Import module

[E1.2]	Solid State NMR Spectroscopy	Compulsory elective module	7 - 10 CP = 210 - 300 h		4 - 7 SWS
			Contact hours 4-7 SWS / 60-105 h	Independent study 150-195 h	

content

Lecture: Anisotropic spin interactions, magic angle sample spinning, magnetization transfer experiments, decoupling and feedback techniques, correlation and separation spectra, characterization of structure and dynamics of anisotropic molecular systems, introduction to the most important theoretical concepts, quadrupole NMR, dynamic nuclear polarization, biomolecular applications. Each lecture is accompanied by simulations on a virtual NMR spectrometer (SIMPSON), which is also available to the students and with which they should solve exercises for each lecture.

Practical course: (optional) In the practical course, the basics of MAS-NMR are taught (control of sample rotation, cross-polarization, determination of anisotropic parameters from rotation sidebands). The basics of resonance assignment and the determination of distance restrictions are taught. In addition, precise core-to-core distances are determined using dipolar feedback techniques. The experimental data are evaluated by the students using computer simulations with the SIMPSON software.

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 Solid State NMR Spectroscopy (compulsory) as well as another course Practical Course / Seminar (CEM) must be attended.
The seminar is part of the modules liquid NMR spectroscopy, EPR spectroscopy and solid state NMR spectroscopy. It can only be scored once.

Learning outcomes and skills

Lecture: The students understand the concept of anisotropic NMR interactions and their relevance in isotropic and anisotropic molecular systems, they get to know the most important experiments and theoretical concepts and understand possible applications for biomolecular, but also pharmaceutical and materials science issues.

Practical course: The students understand the most important practical aspects of solid-state NMR, are able to set up NMR experiments, evaluate data and link hypotheses about computer simulations with experimental data.

Seminar: In the seminar, the students are familiarized with new MR experiments.

Admissions requirements/Conditions for participation in the module/courses

Practical course & seminar: Expert discussion for the lecture *Introduction to solid-state NMR spectroscopy*

Recommended prior knowledge

Organizational details

Import module, the registration and cancellation periods of the regulations for the study course in chemistry apply. (An exam date for the expert discussion must be agreed with the examiner.)

Module allocation (degree programme/faculty)	Master Chemistry / FB14
Module transferrable to other degree programmes	Master Biophysics / FB13, Master Biochemistry / FB14
Module offered	Lecture & practical course: summer semester Seminar: every semester
Duration	2 semesters
Module coordinator	Prof. Glaubitz
Course requirements for credits	
Participation record	- Seminar and practical course: regular and active participation
Coursework	- Lecture: expert discussion (30 min.) - Practical course: processing and protocols of the experiments (for details see practical course regulations) - Seminar: paper with presentation (handout)
Forms of teaching / learning	Lecture, practical course, seminar
Language teaching and instruction	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	

	Mode of teaching / study	Semester hours per week	Semester CP			
			1	2	3	4
Introduction to solid-state NMR spectroscopy	L	2		4		
CEM: solid-state NMR spectroscopy	P	3		3		

	CEM: Modern applications of magnetic resonance spectroscopy	S	2	3		
	TOTAL		4-7	7-10		