

NX-435

Systems neuroscience

Mathis Mackenzie

Cursus	Sem.	Type
Life Sciences Engineering	MA2, MA4	Opt.
Neuro-X minor	E	Opt.
Neuro-X	MA2, MA4	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	During the semester
Workload	120h
Weeks	14
Hours	4 weekly
Lecture	2 weekly
Exercises	2 weekly
Number of positions	

Summary

The course "Systems Neuroscience" explores neural circuits and networks to understand how groups of neurons process information and generate behavior. It integrates techniques from neurophysiology, anatomy, genetics, and computer science to investigate complex brain cell interactions.

Content**Keywords**

Neural circuits, computational modeling, perception & decision-making, neuroAI

Learning Prerequisites**Required courses**

BIO-311

Recommended courses

CS-433, BIO-411, BIO-482

Important concepts to start the course

Programming in Python, good mathematical background, good neuroscience background (Understanding of neurophysiology).

Learning Outcomes

By the end of the course, the student must be able to:

- Apply Apply computational approaches to study specific brain functions such as sensory processing, motor control, and cognition
- Identify Understand the principles of neural coding and information processing.
- Assess / Evaluate Understand the current state-of-the-art techniques for studying the brain, including electrophysiology, optogenetics, and functional imaging
- Understand the relationship between brain circuits and behavior
- Develop computational skills for analyzing neural data

Transversal skills

- Set objectives and design an action plan to reach those objectives.
- Write a scientific or technical report.
- Summarize an article or a technical report.
- Write a literature review which assesses the state of the art.
- Use both general and domain specific IT resources and tools
- Demonstrate the capacity for critical thinking

Teaching methods

Lectures, paper discussions, and hands-on exercises to discuss and work on problem sets

Expected student activities

Attend lectures and take notes during lectures, participate in quizzes and read scientific articles. Solve the problem sets and take the final exam

Assessment methods

The final mark is a combination of three evaluations: problem sets (25%), quizzes (25%), final exam (50%)

Supervision

Office hours	Yes
Assistants	Yes

Resources

Références suggérées par la bibliothèque

- [Principles of neural science, Kandel](#)