

BIOENG-310

Neuroscience foundations for engineers

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Cursus	Sem.	Type
Communication systems	BA6	Opt.
Computer science	BA6	Opt.
HES - IC	E	Opt.

Language of teaching	English
Credits	6
Session	Summer
Semester	Spring
Exam	Written
Workload	180h
Weeks	14
Hours	6 weekly
Lecture	3 weekly
Exercises	3 weekly
Number of positions	

Summary

This overview course bridges computational expertise with neuroscience fundamentals, aimed at fostering interdisciplinary communication and collaboration for engineering-based neuroscience programs.

Content

All content will combine experimental data and findings with computational models.

- Introduction to cellular and molecular biology
- Introduction to neuroscience
- Neural communication
- Individual neurons and small neural populations
- Sensory systems and perception I - Vision
- Sensory systems and perception II -Audition, Somatosensation
- Learning: Neuroplasticity and Molecular Mechanisms of Learning
- Motor Control I - Systems
- Motor Control II - Molecular
- Cognitive Neuroscience I - Systems
- Cognitive Neuroscience II - Molecular
- Molecular Genetics in Neuroscience
- Neuropharmacology and Drug Design

Learning Prerequisites**Important concepts to start the course**

Programming

Learning Outcomes

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

- Interpret experimental data in neuroscience
- Analyze experimental data in neuroscience
- Describe basic concepts in biology, neuroscience
- Describe basic computational tools and models in neuroscience

- Integrate biological and computational concepts in neuroscience

Teaching methods

- Lectures
- Practical tutorials and exercises
- Journal Club or Poster Presentation
- Excursions

Expected student activities

- Attend lectures and take notes
- Participate and prepare for tutorials and exercises
- Work on exercises in a group

Assessment methods

- 70% final exam
- 15% computational exercise
- 15% presentation exercise

Supervision

Office hours	No
Assistants	Yes

Resources

Moodle Link

- <https://go.epfl.ch/BIOENG-310>

Prerequisite for

This course will prepare students for the Neuro-X Master program.