Exchange programme Vrije Universiteit Amsterdam

Vrije Universiteit Amsterdam - Exchange programme Vrije Universiteit Amsterdam - 2024-2025

Exchange

Vrije Universiteit Amsterdam offers many English-taught courses in a variety of subjects, ranging from arts & culture and social sciences, neurosciences and computer science, to economics and business administration.

The International Office is responsible for course approval and course registration for exchange students. For details about course registration, requirements, credits, semesters and so on, please visit the exchange programmes webpages.

Neuronal Networks and Behavior

Course Code	AB_1051
Credits	6
Period	P3
Course Level	300
Language Of Tuition	English
Faculty	Faculty of Science
Course Coordinator	dr. N.A. Goriounova
Examiner	dr. N.A. Goriounova
Teaching Staff	prof. dr. H.D. Mansvelder, ing. A.J. Timmerman, dr. N.A. Goriounova, dr. R. Min, dr. T.S. Heistek
Teaching method(s)	Study Group, Lecture, Practical

Course Objective

This course is designed for life sciences students who want to learn more about how networks of brain cells control behavior. To this end, we will discuss different aspects of brain function covering sensory information processing, control of movement, learning and memory, spatial navigation, cognition, emotions. We will focus on how neuronal networks in different brain areas give rise to these functions.

After completion of this course the students will be able to:

1. Describe and apply the general plan of sensory systems and explain how the following systems function at the levels of receptors, pathways and brain areas:

- touch and proprioception
- vision
- auditory processing
- smell and taste

2. Describe the anatomical organization of motor control pathways and explain the operation of various sensorimotor feedback circuits.

3. Understand which brain areas and pathways are involved in cognitive and emotional processes, and explain the neurobiological basis of a number of neurological and psychiatric disorders linked to damage in these areas.

4. Explain advantages and disadvantages of the techniques used in current neuroscience research to study neuronal networks of behavior, give examples of how recent research techniques enable scientists to study neuronal networks controlling behaviour

The students will also develop the following academic skills in conducting research, analyzing data and communicating the results around the practical part of the course:

1. Hands-on experience in extracellular recordings of action potentials.
2. Experimentally learn and understand the basic principles of sensory coding.
3. Do basic data analysis in Matlab and understand the fundamentals of Matlab programming and scripts.
4. Summarize the experimental results in a lab report.

Course Content

In Neuronal Networks & Behavior we will discuss different aspects of brain function ranging from sensory information processing, control of movement, learning and memory to cognition and emotions. We will study how neuronal networks in different brain areas give rise to these functions. To achieve this, we will use a combination of lectures and practicals. These will build on chapters from the book ‘Neuroscience’ by Purves and colleagues (5th or 6th edition). Some background knowledge on neuronal function and principles of synaptic transmission is required for this course.

To help you in exploring the exciting territory of neurons that shape our behavior, the first two weeks will be centered on lectures. In the second week, a series of practicals will start where you will perform experiments to study how networks control behavior. During the practical you will perform experiments on recording neuronal activity in cockroach leg and will learn basic principles of sensory encoding. During and after the practical you will

analyze the recorded data, and will summarize your results in a practical report.

Additional Information Teaching Methods

1. Lectures (l) by dr. N. Goriounova , dr. R. Min, prof. dr. H. Mansvelder. The first day will start with an opening lecture during which the aims of the course are highlighted. The first week will contain lectures on sensory systems; during the second week we will discuss the motor control of behavior memory and cognition. You are expected to read the text book before the lectures so that we can discuss the topics and address unclear issues in depth. Hours per student: 24 hrs.
2. The practical by J. Timmerman and T. Heistek. During the second week, the practicals will start. The practical will provide you with an insight with what it takes to do research, and it will help you to understand some of the concepts discussed in the course. During the practicals, we will divide the class into teams of 20 students. You will work in pairs on one experimental setup. Hours per student: 4.
3. Workgroups online will support the analysis of the data from practicals and will provide the opportunity to ask questions on the lectures.

Method of Assessment

The grading procedure will be as follows:

1. Practicals (P): pass/fail. Participation in practicals is obligatory;
2. Written reports (R): 20% of the final grade;
3. Written exam (E) consisting of 60 multiple choice questions 80%.

Grades for the reports and exam should be at least 5.5 and can not compensate each other.

Re-examination: Written exam (E)

Entry Requirements

- Understanding of cell biology, neuronal communication and neuroanatomy.
- Purves et al (5th or 6th edition) "Neuroscience" Chapters 1-8.

Literature

Neuroscience, Purves, Sinauer Associates Inc.,U.S., 5th Revised edition (or 6th edition). ISBN: 9780878936953

Up-to-date course materials are posted on the site to which all students and lecturers have access. Background information for this course, relevant literature and copies of all lecture PowerPoints will be provided in the Course Documents folder on Canvas.

Additional Information Target Audience

This course is part of the minor ‘Neurosciences’.

Additional Information

The track ‘Neurosciences’ is an excellent preparation for the Master Neurosciences.

This minor course requires a minimum of 25 participants to take place.

Recommended background knowledge

Basic (first and second year level) courses in Cell Biology and Neurosciences.