



KF2500 Polymer Engineering

9.0 credits

Polymerteknologi

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for KF2500 valid from Autumn 2011

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Chemical Science and Engineering

Specific prerequisites

Admission requirements for independent students:

75 university credits (hp) in chemistry or chemical engineering, 20 university credits (hp) in mathematics and 6 university credits (hp) in computer science or corresponding. Documented proficiency in English corresponding to English B.

Admission requirements for programme students at KTH:

At least 150 credits from grades 1, 2 and 3 of which at least 110 credits from years 1 and 2, and bachelor's work must be completed, within a programme that includes: 75 university credits (hp) in chemistry or chemical engineering, 20 university credits (hp) in mathematics and 6 university credits (hp) in computer science or corresponding.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After the course the student should be able to:

- connect properties of polymeric materials to their structure, use material selection and identification methodologies,
- describe material related conditions for forming of polymer materials and have insight regarding the most important polymer-based processing techniques.

After finished course the student should also have knowledge about:

- how different material parameters and external factors affect the mechanical properties
- which test methods are suitable for measurement of mechanical properties
- difference in influence of static and dynamic stress
- fundamental differences and likenesses between mechanical properties of organic and inorganic materials at small deformations, plastic deformation and deformation to fracture
- influence of time and temperature, “time-temperature equivalence”

Course contents

The course is based on three main parts:

- 1) relation between structure and properties of polymer materials (including material selection and identification),
- 2) polymer processing and
- 3) mechanical properties of polymers. Examples of parts which are included in the course are additives for polymer materials, extrusion, injection moulding, calendering and mechanical properties of polymers under static and dynamic loading.

Structure and properties of organic materials. Additives, material selection, Identification of organic materials in products. The course also aims at providing knowledge in polymer processing and highlights the connections between selection of materials, methods and the final properties of the polymer products. The course deals with the mechanical properties of polymer melts and their physical appearance; rheology, molecular orientation and solidification. The three dominating and technically most advanced processing methods (injection moulding, extrusion and calendering) are thoroughly discussed. Other processing methods are described briefly. Special attention is put on the impact of the different processing methods on the material structure and properties, morphology, molecular orientation, anisotropy, thermal residual stresses etc. Mechanical properties of polymer materials and composites (material blends, nanocomposites, filled and reinforced systems). Mechanical testing, enthalpy elasticity, rubber elasticity, viscoelasticity, plasticity, viscoplasticity, fracture properties, deformation velocity and temperature influence. Molecular and morpholog-

ical influence on the mechanical properties. External influence including moisture, solvents and oxidation.

Disposition

Lectures, Project assignments, Laborations.

Course literature

Will be announced closer to the course starts.

Examination

- PRO1 - Project, 4.0 credits, grading scale: A, B, C, D, E, FX, F
- TEN1 - Examination, 5.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Other requirements for final grade

Passed project report and presentation (PRO1, 4 credits)

Examination (TEN1, 5 credits)

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.