Faculty of Science

KEMM17, 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 2008-12-10 and was last revised on 2012-12-14. The revised syllabus applies from 2012-02-15, autumn semester 2012.

General Information

The course is an optional second-cycle course for a degree of Master of Science, main field of subject Chemistry and is a compulsory course for a degree of Master of Science, main field of subject Organizing Molecular Matter.

Language of instruction: Swedish and English
When necessary, the course in full is given in 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

Nuclear magnetic resonance is a phenomenon, which is used in a number of different areas, e. g. chemistry, medicine and geology. The aim of the course is to provide basic knowledge of how molecular structure and dynamics can be gained from commonly used magnetic resonance methods.

The aim of the course is that on its completion students will have acquired the following skills and knowledge:

Knowledge and understanding

On completion of the course the student will be able to:

- describe the fundamental physics and the scientific equipment for nuclear magnetic resonance spectroscopy (NMR) and magnetic resonance tomography (MRI)
- explain the relationships between the experimentally observable parameters and molecular structure and dynamics
- identify and classify magnetic resonance methods in scientific publications

Competence and skills

On completion of the course the student will be able to:

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

Course content

Lectures and exercises

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

Laboratory work

- chemical exchange
- self-diffusion
- solid state NMR

Course design

Teaching comprises lectures, exercises, laboratory work and a literature project.

Assessment

The course is assessed with written assignments, laboratory reports, presentation of the literature project and a written examination. Re-sit examinations are offered soon after the examination to students who do not pass.

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.
To be awarded Pass on the whole course, students must pass the examination and pass the compulsory components.

The examination grades are: Pass with Distinction, Pass or Fail. Grades for the compulsory components are: Pass or Fail.

The final grade for the course is determined by weighting the results of the written assignments, the laboratory reports, the presentation of the literature project and the written examination.

Entry requirements

To be eligible for this course students must have basic eligibility, English B and 90 higher education credits in completed Science courses, including passes in courses equivalent to:

- KEMA00 General and Analytical Chemistry 7.5 credits, KEMA01 Organic Chemistry – Basic Course 7.5 credits, KEMA02 Inorganic Chemistry – Basic Course 7.5 credits and KEMA03 Biochemistry – Basic Course 7.5 credits

and

- KEMB09 Physical Chemistry – Basic Course 15 credits,
- KEMB08 Molecular Interactions and Structure 15 credit and
- one of the courses MATA01 Mathematics for Scientists 1 15 credits or MATA14 Mathematics: Analysis 1 15 credits.

Admission requirements are also fulfilled for those with basic eligibility and passes in courses equivalent to:

- 90 credits in Physics including FYSA31 Physics 3: Modern Physics 30 credits and
- 30 credits in Mathematics

or

- 60 credits in Chemistry, 60 credits in Physics and 60 credits in Mathematics

Equivalent knowledge that has been gained in another way also provides eligibility for the course.

Further information

The course cannot be credited as part of a degree programme that also includes KEM065 Physical Chemistry – advanced course, 15 credits.

Subcourses in KEMM17, Chemistry: Magnetic Resonance - Spectroscopy and Imaging

Applies from H13

0711 Magnetic Resonance - Spectroscopy and Imaging, 3,0 hp
Grading scale: Fail, Pass, Pass with distinction
0712 Magnetic Resonance - Spectr. and Imaging, Comp. Elements, 4,5 hp
Grading scale: Fail, Pass

Applies from H07

0701 Magnetic Resonance - Spectroscopy and Imaging, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction
0702 Magnetic Resonance - Spectroscopy and Imaging, Comp Elements, 0,0 hp
Grading scale: Fail, Pass