UNIVERSITY OF BORÅS

Experimental methods for polymers and textiles

Experimentella metoder för polymerer och textilier

7.5 credits

Ladok Code: A529TA
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 (A1N)
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)

Content

In order to be able to develop polymer materials for different purposes, experimental knowledge of methods and techniques for processing, characterisation, and material testing as well as chemical and physical analysis is needed. This course aims to provide students with knowledge and understanding of how polymer materials can be processed and characterised by experimental methods. Polymeric processing includes the most important methods for the manufacture of plastics, composites, and fibres. Produced materials will then be characterised regarding their material properties through practical laboratory work. The course will provide students with knowledge and understanding of the fundamental principles of the most important experimental methods, as well as give students the ability to conduct testing and perform analyses on polymer materials. The procedures regarding the most important analysis and testing instruments are introduced so that the student can independently perform testing and characterisation, as well as be able to analyse the results obtained.

The laboratory work included in the course may include the following components a) simple polymer synthesis, b) extrusion and injection moulding of thermoplastic polymers, c) processing of fibre-reinforced thermosets d) determination of the mechanical properties of polymers by tensile, flexural, and impact testing, e) characterisation of polymers' thermal properties with DSC and TGA, f) analytical methods (e.g. FTIR, NMR and GPC) for characterisation of polymer chemical composition and molecular weight distribution g) structural material analysis with optical microscopy and electron microscopy (SEM) and h) DMTA analysis to determine the viscoelastic properties of polymers.

Learning Outcomes

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

Knowledge and understanding
1.1. explain the basic principles of the most important experimental methods, as well as how they can be used for processing, material testing, and characterisation of polymer materials,
1.2. interpret and analyse obtained results and measurement data.

Skills and abilities
2.1. select the most relevant and appropriate experimental method for the processing, testing, and analysis of polymer materials,
2.2. perform practical laboratory work in a well-planned, responsible, and safe way when it comes to the work environment,
2.3. demonstrate the practical use of instruments according to instructions,
2.4. use various relevant experimental methods within the relevant research area.

Evaluation ability and approach
3.1. reflect on how obtained results and measurement data relate to known knowledge and knowledge regarding the polymer

materials' properties
3.2. assess work environment and environmental risks regarding practical laboratory work.

Forms of Teaching

The course consists of:

- Lectures
- Laboratory sessions

Teaching is conducted in English.

The language of instruction is English.

Forms of Examination

The course is examined through the following components:

- Examination
  Learning outcomes: 1.1-1.2, 2.1
  Credits: 3.0
  Grading scale: A-F
- Laboratory work – laboratory project, report
  Learning outcomes: 1.2, 2.1- 2.4, 3.1-3.2
  Credits: 4.0
  Grading scale: Pass/Fail

  The student must complete the project, write a report, and present their work to obtain a passing grade on this part of the course.
- Laboratory safety course
  Learning objectives: 2.3-2.4, 3.2
  Credits: 0.5
  Grading scale: Pass/Fail

  Re-take examination of laboratory work is limited to one extra laboratory session opportunity during the academic year. The next opportunity for a re-take examination of laboratory work takes place when the course is given regularly in the next academic year.

  Having passed the laboratory safety course is a prerequisite for beginning practical work in the laboratory. One opportunity for a re-take examination in this component is given before the laboratory session.
  The laboratory session report has a re-take examination opportunity the same week as the re-take examination for the exam. In order to write the laboratory report, it is required that the laboratory session on which the report is based, which is stated in the distributed laboratory booklet, has been carried out.

  The examination component "Examination" determines the final grade of the course, which is issued only when all components have been passed.

  Laboratory safety
  Students must participate in a laboratory safety course before the laboratory session begins. Laboratory safety courses are taken seriously and everyone is expected to follow the laboratory rules.
  Students who do not follow the rules of procedure and the safety instructions given, or do not work in a way that is safe for the student and the environment, can be evicted from laboratory work. No extra laboratory session opportunity for re-take examination is given in this case. The student is referred to when the course is given during the next academic year.

  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's programme -- Polymer Materials for the Circular Economy, but is also offered to exchange students and students in the other specialisations in the Master's Programme in Resource Recovery and doctoral students in Resource Recovery. This syllabus is a translation from the Swedish original.