for group meetings.
- Negotiate effectively within the group.

### Teaching methods

Lectures will be given in the class assisted by powerpoint presentations.  
Lecture notes will be distributed before each class.

### Expected student activities

Class participation.  
Homework (not obligatory).

### Assessment methods

Project report and oral exam (based on project presentation).

### Supervision

Office hours	No
Assistants	Yes
Forum	Yes

### Resources

#### Bibliography

No textbook required

#### Notes/Handbook

Lecture notes are distributed.

#### Moodle Link

- <http://moodle.epfl.ch/course/view.php?id=9071>