UNIVERSITY OF BORÅS

Polymer Technology
Polymerteknik
7.5 credits

Ladok Code: AT2PT2
Version: 4.0
Established by: Committee for Education in Technology 2022-03-04
Valid from: Autumn 2022

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 technology and engineering
Subject Area: Textile Technology
Grading Scale: Seven-degree grading scale (A-F)

Content
The course covers both polymer chemistry and physics as well as processing.
Following the introduction with an outline of fundamental concepts, emphasis is put on polymerization, what's feasible and how does different polymerization mechanisms govern constitution and configuration. Then polymeric solutions and blends are focused to prepare for understanding of solution spinning and functionalization of polymeric surfaces. The course treats the the glassy state annd the glass transition fenomenon and how it's controlled by the polymer structure. The glass transition impact on crystallization and how other factors affect the crystallization ability and kinetics is also covered as well as characerization methods to describe annd quantify these thermal transitions. Physical properties such as rheology, viscoelasticity and mechancial properties are also studied. These properties are essential for processing of thermoplastic and thermosetting plastics. The three major topics are finally tied together through studies of how polymer architecture can be utilized to create materials with certain structures to render desired property profiles, i.e. the structure-property interrelation and how it can be manipulated by different means and additives to accomplisher further refined properties. Throughout the course the education is related to issues of synthetic and environmental concern. The students are actively engaged in the course implementation as presenters of selected parts of the content, lab assignments and educational visits as well as input for the written exam.

Learning Outcomes
Upon completion of the course the students should be able to, with regard to
Knowledge and understanding
1.1 explain how core polymer physical concepts such as the glass transition, crystallization and morphology affect the properties of polymeric materials,
1.2 account for the different polymerization mechanisms and their processes, and discuss their pros and cons,
1.3 account for the physical properties based on constitution, configuration and conformation, and thermal history, and
1.4 account for means to manipulate and shape polymeric materials based on their structure through different thermomechanical proocesses and additives.
Skills and abilities
2.1 interpret resukts from characterization methods commonly used in a polymer lab and select appropriate characterization method to describe specific properties of polymeric materials,
2.2 apply polymeric material understanding for educated material choice, additives and manufacturing method that suits individual polymer based products,
2.3 apply profound understanding of polymers on synthetic fiber particular conditions, and
2.4 present complex polymer technological matters in a pedagogic way.
Assessment and approach
3.1 problematize polymeric material utility-risk considering raw materials, manufacturing, processing, use, reuse, recycling and waste management,
3.2 handle complex polymer technological concepts in dialogue with scholars and peers respectfully and constructively.

Forms of Teaching

The education consists of seminars and assignments. The seminars, with active student participation are followed by short exams.

The language of instruction is English.

Forms of Examination

The course is examinated through the following steps:

- Written exam
  Learning outcomes: 1.1-2.3, 3.1
  Credits: 5.5
  Grading: A-F
- Assignment, seminars
  Learning outcomes: 1.1-3.2
  Credits: 0.5
  Grading: Pass/Fail
- Lab assgnment with report
  Learning outcomes: 1.1, 1.3-1.4, 2.1-2.3, 3.1-3.2
  Credits: 1.5
  Grading: Pass/Fail

Grading scale: E7, i.e. A, B, C, D, E Fx or F (ECTS scale) where F and Fx means fail.
Non-compulsory short exams follow each lecture. Up tp 10% bonus points of the maximum written exam score can be added on top of the written exam score. This option is only offered the first time the student makes an attempt. Once every examination step has to be cleared the final grade is determined by the written exam results, potentially augmented by the bonus points.

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

Cowie J.M.G. & Arrighi V., Polymers: Chemistry and Physics of Modern Materials, 3rd Ed. Taylor and Francis Group 2008
Frizelle W. G. Kap. 10 Injection Molding, Applied Plastics Processing Handbook (2nd Ed.) Editor Kutz M. William Andrew Publishing 2017
Mount III E.M. Kap. 12 Extrusion Processes A2, Applied Plastics Processing Handbook (2nd Ed.) Editor Kutz M. William Andrew Publishing 2017
Additional material, scientific papers, lab-PM is provided by the UB learning platform.

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 primarely intended for the master programme in textile technology and engineering.
This syllabus is a translation from the Swedish original.