Soft Condensed Matter Physics

Programme course

6 credits

Mjuka material

TFYA37

Valid from: 2017 Spring semester

Determined by
Board of Studies for Electrical Engineering, Physics and Mathematics

Date determined
2017-01-25

Main field of study
Applied Physics, Physics

Course level
Second cycle

Advancement level
A1X

Course offered for
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- Engineering Biology, M Sc in Engineering
- Biomedical Engineering, M Sc in Engineering

Entry requirements
Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites
Mandatory courses in mathematics and physics for the Y-program or equal.

Intended learning outcomes
The course will ive the student knowledge of the statistical physics of polymers, the chemical, geometrical and electronic structure of polymers as well as the structure, dynamics and processing of polymer solids. We will discuss condensed matter in the form of colloids, amphiphiles, liquid crystals, molecular crystals and biological matter.
After the course, the student should be able to

- describe the geometry of polymer chains and their dynamics, and the mathematical description of these phenomena
- utilize thermodynamical analysis of phase transitions in polymers and polymer blends
- describe micro and nanostructure of polymer solutions and polymer blends
- describe amphiphile materials, colloids, foams and gels, liquid crystals

Course content

Polymers: terminology, chemical structures and polymerization, solid state structures, polymers in solution, colligative properties. Statistical physics of polymer chains: random coils, entropy measures, rubber physics.
Polymer geometry: random coils, crystals, spherulites, polymers adsorbed on surfaces, in liquid crystals, polymer blends. Flory-Huggins theory for polymer blends. Optical and electronic properties of conjugated polymers. Amphiphilic materials and polyelectrolytes. Liquid crystals. Foams and gels. Biological molecules in condensed phase. Ion conduction in polymer electrolytes.

Teaching and working methods

Lectures and seminars

Examination

UPG1	Assignments	1.5 credits	U, G
TEN2	Written examination	4.5 credits	U, 3, 4, 5

Grades

Four-grade scale, LiU, U, 3, 4, 5

Department

Institutionen för fysik, kemi och biologi

Director of Studies or equivalent

Magnus Johansson

Examiner

Niclas Solin

Course website and other links

http://www.ifm.liu.se/undergrad/fysikgtu/coursepage.html?selection=all&sort=kk

Education components

Preliminary scheduled hours: 48 h
Recommended self-study hours: 112 h

Course literature

Additional literature

Books

Linda S. Hirst, *Fundamentals of Soft Matter Science*

Compendia

Extra material och handouts

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.