UNIVERSITY OF BORÅS

Textile-based Composite Technology and Additive Manufacturing

Textilbaserad kompositteknologi och additiv tillverkning

7.5 credits

Ladok Code: AT2TK1
Version: 4.0
Established by: Committee for Education in Technology 2023-06-16
Valid from: Autumn 2023

Education Cycle: Second cycle
Main Field of Study (Progressive Specialisation): Textile Technology (A1F)
Disciplinary Domain: Technology
Prerequisites: Passe result in the course Fibre and Yarn Technology, 7,5 credits
Subject Area: Textile Technology
Grading Scale: Seven-degree grading scale (A-F)

Content

The course offers a comprehensive understanding of composites, encompassing their constituent materials and fabrication processes. It delves into biomimetics and examines how nature utilizes composites while also covering different types of polymers used in composites.
The course emphasizes the role of fibres (including recycled fibres) as textile reinforcements in composites and the effect of textile structures in the preforms of composite in 2D and 3D.
The course also explores the possibilities of textile techniques such as embroidery, surface modification, and impregnation to accomplish localized special properties.
The utilization of continuous filament and staple fibre-reinforced bi-component filaments in additive manufacturing will be introduced.
The course covers various methods for composite production, characterization, and analytics, with examples of composite applications and design criteria.
Additionally, the course includes an introduction to the use of digital tools and modelling for composite materials.

Learning Outcomes

Learning Outcomes
After completing the course, the student should be able to:

Knowledge and understanding
1.1. Elaborate on how the design of textile preforms impacts the reinforcement effect and other associated characteristics of composites,
1.2. describe the primary manufacturing techniques used for composites and their impact on the composite's performance and properties,
1.3. explore the environmental impact of composites and potential sustainability issues associated with their use,
1.4. comprehend how the enhancement of composite properties is linked to the utilization of textile techniques, and
1.5. provide an overview of the possibilities of simulating the mechanical properties of composite materials.

Skills and abilities
2.1. Select a suitable matrix and textile reinforcement, along with the preform structure of the textile reinforcement, to attain the intended performance,
2.2. elaborate on how the preforms of 2D and 3D textile structures impact composites,
2.3. identify suitable textile techniques that can accomplish localized special properties,
2.4. contemplate the integration of composites into a sustainable society, and
2.5. use digital tools for the modeling of composite.

Forms of Teaching

The course consists of lectures, seminars, projects, and laboratories.

The language of instruction is English.

Forms of Examination

The course will be examined through the following examination elements:

Exam
Learning outcomes: 1.1–1.4, 2.1–2.4
Credits: 4.5
Gradingscale: Seven-degree grading scale (A-F)

Project and presentation
Learning outcomes:
Credits: 1.5
Gradingscale: Fail (U) or Pass (G)

Laboratory with report
Learning outcomes: 1.1–1.4, 2.1–2.4
Credits: 1.5
Gradingscale: Fail (U) or Pass (G)

In order to pass the course, the exam and assignment must be approved.
The student's rights and obligations for examination are in accordance with guidelines and regulations at the University of Borås.

If the student has received a decision/recommendation regarding special pedagogical support from the University of Borås due to disability or special needs, the examiner has the right to make accommodations when it comes to examination. The examiner must, based on the objectives of the course syllabus, determine whether the examination can be adapted in accordance with the decision/recommendation.

Student rights and obligations at examination are in accordance with guidelines and rules for the University of Borås.

Literature and Other Teaching Materials

Course literature is in English.

Miravete, A. (1999). 3-D Textile Reinforcements in Composite Materials. Woodhead Publishing Series in Composites Science and Engineering.

Clyne, T., & Hull, D. (2019). An Introduction to Composite Materials (3rd ed.). Cambridge: Cambridge University Press.

Supplementary material is distributed during the course.

The course is primarily intended for students in the “Master Programme in Textile Technology and Engineering” but is also offered to exchange students.

Student Influence and Evaluation

The course is evaluated in accordance with current guidelines for course evaluations at the University of Borås in which students' views are to be gathered. The course evaluation report is published and returned to participating and prospective students in accordance with the above-mentioned guidelines, and will be taken into consideration in the future development of courses and education programmes. Course coordinators are responsible for ensuring that the evaluations are conducted as described above.

Miscellaneous

This syllabus is a translation from the Swedish original.