SDC
The university partnership
Denmark – China

Course description for Advanced Neuroscience

Module details
Advanced Neuroscience – ANS (5 ECTS)

Time frame
End of 2nd semester

Module coordinator team
China: Fude Huang, professor, SARI Center for Stem Cell and NanoMedicine, Shanghai Advanced Research Institute, CAS, Shanghai (huangfd@sari.ac.cn)

Denmark: Jens Midtgaard, MD, PhD. Associate Professor, Department of Neuroscience and Pharmacology, Panum Institute, Faculty of Medical Sciences, Copenhagen University. (jmidtgaard@sund.ku.dk)

Aim
The objective of this course is to provide the student with a broad knowledge of current approaches for the study of neural function and behavior.

The student should get an understanding of information processing in synapses, neurons and microcircuits; understand the experimental approaches used in analyzing the neurophysiological basis of behavior in intact animals, and understand the use of animal models in the study of neurological disease. The course includes a wide variety of animal model systems used in neuroscience research, and techniques for genetic manipulation in both invertebrate (e.g. C. elegans, Drosophila) and vertebrate models. The students should be able to critically read and present the current literature, and discuss the function and structure of neuronal circuits in relation to animal behavior. This course provides an up-to-date knowledge of the neural basis for indirect measurements of global brain function such as PET and fMRI. As such, it provides insights useful when designing and interpreting experiments in human brain scanning studies. The course provides examples of genetics, signal processing, neural modelling and physiology used in the study of neural function in health and disease.

Learning objectives

Learning objectives (Listed as in New Danish qualifications framework for higher education)	
Knowledge	At the end of the course the student should be able to: • Demonstrate knowledge and understanding of molecular, genetic and physiological methods for measuring and manipulating brain function and behavior • Demonstrate an understanding of the strengths and limitations of the different animal models on the basis of their physiological and pathophysiological relevance, and understand how to select the best animal model(s). • Demonstrate knowledge and understanding of the molecular, dendritic, cellular and circuit organization and physiology of the CNS in relation to the behavioral requirements and evolutionary adaptations of the organism
Skills	During the course the student will obtain the ability to • Evaluate results derived from experiments performed in animals in neuroscience research. • Argue for the relative merits of the above methods, and suggest new developments of methods and new physiological experiments • Identify relevant animal models and experimental approaches to address a particular neuroscientific question • Find, evaluate and present relevant current scientific literature
Competencies	By the end of the course the student have acquired the capacity to: • Critically understand modern molecular, cellular and behavior-testing methods in relation to the analysis of neural information processing and brain function in health and disease. • Perform independent as well as in team work, trans-disciplinary scientific projects using a variety of physiological methods for the analysis of brain function • Analytically evaluate own and general knowledge and understanding of brain function, and indicate avenues for further improvements.

Recommended student requirements

Knowledge and understanding of basic neurobiology, physics, mathematics and signal processing, and electrophysiological and optical imaging methods, commensurate with a level at or above that which is the objective of the basic 1st. and 2nd.semester courses in neuroscience and neuroimaging. English language proficiency.

Module structure and teaching approach

Each subject will be covered by one original paper and possibly one review in double-lessons. One or two students (working as a team) will present the original paper (15 minutes), followed by general discussion. In the second lesson a review may be presented by another student or by another pair of students (also 15 minutes presentations). Alternatively, only the original paper will be presented, and the review is expected to be read by the students in preparation. Both original papers and reviews will be used in the examination. Teachers will be from Chinese and Danish Universities affiliated with SDC. The teacher's role is primarily to guide the presentations in class, and to provide feedback.

All students are expected to actively participate in class. The course coordinators will (before the start of the course) allocate published papers/reviews for the students to present. It is a prerequisite for attending the oral exam that the student has presented two papers, one of these must an individual presentation (to mimic the exam situation).

Literature

Current international original scientific papers and reviews.

Assignment and exam

Exam format: Oral examination based on the papers/reviews presented during the course.

Examiners: Teachers from the course. Grading will be 7-step/100 point scale.

The exam duration will be 35 minutes (followed by 5 minutes for evaluation). The first part (15 minutes) consists of a paper presentation by the student, followed by 20 minutes discussion. Each student will be assigned a paper for presentation 48 hours prior to the examination. During the 48 hours the student is expected to produce an exam-PowerPoint presentation of the paper. The exam-paper will not be the same as the one(s) the student has presented in class during the course, but will be one of the papers presented by other students during the course.

When evaluating the exam, it is important that the student has shown the ability to present the paper in a concise fashion, using effective presentation techniques. The main emphasis is on the ability to extract the important points of the paper, to argue why things have been included in the exam-presentation, to evaluate the paper in a critical fashion, and to put the findings and conclusions of the paper into a wider context, for instance based on the course literature and material found by the student.

Re-exam

Will be in the same form as the original exam.