Course title: Imaging in Stereotactic Neurosurgery				
Identification number	**Workload**	**Credits**	**Frequency of occurrence**	**Duration**
M-Neuro-AM7 a-d	180h	6	WS	One semester

1	**Type of lessons**	**Contact times**	**Self-study times**	**Intended group size**
	a) lectures b) practice	a) 20h b) 14h	116h (Preparation and post-processing of lectures, practical and exam)	a) ca. 5-15 b) ca. 5-15/tutor

2	**Aims of the module and acquired skills**
	After completing the module, the student will be familiar with (i) the principles of X-ray, CT, PET and MR imaging and MR-guided tractography, (ii) their use, significance and limitations in stereotactic neurosurgery; and (iii) the types of radiation used in these imaging procedures, with their biological effects and risks. He / she acquires basic knowledge in quantitative "Image Science" in medicine. The student learns software tools for the representation, processing and evaluation of medical image data and can describe stereotactic procedures (e.g. deep brain stimulation).

3	**Contents of the module**
	- Introduction to medical imaging - Digital image processing - CT, PET, X-ray – image formation, contrasts - MRI – physical basics - MRI – contrasts, artifacts - MRI – diffusion, tractography - Clinical interpretation of cross-sectional imaging - PET – clinical application - Biological effects of imaging - Physical principles of stereotactic operations - Neurofunctional systems - Quantitative image analysis, Radiomics - Clinical applications in neuro-oncology - Deep brain stimulation

4	**Teaching/Learning Methods**
	Lecture with practical exercises (partly on the computer), Participation in a stereotactic operation (deep brain stimulation, biopsy).

5	**Requirements for participation**
	Enrollment in the Master's degree course "Experimental and Clinical Neurosciences" at the University of Cologne Additional: The basic knowledge of upper secondary school in physics and mathematics is advantageous

6	**Type of module examination**
	Written exam (multiple choice)

7	**Requirement for the allocation of credits**
	Regular participation and active participation in the exercises Final exam (= module exam) after the module Exam content: material of the lecture and exercises

8	**Compatibility with other Curricula**
	none
9	**Significance of the module mark for the overall grade**
	In the Master´s degree course "Experimental and Clinical Neurosciences": 6% of the overall grade (see also appendix of the examination regulations)
10	**Module coordinator**
	PD Dr. H. Treuer, Tel. 478-82757, harald.treuer@uk-koeln.de
	Lecturing tutors: Prof. Dr. V. Visser-Vandewalle, Prof. Dr. M. Ruge, PD Dr. H. Treuer, Prof. Dr. N. Galldiks, Prof. Dr. M. Kocher, Dr. D. Giese, Dr. A. Hellerbach, Dr. C. Fürweger, Dr. P. Lohmann, Dr. D. Rueß, Dr. C. Hamisch
11	**Additional information**
	Literature:
	(i) P Suetens: Fundamentals of Medical Imaging. Cambridge University Press 2009 (ii) JK Krauss, J Volkmann: Tiefe Hirnstimulation. Steinkopff Verlag Darmstadt 2004, (iii) M. Jenkinson, M. Chappell: Introduction to Neuroimaging Analysis. Oxford University Press 2018

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