

Module title		Abbreviation
Advanced Magnetic Resonance Imaging		11-MRI-171-mo1
Module coordinator		Module offered by
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy
ECTS	Method of grading	Only after succ. compl. of module(s)
6	numerical grade	--
Duration	Module level	Other prerequisites
1 semester	graduate	--
Contents		
<p>Nuclear magnetic resonance (NMR) is a quantum mechanical phenomenon that, through magnetic resonance imaging (MRI), has played a major role in the revolution of medical imaging over the last 30 years. Based on the fundamental principles of nuclear magnetic resonance (resonance principle, relaxation times, chemical shift) this course covers:</p> <ol style="list-style-type: none"> <li>1) the NMR signal theory and signal evolution (Bloch equations),</li> <li>2) the principles of spatial encoding, magnetic resonance imaging (MRI) and corresponding imaging sequences and measurement parameters,</li> <li>3) the concept of k-space and Fourier imaging, and</li> <li>4) the physical, methodological and technical possibilities and limits of MRI. As a last point, exemplary applications in fields of MRI of biomedical research, clinical imaging and non-destructive testing are introduced.</li> </ol>		
Intended learning outcomes		
The students have advanced knowledge of the mathematical-theoretical and physical principles of modern imaging magnetic resonance, image generation and processing. They gain a broad overview of the field of modern MRI and its interdisciplinary contexts and applications.		
Courses (type, number of weekly contact hours, language — if other than German)		
V (3) + R (1) Module taught in: English		
Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)		
<p>a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes).</p> <p>If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest.</p> <p>Assessment offered: In the semester in which the course is offered and in the subsequent semester</p> <p>Language of assessment: German and/or English</p>		
Allocation of places		
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Additional information		
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Workload		
180 h		
Teaching cycle		
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Referred to in LPO I (examination regulations for teaching-degree programmes)		
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**Module appears in**

Master's degree (1 major) Physics (2016)  
Master's degree (1 major) Nanostructure Technology (2016)  
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)  
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)  
Master's degree (1 major) Nanostructure Technology (2020)  
Master's degree (1 major) Physics (2020)  
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)  
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)  
Master's degree (1 major) Quantum Technology (2021)  
exchange program Physics (2023)