

<b>Module Number</b> <b>3c</b>	<b>Title:</b> <b>Cognitive Neurosciences</b>		
<b>Module type:</b> compulsory elective	<b>Language:</b> English	<b>Group Size:</b> 10 students	
<b>Study semester:</b> 1	<b>Availability:</b> winter semester	<b>Duration:</b> 1 semester	
<b>Workload:</b> 420 hrs	<b>Credits:</b> 14CP	<b>Contact time:</b> 119 hrs	<b>Independent Study:</b> 301 hrs
<b>1</b>	<b>Courses</b> a) Lectures: 4 PPW b) Practical Course: 5 PPW c) Seminar 2 PPW		
<b>2</b>	<b>Intended Learning Outcomes</b> Upon completion of this module the students are able to describe the functioning of the human brain with respect to processes such as neural rhythms and oscillatory networks as well as systems such as control of movement, perception and emotions. They are capable to explain and interpret modern imaging methods for representing the structures and functions of the human brain as well as methods for brain stimulation. These include magnetic resonance imaging (MRI), neuroinformatic tools and models, magnetoencephalography (MEG), electroencephalography (EEG), transcranial magnetic stimulation (TMS), transcranial direct and alternating current stimulation (tDCS/tACS) and deep brain stimulation (DBS). The students will be able to plan, develop and apply experiments employing these methods (including first knowledge in applying them), to evaluate and interpret the data thus gathered and to coherently present the results verbally and in writing.		
<b>3</b>	<b>Content</b> <b>Lecture:</b> <i>Cognitive Neuroscience: from the brain to behaviour</i> Methods of brain imaging and brain stimulation, neural rhythms and oscillatory networks, the motor system, control of movement and action planning, the somatosensory system and pain, perception and attention, memory systems, emotion and motivation, social neuroscience, neurological disorders. <b>Recommended reading:</b> <ul style="list-style-type: none"> <li>○ Baer, MF, Connors, BW, Paradiso MA: Neuroscience – Exploring the Brain. Lippincott Williams and Wilkins, USA 2007</li> <li>○ Squire LR, Berg D, Bloom FE, DuLac S, Ghosh A, Spitzer NC: Fundamental Neuroscience. Elsevier, Amsterdam 2008</li> </ul> <b>Practical course:</b> <i>Measurement and modulation of human brain activity</i> <b>1) Theoretical exercises on imaging techniques and neurophysiological methods:</b> MEG and EEG (including planning, execution and evaluation of MEG and EEG examinations, derivation of eye movements and muscle activity, registration of movement kinematics, time frequency analyses, dipole analyses, co-registration of MRT and MEG), structural and functional MRI including morphometry, connectivity analysis and data-driven analyses, local field potential derivations from basal ganglion cores in patients with movement disorders, deep brain stimulation <b>2) Experimental neurophysiological and functional imaging applications for the examination of brain functions as well as their non-invasive modulation:</b> Students will perform following methods in the practical course: Electroencephalography (EEG), trans-cranial magnetic stimulation (TMS), magnetencephalography (MEG), transcranial electric stimulation (tDCS, tACS) as well as the analysis of structural and functional magnetic resonance imaging data. <b>3) Short presentation of experimental results at the end of the course.</b>  <b>Seminar:</b> <i>Analysis and Organization of Cognitive Systems</i> Functional neuroanatomy, brain network analysis, connectivity, motor and somatosensory systems, perception and attention, language, memory, emotion and motivation, social cognition.		

<b>4</b>	<b>Teaching methods</b> Lecture, seminar and practical course with accompanying lessons
<b>5</b>	<b>Prerequisites</b> <b>Formal:</b> Successful completion of module 1. Proficiency in English level B2 of Common European Framework of Reference for Languages (CEFR); Bachelor degree in biology, psychology or a related field <b>With regards to content:</b> Basic knowledge of neuroanatomy, neurophysiology and neurobiology are a prerequisite.
<b>6</b>	<b>Examination types</b> <b>Cumulative Examination:</b> 1. Oral presentation (e.g. Powerpoint) in seminar (50% of total grade), 2. Oral presentation of experimental results at the end of the practical course (50% of total grade).
<b>7</b>	<b>Requirements for award of credit points</b> Regular and active participation in the lecture, practical course and seminar, including oral presentations in the latter. Drafting of experimental designs. Successful presentation of the project at the end of the practical course.
<b>8</b>	<b>Module applicability (in other study courses)</b>
<b>9</b>	<b>Assessment</b> The mark given will contribute to the final grade in proper relation to its credits.
<b>10</b>	<b>Module convenor and main lecturers</b> Prof. S. B. Eickhoff, Dr. M. Butz, Dr. Robert Langner, Prof. Dr. Esther Florin
<b>11</b>	<b>Further information</b> The regular attendance at the lectures is strongly recommended. The content of the lectures is prerequisite for the practical course and the seminar.