MSE-710

Modeling of advanced composites: processing and mechanical properties

Hôte(s) académiques(s) , Michaud Véronique

Cursus	Sem.	Type
Advanced Manufacturing		Obl.
Materials Science and Engineering		Obl.

Language of teaching	English
Credits	1
Session	
Exam	Multiple
Workload	30h
Hours	**14**
Courses	14
Number of positions	**20**

Frequency

Every 2 years

Remark

Spring 2018

Summary

This course introduces the main phenomena in composite processing and mechanical as well as hygrothermal properties and the methods to model them, mostly analytically. Teaching is ex-cathedra with a term paper on a topic defined with the teachers.

Content

1. Brief introduction on composites and their processing techniques
2. Composite processing: governing phenomena
3. Multi-phase flow, saturation and capillary phenomena
4. Mechanics of fiber reinforcement, introduction into process models
5. Effective property analysis
6. Stress transfer in short fiber composites
7. Fracture and damage models
8. Interfacial mechanics, residual stresses

Keywords

Modeling, composite processing techniques, flow in porous media, composite mechanics, damage models, process-induced stresses.

Learning Prerequisites

Recommended courses

Prerequisites for the course include the knowledge of kinetics and transport phenomena, and of polymers, as relevant to materials science and engineering. Prior knowledge of basic composites (classical laminate theory, basic micromechanics) is recommended, upon request, some notes or references can be transmitted to the students.

Learning Outcomes

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

- Propose modelling methods for a given composite process or property
- Analyze critically the literature on composite modelling

Transversal skills

- Write a literature review which assesses the state of the art.
- Access and evaluate appropriate sources of information.

Teaching methods

Ex-cathedra

Assessment methods

- Term paper
- Oral presentation

Resources

Bibliography

Process modeling in Composites manufacturing, S. Advani, M. Sozer, Marcel Dekker , 2003
Liquid composite moulding, R.Parnas, Hanser Gardner, June 2000
“Composite reinforcements for optimum performance”, P. Boisse, Ed, Woodhead, 2011.
Comprehensive composite materials, Kelly A, Zweben C. ed., Elsevier 2000
Fiber-reinforced composites P.K. Mallick, Marcel Dekker, Inc, 1993
Matériaux composites, D. Gay, Hermes, 1997
Engineering mechanics of composites materials, I.M. Daniel, O. Ishai, Oxford University Press, 1994

Ressources en bibliothèque

- Engineering mechanics of composites materials / Daniel
- Comprehensive composite materials / Kelly
- Matériaux composites / Gay
- Liquid composite moulding / Parnas
- Process modeling in Composites manufacturing / Advani
- Composite reinforcements for optimum performance / Boisse
- Fiber-reinforced composites / Mallick

Références suggérées par la bibliothèque

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