

## Polymers and Textiles in Composites

### Polymerer och textil i kompositer

7.5 credits

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**Ladok Code:** A528TA

**Version:** 5.0

**Established by:** Committee for Education in Technology 2021-10-08

**Valid from:** Spring 2022

**Education Cycle:** Second cycle

**Main Field of Study (Progressive Specialisation):** Polymeric Technology (A1F)

**Disciplinary Domain:** Technology

**Prerequisites:** Meets the requirements for admission to the Master's programme in Resource Recovery

**Subject Area:** Chemical Engineering

**Grading Scale:** Seven-degree grading scale (A-F)

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### Content

The course covers the design and manufacture of composites with the intention of providing knowledge and awareness of the role of composites in the circular economy. Various polymeric matrix materials and textile reinforcements are dealt with including their significance for the properties and performance of the composites. The most important manufacturing methods for composites are presented and discussed when it comes to technical limitations and economic conditions. The possibility of utilising bio-based and renewable components in composites is presented, both in terms of matrix material and textile fibre reinforcement. An important part of the course is the structuring of the textile fibre reinforcements in the composite when it comes to fibre orientation, quantity, and thickness, as well as placement in the mould tool, which is dealt with by reviewing the basics of composite mechanics. Work environment issues regarding material handling during processing are discussed. Design and manufacturing methods are demonstrated for selected components and details, by giving relevant examples from transport and aviation, sports, and boats as well as from the design and construction sectors. The course includes project work comprising the planning of a composite detail in regards to design, material selection, manufacturing, and construction, as well as waste management. The course also includes an oral presentation based on scientific literature addressing a question relevant to the course.

### Learning Outcomes

After completing the course, the student will be able to:

#### Knowledge and understanding

- 1.1 describe the components of the composite and their role regarding processing and properties,
- 1.2 describe the most important manufacturing methods for composites, as well as how these methods can be related to the composites' performance and properties,
- 1.3 give a written and oral account of the environmental benefits of composites and their handling and role in the circular economy.

#### Skills and abilities

- 2.1 select the appropriate matrix and textile reinforcement, including the preform structure of the textile reinforcement, to achieve the desired performance,
- 2.2 assess how a composite can be designed to achieve resource efficiency without sacrificing property requirements and performance,
- 2.3 be able to describe the most important fracture mechanisms in a composite and how these are related to the composition and construction of the composite.

#### Evaluation ability and approach

- 3.1 evaluate a composite product's value chain regarding material selection, costs, technical challenges, as well as environmental

issues,

3.2 reflect on how composites can be integrated into a sustainable society.

### **Forms of Teaching**

The course consists of:

- Lectures
- Seminar
- Project work in groups

The language of instruction is English.

### **Forms of Examination**

The course is examined through the following components:

- Examination  
Learning outcomes: 1.1-1.5, 2.1-2.2, 3.1-3.2  
Credits: 3.0  
Grading scale: A-F
- Project work with oral and written presentations  
Learning outcomes: 1.1-1.5, 2.1-2.2, 3.1-3.2  
Credits: 3.5  
Grading scale: Pass/Fail
- Seminar  
Learning outcomes: 1.1-1.5, 2.1-2.2, 3.1-3.2  
Credits: 1.0  
Grading scale: Pass/Fail

The examination component “Examination” determines the final grade of the course, which is issued only when all components have been passed. Grading scale for the course is: Seven-point grading scale (A-F)

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**

### **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**

The course is primarily intended for students in the Master Programme in Resource Recovery - Polymer Materials for the Circular Economy, but is also offered to exchange students. This syllabus is a translation from the Swedish original.