Import module

[E1.3]	Liquid-state NMR spectroscopy	Compulsory elective module	6 - 9 CP (total) = 180 - 360 h		4 - 7 SWS
			Contact hours 4-7 SWS / 60-105 h	Independent study 120- 65 h	

Content

Lecture: Mathematical fundamentals of NMR spectroscopy; isotropic and anisotropic interactions in magnetic resonance (MR) and their quantum mechanical description

Lecture - Advanced: (optional) Introduction into the MR relaxation theory and its quantum mechanical description

Practical course: (optional) Assignment of nD-NMR spectra of natural products, synthetic molecules (with examples from synthetic working groups) and biomacromolecules (proteins, peptides, RNA, DNA, oligosaccharides), structure calculation

Seminar: (optional) Presentation on a current research publication in the field of magnetic resonance spectroscopy, selection of a suitable publication, literature research, development of the topic in interaction with one of the lecturers on magnetic resonance, lecture in the seminar, discussion of the presented method and the knowledge gained from this also in the context of the other seminar lectures/methods.

The courses lecture Mathematical Basics of NMR spectroscopy (compulsory) as well as another lecture Advanced / Practical course / Seminar (CEM) must be attended. Maximum two elective subjects.
The seminar is part of the modules Liquid-state NMR spectroscopy, EPR spectroscopy and solid-state NMR. It can only be scored once.

Learning outcomes and skills

Lectures: The students are introduced to the quantum mechanical and mathematical basics of magnetic resonance spectroscopy. Afterwards you can analytically describe and understand simple pulse sequences. You will learn how to extract structural parameters from magnetic resonance spectra.

Practical course: The students learn the interpretation of "state of the art" NMR experiments and the determination of conformation and dynamics using examples. You will also learn how to use important programs for interpreting NMR spectra.

Seminar: The students are familiarized with new MR experiments.

Admissions requirements/Conditions for participation in the module/courses

Lecture & Practical course: Module *Structure and function of biomacromolecules.*
Lecture - Advanced & Seminar: Expert discussion on the lecture *Mathematical basics of NMR spectroscopy*.

Recommended prior knowledge

None

Organizational details

Import module, the registration and cancellation periods of the regulations for the Master's degree in chemistry apply. (For the expert discussion, an examination date must be agreed with the examiner.)
The lectures take place as block events during the lecture-free period.
The practical course takes place as a block event during the lecture-free period. Registration is required. The practical course regulations are announced at the beginning of the respective practical course.

Module allocation (degree programme/faculty)	Master Chemistry / FB14
Module transferrable to other degree programmes	Master Bioinformatics / FB12, Bachelor Biophysics / FB13, Master Biophysics / FB13, Master Physics / FB13, Master Biochemistry / FB14
Module offered	- Lectures & practical course: once a year (after announcement) - Seminar: every semester
Duration	2 semesters
Module coordinator	Prof. Schwalbe
Course requirements for credits	
Participation record	- Seminar & practical course: regular and active participation
Coursework	- Lecture: expert discussion (30 min.) - Lecture - Advanced: expert discussion (20 min.) - Practical course: processing and protocols of the experiments in the practical course, expert discussion on the protocol (30 min.) - Seminar: paper with presentation (20 min., handout)
Forms of teaching / learning	Lecture, practical course, seminar
Language teaching and instruction	German - on request English
Module assessment	**Form / duration / content, if applicable**
Final module assessment	None
Cumulative module assessment consisting of	
Composition of the module grade for cumulative module assessment	

				Semester CP

	Mode of teaching / study	Semester hours per week	1	2	3	4
Compulsory: Mathematical basics of NMR spectroscopy	L	2	3			
CEM: Deepening of the mathematical foundations of NMR spectroscopy	L	2	3			
CEM: NMR intensive course	P	3	3			
CEM: Modern applications of MR spectroscopy	S	2	3			
TOTAL		4-7	6-9			