Faculty of Science

KEMM57, Chemistry: Magnetic Resonance - Spectroscopy and Imaging, 7.5 credits

Kemi: Magnetisk resonans - spektroskopi och avbildning, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2018-12-19 to be valid from 2018-12-19, autumn semester 2019.

General Information

The course is an elective second-cycle component of a Master of Science (120 credits) degree in Chemistry and compulsory for a degree of Master (120 credits) of Science in Organizing Molecular Matter.

Language of instruction: English

Main field of studies	*Depth of study relative to the degree requirements*
Chemistry	A1N, Second cycle, has only first-cycle course/s as entry requirements
Organizing Molecular Matter	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The phenomenon of nuclear magnetic resonance is exploited in several different fields, e.g. chemistry, medicine and geology. The aim of the course is to enable students to acquire basic knowledge of how information about the structure and dynamics of molecules can be obtained through common magnetic resonance methods.

Knowledge and understanding

On completion of the course, the students shall be able to

- describe the basic physics and scientific equipment required for nuclear magnetic resonance spectroscopy (NMR) and magnetic resonance imaging (MRI)
- explain the relations between experimentally observable parameters and the structure and dynamics of molecules
- identify and classify magnetic resonance methods in research publications

Competence and skills

On completion of the course, the students shall be able to

- apply their basic knowledge to simulate and calculate results of magnetic resonance experiments
- reflect on the validity of molecular interpretations of magnetic resonance experiments

Course content

Lectures and exercises (3 credits)

- nuclear spin and quantum mechanics
- chemical shift and interaction between nuclear spins
- magnetic fields, radio waves and spin dynamics
- scientific equipment: the NMR spectrometer and magnetic resonance imaging
- multidimensional methods
- special techniques for solid materials
- nuclear spin relaxation and molecular dynamics
- magnetic field gradients: methods for imaging and the motion of molecules

Laboratory sessions, projects and written assignments (4.5 credits)

- chemical exchange
- self-diffusion
- literature project
- assignments

Course design

The teaching consists of lectures, exercises, laboratory sessions and a literature project. Compulsory participation is required in laboratory sessions, written assignments, the literature project and associated elements.

Assessment

The assessment is based on a written mid-course exam and compulsory components throughout the course.

Students who fail an 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.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.
For a grade of Pass on the whole course, the student must have passed the exam and the compulsory components.

The grades awarded for the exam are Fail, Pass and Pass with Distinction. The grades awarded for the compulsory components are Fail and Pass.

The final grade is determined by a weighted aggregate of the results of the assessed components. The final grade is based on the exam (40%), laboratory reports (15%), written assignments (15%) and the literature project (30%).

Entry requirements

To be admitted to the course, students must meet the general entry requirements for higher education and requirements for English proficiency corresponding to English 6 from Swedish upper secondary school, and have passed 90 credits in science courses including:

- KEMA20 General Chemistry 15 credits, or KEMA10 General Chemistry 7.5 credits and KEMA12 Inorganic Chemistry- Basic Course 7.5 credits, KEMA01 Organic Chemistry- Basic Course 7.5 credits and KEMA03 Biochemistry- Basic Course 7.5 credits,
- KEMB09 Physical Chemistry- Basic Course, 15 credits,
- MATA02 Mathematics for Scientists 15 credits, or the equivalent

The admission requirements are also met by students who satisfy the general entry requirements for higher education and requirements for English proficiency corresponding to English 6 from Swedish upper secondary school, and have passed courses including:

- 75 credits in physics including FYSC11 Atomic and Molecular Physics 7.5 credits and FYSC13 Solid State Physics 7.5 credits, and
- 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 may not be included in a degree together with KEMM17 Magnetic Resonance- Spectroscopy and Imaging 7.5 credits. The course is taught together with KFKN01 Magnetic Resonance- Spectroscopy and Imaging 7.5 credits at the LTH.

Subcourses in KEMM57, Chemistry: Magnetic Resonance - Spectroscopy and Imaging

Applies from H19

1901 Magnetic Resonance - Spectroscopy and Imaging, 3,0 hp
Grading scale: Fail, Pass, Pass with distinction
1902 Magnetic Resonance - Spectroscopy and Imaging, Comp Elements, 4,5 hp
Grading scale: Fail, Pass