

<b>Course title: Medical Imaging in Stereotactic Neurosurgery</b>				
<b>Identification number</b>	<b>Workload</b>	<b>Credits</b>	<b>Frequency of occurrence</b>	<b>Duration</b>
M-Neuro-AM7 a-d	180h	6 points	Winter term	One term per year
1	<b>Type of lessons</b> a) Lecture b) Seminar c) Practical part	<b>Contact times</b> a) 1.5h b) 18h c) 4.5h	<b>Self-study times</b> 156h (preparation and reworking of lectures, seminars and practical part; exam)	<b>Intended group size</b> a) 5-15 b) 5-15 c) 5-15
2	<b>Aims of the module and acquired skills</b>  After completing the module, the student will be familiar with <ul style="list-style-type: none"> <li>✓ principles and application of X-ray, CT, PET and MR imaging for stereotactic neurosurgery</li> <li>✓ software tools for the representation, processing and evaluation of medical images</li> <li>✓ stereotactic coordinate systems and devices</li> <li>✓ clinical interpretation of multimodal neuroimages</li> <li>✓ advanced image analysis methods including tractography, radiomics and deep learning</li> </ul>			
3	<b>Contents of the module</b> <ul style="list-style-type: none"> <li>• Introduction to medical imaging</li> <li>• Image formation and digital image processing: X-ray, CT</li> <li>• PET – physical basics, clinical applications</li> <li>• MRI – physical basics</li> <li>• MRI – diffusion imaging, tractography</li> <li>• Clinical interpretation of multimodal imaging</li> <li>• Physical principles of stereotactic procedures</li> <li>• Deep brain stimulation</li> <li>• Artificial intelligence, Deep Learning</li> <li>• Artificial intelligence, Radiomics</li> <li>• Practical MRI demonstration</li> <li>• Imaging applications in stereotactic neuro-oncology</li> <li>• Intraoperative imaging methods</li> <li>• Participation in a stereotactic operation (deep brain stimulation, biopsy)</li> </ul>			
4	<b>Teaching/Learning Methods</b> Lecture for introduction; seminars and practical part, participation in a stereotactic operation (deep brain stimulation, biopsy), participation in MR demonstration			
5	<b>Requirements for participation:</b> Enrollment in the Master's degree program "Experimental and Clinical Neurosciences" at the University of Cologne, basic knowledge of upper secondary school physics and mathematics			
6	<b>Type of module examination</b> Written exam (multiple choice)			

7	<p><b>Requirement for the allocation of credits</b></p> <p>Regular participation in the seminars and practical part  Final exam (= module exam) after the module  Exam content: material of the lecture, seminars and practical parts</p>
8	<p><b>Compatibility with other Curricula</b></p> <p>none</p>
9	<p><b>Significance of the module mark for the overall grade</b></p> <p>In the Master's degree program "Experimental and Clinical Neurosciences": 6% of the overall grade (see also appendix of the examination regulations)*</p>
10	<p><b>Module coordinator</b></p> <p>Prof. Dr. M. Kocher, tel. 478-82745, martin.kocher@uk-koeln.de</p> <p><b>Lecturing tutors:</b> Dr. P. Andrade-Montemayor, Dr. L. Caldeira, M.sc. M. Eichner, Prof. N. Galldiks, Dr. C. Hamisch, PD Dr. S. Hunsche, Dr. S. Jünger, Dr. J. Lindemeyer, PD Dr. P. Lohmann, M.sc. R. Loucao, Dr. A. Meissner, PD Dr. D. Rueß, Prof. Dr. M. Ruge, Prof. Dr. V. Visser-Vandewalle</p>
11	<p><b>Additional information</b></p> <p>The course will run from 9.10.2023 to 19.2.2024 (exam)  Date: Mondays 14:00 – 15:30, conference room LFI 2.049 (LFI level 2)</p> <p>Literature:</p> <ul style="list-style-type: none"> <li>• P Suetens: Fundamentals of Medical Imaging. Cambridge University Press 2009</li> <li>• JK Krauss, J Volkmann: Tiefe Hirnstimulation. Steinkopff Verlag Darmstadt 2004</li> <li>• M. Jenkinson, M. Chappell: Introduction to Neuroimaging Analysis. Oxford University Press 2018</li> <li>• S.R. Cherry, J.A. Sorenson, and M.E. Phelps. Physics in Nuclear Medicine. Elsevier Science, 2012</li> <li>• D.W. McRobbie, E.A. Moore, M.J. Graves, M.R. Prince. MRI - From Proton to Picture. Cambridge University Press, 2017</li> </ul>