

Neuroinformatics

Subject area: Other subject area

University:	CTU
Level:	MA all years, PhD
Teaching mode:	hybrid: some students participate online, other students attend real-life
Instructor(s):	Doc. Ing. Daniel Novák PhD, Ing. Eduard Bakštein PhD

Short description

The course neuroinformatics is focused on the basic principles of formation and transmission of information in the brain. In the practical exercises, you will learn how to calculate generation of the action potential or model neuron populations.

Full description

The course covers the following topics

- neuron modeling, learning methods at the cellular level, neuron signal processing, encoding and decoding of information in the brain.
- information processing at the cellular level.
- how information is encoded and decoded in the brain.
- modeling individual neurons to complex cognitive networks.
- cognitive process and brain

<https://intranet.fel.cvut.cz/en/education/bk/predmety/55/01/p5501406.html>

Learning outcomes

- Students understand the basic principle of the generation of nervous excitement - the so-called action potential (AP).
- Student will clarify what types of ion channels are contained in the membrane of nerve cells and try out examples of how they contribute to the formation of AP.
- Students will realize first-hand the important aspects of modeling biological systems
- Students will understand the ways in which information is encoded in the brain and how to understand it.
- Students will find out why the sigmoidal function is used in artificial neural networks.
- Students will see and try out how Hebbian learning of neuron input weights works
- Students will delve into the modeling of large-scale neuronal populations
- Students will understand the difference between classical and "spiking" artificial neural networks

General information

Contact hours per week:	4
Total workload:	150 (in student hours for the whole course)
ECTS credits:	6
Language:	English
Course start date:	20 February 2023
Course end date:	28 May 2023
Add. info about start date:	Start course date refers to starting date of the semester.
Weekly teaching day/time:	
Time zone:	CET (Denmark, Germany, France, Netherlands, Switzerland, Czech Republic)
Further information:	<ul style="list-style-type: none">- lessons will be recorded and provided to students- pdf lab exercise instructions available
Prerequisites:	- Fundamentals of mathematics
Activities and methods:	Lectures, Lab-work
Presence on campus:	

Final examination

Form:	oral
Date:	
Location/format:	
Re-sit possibility:	yes
Transcript available:	end of semester
Add. info/requirements:	Final examination consists of: <ul style="list-style-type: none">- 60% of lab exercises- 40% of final oral exam

Registration

To register for this course, follow the registration requirements of your **home university** as specified here: www.euroteq.eu/courses-registration.

Administration

Number of places:	15
Minimum participants:	5
Internal course code:	BEAM33NIN
Contact:	xnovakd1@fel.cvut.cz

This course is part of the EuroTeQ Engineering University joint course catalogue 2023. This is a collaborative activity of the partner universities DTU, L'X, TU/e, TalTech, CTU, TUM as well as Technion. Students from these universities can participate in the offered courses. It is the responsibility of the student to check if you fulfil the requirements to participate in a specific course. Students are also advised to check with their home institution how to get recognition of the ECTS credits gained in courses of the EuroTeQ course catalogue. For further information about EuroTeQ Engineering University, visit www.euroteq.eu or get in touch with the above-mentioned point of contact.