

Module Name Computational Neuroscience						
Identification Number	Workload	Credit Points	Term	Offered Every	Start	Duration
M-Neuro-AM1 a-c	360 h	12 CP	2 nd term of studying	Summer term, 2 nd half	Summer term only	7 weeks
1	Course Types a) Lectures b) Practical/Lab c) Seminar		Contact Time 30 h 100 h 12 h	Private Study 60 h 130 h 28 h		
2	Module Objectives and Skills to be Acquired Students who successfully completed this module <ul style="list-style-type: none"> • have acquired a general overview over the field of computational neuroscience. • can use Python for scientific programming, data analysis, and computational modeling as well as for visualization of data and analysis of results. • have gained an understanding of how electrical properties of neurons can be represented mathematically. • can describe aspects of neural network connectivity using graph theoretical concepts. • can perform basic spiking neural network simulations with NEST. • are able to extract and condense information from the neuroscientific literature. • have improved their overall analytical skills. • have learned how to present research results and to critically discuss scientific publications related to the topic of the module on a professional level. • are able to transfer skills acquired in this module to other scientific fields. 					
3	Module Content <ul style="list-style-type: none"> • Fundamentals and selected topics of computational neuroscience • Scientific programming with Python • Analysis of electrophysiological data with Python • Spike train statistics and stochastic point processes • Neural coding and plasticity • Mathematical descriptions of neurons and networks • Ordinary differential equations • Graph theory of neural networks • Phase oscillator models of neural interactions • Introduction to the neural network simulation tool NEST 					

4	<p>Teaching Methods</p> <ul style="list-style-type: none"> Lectures; Programming/mathematical exercises; Seminar; Guidance to independent research; Training on presentation techniques in oral and written form
5	<p>Prerequisites (for the Module)</p> <p>Enrollment in the Master's of Science degree course "Neuroscience" or in the Master's degree course "Computational Biology" or in the Master's degree course "Experimental and Clinical Neuroscience" or in the Master's degree course "Computational Sciences"</p> <p>Additional academic requirements</p> <p>Previous attendance of the lecture module Neuroscience; Some programming experience in any language is highly recommended.</p>
6	<p>Type of Examination</p> <p>The final examination consists of two parts: One hour written examination on topics of lectures, seminars and the practical/lab part (50 % of the total module mark), oral presentation (20-30 min; 50 % of the total module mark)</p>
7	<p>Credits Awarded</p> <p>Regular and active participation; Each examination part at least "sufficient" (see appendix of the examination regulations for details)</p>
8	<p>Compatibility with other Curricula*</p> <p>Optional compulsory module in the Master's degree course "Computational Biology", the Master's degree course "Experimental and Clinical Neuroscience" and in the Master's degree course "Computational Sciences"</p>
9	<p>Proportion of Final Grade</p> <p>12.0 %</p>
10	<p>Module Coordinator</p> <p>Prof. Dr. Martin Nawrot, phone 470 7307, e-mail: mnawrot@uni-koeln.de</p>
11	<p>Further Information</p> <p>Participating faculty: Prof. Dr. S. van Albada, Prof. Dr. S. Daun, Prof. Dr. M. Nawrot, Dr. V. Rostami</p> <p>Literature:</p> <ul style="list-style-type: none"> Information about textbooks and other reading material will be given on the ILIAS representation of the course (see https://www.ilias.uni-koeln.de/ilias/goto_uk_cat_2815610.html) <p>General time schedule: Week 1 (Mon.-Thu.): Seminar, lectures and practical sessions; Week 2-6 (Mon.-Thu.): Lectures and practical sessions; Week 1-6 (Fri.): Self-study time; Week 7 (Mon.-Fri.): Preparation for the written examination</p> <p>Note: The module contains computer-based practical sessions as a main component.</p> <p>Introduction to the module / Examination dates: The dates of the introduction to the module and the examinations will be announced in a regularly updated module description that will be posted in the internet and in KLIPS before registration to the module starts.</p>