BIOENG-448

Fundamentals of neuroengineering

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Cursus	Sem.	Type
Bioengineering	MA4	Opt.
Computational Neurosciences minor	E	Opt.
Electrical and Electronical Engineering	MA2, MA4	Opt.
Life Sciences Engineering	MA2, MA4	Opt.
Neuroprosthetics minor	E	Opt.
Neuroscience		Opt.
Robotics, Control and Intelligent Systems		Opt.
Robotics	MA2, MA4	Opt.
Sciences du vivant	MA4	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

Neuroengineering is at the frontier between neuroscience and engineering: understanding how the brain works allows developing engineering applications and therapies of high impact, while the design of new measurement and data analysis techniques contributes to advance our knowledge about the brain.

Content

1. Understand the nervous system and the sensory-motor functions
2. Record and decode neural data
3. Peripheral Neuroprosthesese
4. Brain-machine interfaces
5. Sensory Neuroprosthesese
6. Neuromodulation
7. Neuroplasticity and Neurorehabilitation

Learning Prerequisites

Recommended courses

Background in neuroscience, signal processing, and machine learning (e.g., EE-516).

Learning Outcomes

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

- Formalize basic building blocks of neuroengineering.
- Develop critical thinking
- Assess / Evaluate the potential and current limitations of neuroengineering

Teaching methods

Lectures, exercises.

Expected student activities

Students will have to carry out weekly exercises (critical review of papers, and practicals) and provide written reports.

Assessment methods

Written exam. Final grade: 60% Exam, 40% Exercises.

Resources

Moodle Link

- http://moodle.epfl.ch/enrol/index.php?id=12691