



Polymer Technology

Polymerteknik

9 credits

Ladok Code: AT2PL1

Version: 2.0

Established by: Committee for Education in Technology 2017-05-12

Valid from: Autumn 2017

Education Cycle: Second cycle

Main Field of Study (Progressive Specialisation): Textile Engineering (A1N)

Disciplinary Domain: Technology

Prerequisites: Admitted to the Master's Programme in Textile Engineering.

Subject Area: Textile Technology

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

Content

Following introduction that freshens up fundamental concepts, polymerization is emphasized where possibilities to govern constitution and configuration are covered, among many other aspects. Then polymer solutions and polymer blends are focused followed by structural characterization, morphology and physical properties that are followed by crystallization, glass transition and the glassy state. Study of rheological, viscoelastic and mechanical including elastomeric properties are followed by thermoplastic and thermosetting polymer processing, and the content is finally wrapped up by looking at how polymer based products should be designed including the possibility to tamper with their properties by additives and thermomechanical treatments. Synthetic textile fibres and environmental aspects are frequently referred to as important contexts. Active student participation is a prerequisite for the course quality by presenting selected parts of content, laboratory assignments, educational visits and formulation of exam questions.

Learning Outcomes

The examinee shall independently be able to:

Knowledge and understanding

- 1.1 explain how core polymer physical concepts such as glass transition, crystallization and morphology influence properties of polymeric materials,
- 1.2 account for the different polymerization routes, their processes and discuss their opportunities and limitations,
- 1.3 account for polymeric material properties physical properties based on constitution, configuration, conformation and thermomechanical history, and
- 1.4 account for the possibilities to manipulate and shape different polymeric materials based on their structure through available thermomechanical processes and additives.

Skills and abilities

- 2.1 interpret results from characterization by commonly used polymer lab methods and select appropriate method to describe specific properties of polymeric materials,
- 2.2 apply acquired knowledge of polymeric materials to select appropriate material, additives and processing method for different polymer based products,
- 2.3 apply polymer engineering knowledge for synthetic fibers particular conditions, and
- 2.4 feature complex polymer engineering issues in a pedagogic way.

Judgement and approach

- 3.1 problematize use and risk of polymeric materials considering raw materials, polymerization, processing, use, reuse, recycling and scrapping, and
- 3.2 handle complex polymer technological concepts in dialogue with staff and peers in a respectful and constructive manner.

Forms of Teaching

The course consists of workshops and laboratory work. Each workshop ends with a short exam.
The course is given in English.

Forms of Examination

The course will be examined through the following examination elements:

Written exam (Learning objectives 1.1-2.3, 3.1)

Learning outcomes:

Credits: 7

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

Assignment, work shops (Learning outcomes 1.1-3.2)

Learning outcomes:

Credits: 0.5

Grading scale: Fail (U) or Pass (G)

Lab report (learning obj 1.1, 1.3-1.4, 2.1-2.3, 3.1-3.2)

Learning outcomes:

Credits: 1.5

Grading scale: Fail (U) or Pass (G)

Grades: E7, i.e. assessed by grades A, B, C, D, E, Fx eller F (ECT grade scale).

UG, U means fail and G means pass.

Non-compulsory short exams follow each lecture. Based on the outcome of the short exams up to 10% bonus on the exam maximum score can be collected. This bonus can be utilized the first time the student takes the exam.

Every examination step should be assessed at least with an E (or G) and the final grade is determined by the final exam that may have been adjusted by the short exam bonus.

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

Literature and Other Teaching Materials

Cowie J.M.G. & Arrighi V., Polymers: Chemistry and Physics of Modern Materials, 3rd Ed. Taylor and Francis Group 2008

Frizelle W. G. Chap. 10 Injection Molding, Applied Plastics Processing Handbook (2nd Ed.) Editor Kutz M. William Andrew Publishing 2017

Mount III E.M. Chap. 12 Extrusion Processes A2, Applied Plastics Processing Handbook (2nd Ed.) Editor Kutz M. William Andrew Publishing 2017

Sections from various e-books available at the university library, scientific papers and practicals hand out are available through HB's learning platform.

Student Influence and Evaluation

The students' opinions are collected systematically and regularly through written course evaluations once the course is completed. One time per semester, student representatives, together with the Director of studies and Programme Directors, evaluate completed courses.

For additional materials, please refer to the University's policy on course evaluation and documents established by the Department board, the Director of studies and the Course manager.

Miscellaneous

This course is primarily a programme course in the Master programme in textile engineering.

This syllabus is a translation from the Swedish original.