CH-409

Nuclear magnetic resonance

Emsley Lyndon

Cursus	Sem.	Type
Chemistry	BA5	Opt.
HES - CGC	H	Obl.

Language of teaching	English
Credits	3
Session	Winter
Semester	Fall
Exam	Written
Workload	90h
Weeks	14
Hours	**2 weekly**
Courses	2 weekly
Number of positions	

Summary

Principles and practice of modern nuclear magnetic resonance spectroscopy. NMR is today the most powerful spectroscopic method to determine the structure of molecules and materials, in physics, chemistry, biology or medicine.

Content

Principles of nuclear magnetism. Quantum description of magnetic resonance leading to the vector model. Interactions defining the spectrum: chemical shifts, scalar, dipolar and quadrupolar couplings. Time-domain spectroscopy by pulsed excitation: interaction with radiofrequency fields, coherence, precession, signal induction and the Fourier Tranform. Relaxation and the return to equilibrium. Polarization transfer. Multi-dimensional correlation spectroscopy. The Overhauser effect and confirmational analysis. Instrumentation and applications in modern chemistry.

Keywords

Spectroscopy; Magnetic Resonance; NMR; Strucutre; Chemical Analysis;

Learning Prerequisites

Required courses

None

Recommended courses

Basic undergraduate chemistry courses

Important concepts to start the course

Spectroscopy, chemical analysis, chemical structure

Learning Outcomes

By the end of the course, the student must be able to:

- Explain the fundamental principles of Magnetic Resonance
- Interpret an NMR spectrum in terms of the interactions involved
- Describe the elements of a pulsed Fourier transform NMR experiment
- Design a strategy for analysis of molecular structure or dynamics by NMR

Transversal skills

- Access and evaluate appropriate sources of information.
- Set objectives and design an action plan to reach those objectives.

Teaching methods

Lectures, homework and problem classes

Assessment methods

Written examination

Supervision

Assistants Yes

Resources

Bibliography

“Nuclear Magnetic Resonance,” P.J. Hore, Oxford, 2003 : substitute the most recent edition!

"NMR: the Toolkit", P.J. Hore, J.A. Jones and S.Wimperis, Oxford, 2003 : substitute the most recent edition!

"Understanding NMR Spectroscopy," 2nd Edition, J. Keeler, Wiley, 2010

"Spin Dynamics," 2nd Edition, M.H. Levitt, Wiley, 2008

Ressources en bibliothèque

- Nuclear magnetic resonance / Hore
- Understanding NMR spectroscopy / Keeler
- NMR the toolkit / Hore
- Spin dynamics / Levitt

Notes/Handbook

On moodle

Prerequisite for

Advanced NMR and Imaging