Faculty of Science

KEMM97, Chemistry: Scattering Methods for Soft Matter, 7.5 credits

Kemi: Spridningsmetoder för mjuka material, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by The Education Board of Faculty of Science on 2026-04-26. The syllabus comes into effect 2026-05-26 and is valid from the spring semester 2027.

General information

The course is an elective course in the second cycle for a degree of Master of Science in Chemistry.

Language of instruction: English

Main field of study	*Specialisation*
Chemistry	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The overall learning outcome for the course is to provide students with fundamental knowledge of and understanding of various light, X-ray, and neutron scattering methods used to study the structural and dynamic properties of soft matter, such as dispersions and solutions of proteins, polymers, colloidal particles, and other biological or synthetic macromolecules.

The course provides examples of how these techniques and systems are applied in both fundamental research and industrial contexts. Students will also be trained in writing research proposals for beamtime at large-scale research facilities, such as MAX IV and ESS.

Knowledge and understanding

On completion of the course, the student shall be able to:

- describe various fundamental static scattering methods and explain how they can be used to understand colloidal dispersions
- explain general principles of dynamic scattering experiments and describe the type of information obtained from such experiments
- describe general experimental setups for light, X-ray, and neutron scattering
- describe general experimental setups for the scattering techniques covered in the course

Competence and skills

On completion of the course, the student shall be able to:

- participate in the planning and execution of an experiment for fundamental research or industrial applications at a large-scale research facility such as MAX IV or ESS
- calculate, analyze, and interpret results from scattering experiments, including the static structure factor, various form factors and intermediate and van Hove scattering functions

Judgement and approach

On completion of the course, the student shall be able to:

- reflect on and critically discuss the applicability and limitations of scattering techniques for the study of soft matter

Course content

Sub-course 1 (Theory) 5 credits: The course begins with fundamental scattering theory, including the derivation of scattering from spherical colloidal particles. Specific topics and methods covered in the course include:

- Small-Angle Neutron Scattering (SANS)
- Small-Angle X-Ray Scattering (SAXS)
- Neutron Reflectometry (NR)
- Dynamic Light Scattering (DLS)
- Quasi-Elastic Neutron Scattering (QENS)
- Data analysis

Sub-course 2 (Laboratory sessions and exercises) 2.5 credits: Laboratory exercises on colloidal dispersion, using Small-Angle X-Ray Scattering (SAXS) and Dynamic Light Scattering (DLS).

Course design

Teaching consists of lectures, exercises, seminars, and laboratory exercises. Participation in laboratory exercises and associated elements is compulsory.

Assessment

Assessment takes the form of a written exam at the end of the course, laboratory reports and participation in compulsory components throughout the course.

Students who did not pass a regular assessment will be offered another opportunity for assessment soon thereafter.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Grades

Grading scale includes the grades: Fail, Pass, Pass with distinction
For a Pass grade on the whole course, the student must have Pass grade the exam, the laboratory reports and compulsory components.

The grading scale for the exam is Fail, Pass, Pass with Distinction, whereas the laboratory reports is graded according to the scale Fail, Pass.

The final grade is determined by grade on exam.

Entry requirements

To be admitted to the course, students must meet requirements for English proficiency equivalent to English 6/B from Swedish upper secondary school, and have passed 90 credits in natural science studies, including courses equivalent to:

- KEMA20 General Chemistry, 15 credits
- KEMA41 Organic Chemistry - Basic Course, 7.5 credits
- KEMA13 Biochemistry - Basic Course, 7.5 credits
- KEMB39 Physical Chemistry - Basic Course, 15 credits
- MATA03 Mathematics for Scientists 1, 15 credits

The entry requirements are also met by students who have English proficiency equivalent to English 6/B from Swedish upper secondary school, and have passed courses equivalent to:

- 75 credits in physics
- 30 credits in mathematics

Students who have obtained the equivalent knowledge by other means may also be admitted to the course.

Further information

The course replaces KEMM67 Scattering Methods, 7.5 credits and credits from that course cannot count towards a degree together with this course.

The course is studied together with EXTN85 Scattering Methods, 7.5 credits, at Lund Faculty of Engineering, LTH.

The course is offered at the Department of Chemistry, Lund University.