FCK3130 NMR Spectroscopy of Materials 5.0 credits

NMR-spektroskopi av material

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

Establishment

Course syllabus for FCK3130 valid from Spring 2025

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

Eligible for studies at the third-cycle level.

Language of instruction

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

Intended learning outcomes

After completion of the course the doctoral student should have the knowledge and ability to

• Explain the basic principles of NMR spectroscopy and imaging

• Explain how different NMR parameters depend on and reflect the structural and dynamical properties of various materials

• Motivate the choice of specific NMR experiments to study selected properties of and phenomena in various materials

Course contents

The vector model of NMR spectroscopy

• the rotating coordinate system

• radiofrequency pulses and their effect

• the time-dependent signal

• Fourier transformation (FT)

• simple pulse sequences and instrumentation

• chemical shift and chemical exchange in liquids

• 2D FT NMR

Nuclear spin interactions and their effect on NMR observables

• Dipole and quadropole interactions and chemical shift anisotropy

• The effect of inetractions in crystalline and amorphous systems

• Dipolar recoupling

• Field gradients and MRI, diffusion and flow measurements

• NMR relaxation

• Quantum chemical computations of NMR parameters

• Molecular dynamics simulations of NMR data

Examination

• TEN1 - Written exam, 5.0 credits, grading scale: P, 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

Physical presence at the initial and final 2-days blocks is mandatory. It is also mandatory to participate at (i) all flipped classrooms/disussions and workshops and (ii) at least half of the Zoom lectures.

Transitional regulations

If the examination form is changed, the student will be examined according to the examination form that applied when the student was admitted to the course. If the course is completed, the student is given the opportunity to be examined on the course for another two academic years.

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.