Universität Bremen

D-MRI-MRS/ MRI and MRS in Biomedical Research

module code / module title	

date / version of the module description	26.10.2021

1	**INFORMATION ON THE MODULE**	
1a	module code	D-MRI-MRS
1b	module title *(German title)*	MRI und MRS in der biomedizinischen Forschung
1c	module title *(English title)*	MRI and MRS in Biomedical Research
1d	credit points	6
1e	responsible for the module	Prof. Dr. Ralf Dringen
1f	type of module	elective module
1g	programs using the module	M.Sc. Biochemistry and Molecular Biology
1h	organizational unit offering the module	Klicken Sie hier, um Text einzugeben.
1i	content-related prior knowledge or skills	
1j	learning contents	*Topics of the lecture:* · NMR-Equipment · Principle of nuclear magnetic resonance · Basics of signal- and image formation · Relaxation · Intrinsic and extrinsic NMR contrasts

| | | · | Basics of advanced NMR techniques (fast imaging, fMRI, …) |

· Pathophysiological aspects of metabolic & cardiovascular diseases, diseases of the central nervous system

· Basic concepts of associated in-vivo models

Lab course:

Execution of NMR experiments to get a deeper understanding of the following NMR aspects and the ability to analyze / calculate NMR parameters

· NMR contrasts, Relaxation times, Diffusion …

· Relaxivity and contrast behavior of contrast agents

· Artefacts

1k	learning outcomes/ competencies/ targeted competencies	Students have a fundamental and advanced knowledge in physical aspects of MR imaging and spectroscopy including basics of the development of MR sequences. Students can differentiate between typical imaging contrasts and analyse basic MR images. Students can develop a strategy for in-vivo experiments based on given pathophysiology.

The total amount of the presence time and working hours of the module has to be calculated additionally in the detailed calculation a) to c).

a) detailed calculation:
   SWS / presence time/working hours in each course of the module

☒	1	lecture(s) with	2	SWS/ contact hours	28	hours of presence time
☒	1	seminar(s) with	1	SWS/ contact hours	14	hours of presence time
☐		exercise(s) with		SWS/ contact hours		hours of presence time
☐		internship(s) with		sum of working hours		
☐		seminar(s) with		SWS/ contact hours		total hours of presence time
☒	1	laboratory/laboratories with	1	SWS/ contact hours	14	total hours of presence time
☐		tutorial(s) with		SWS/ contact hours		

1l — calculation of student workload *(part a: calculation of presence time and working hours)*

☐	excursion(s) with	SWS contact hours working hours in total

☐   other form of course (e.g. block seminar), namely this:

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with	SWS / with totaly	contact hours	☐ presence time	☐ working hours

= sum of presence time and working hours:

56

calculation of student workload *(part b: preparation time and follow-up work/self-study)*	**b) working hours for preparation/follow-up work of the course(s) and/or self-study** = sum of working hours: 78	
calculation of student workload *(part c: exam preparation etc.)*	**c) exam preparation (incl. examination)** = sum of working hours: 46	
calculation of student workload *(total amount of hours including a) - c))*	**Total amount of the presence time and working hours a) to c):** 180	
1m	description of possible optional courses in the module	<u>*Can a student choose between different courses within the module?*</u> NO <u>*Short description of selection option*</u> Klicken Sie hier, um Text einzugeben.
1n	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this: Klicken Sie hier, um Text einzugeben.

1o	frequency	*(regular cycle module is offered) e.g.: winter semester, yearly or summer semester, yearly or each semester* summer semester yearly Klicken Sie hier, um Text einzugeben.
1p	duration	one semester module Klicken Sie hier, um Text einzugeben.
1q	Literature (*optional*)	Klicken Sie hier, um Text einzugeben.
1r	more information on the module (*optional*)	Instructor: Claudia Neumann-Haefelin

2	**INFORMATION ON THE MODULE EXAMINATION** (see also AT Art. 5 section 8)	
2a	type of examination	☒ module exam; i.e. exam with only one component (MP) ☐ combination exam, i.e. exam with several components (administered by instructors) (KP) ☐ partial exam; i.e. exam with several components (administered by registrar) (TP)
2b	exam components or prerequisites *(type, number)*	*PL* = *graded component of the examination* *SL* = *ungraded component of the examination, coursework* *PVL* = *prerequisite of the examination (see AT Art. 5 Section 10)* ☒ PL | 1　　　　　☐ SL |　　　　　☐ PVL | justification If necessary, further explanations: Portfolio, consisting of: oral presentation (seminar talk) (40%) and oral examination (in English or German) (60%)
2c	Give this information for combination examinations only: Weights (in percentage) of component grades	PL 1: PL 2: PL 3: Klicken Sie hier, um Text einzugeben. PL 4:　Klicken Sie hier, um Text einzugeben. If necessary, further comments: Klicken Sie hier, um Text einzugeben.

2d	form of examination (see AT BPO/AT MPO Art. 8, 9 and 10)	☐ Assignment ☐ Written examination ☒ Portfolio ☐ Internship report ☐ Other (concrete definition is given in the examination regulations): Klicken Sie hier, um Text einzugeben.	☐ Oral examination (single) ☐ Group examination, oral ☐ Project report ☐ Colloquium	☐ Presentation, oral ☐ Presentation and written assignment ☐ Bachelor Thesis ☐ Master Thesis
2e	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this: Klicken Sie hier, um Text einzugeben.		