

BIOENG-448

**Fundamentals of neuroengineering**

Micera Silvestro, Millán José del R.

<b>Cursus</b>	<b>Sem.</b>	<b>Type</b>
Bioengineering	MA2, MA4	Opt.
Computational Neurosciences minor	E	Opt.
Neuroprosthetics minor	E	Opt.
Neuroscience		Obl.
Sciences du vivant	MA2, MA4	Opt.

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

**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 design of new measurement and data analysis techniques contributes to advance our knowledge about the brain.

**Content**

1. How the Brain Works
2. Recording and Analysis of Brain Activity
3. Peripheral Neuroprostheses
4. Brain-Machine Interfaces
5. Sensory Neuroprostheses
6. Plasticity
7. 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 (mostly critical review of papers) and provide a written report.

### **Assessment methods**

Written exam. Final grade: 2/3 Exam, 1/3 Exercises.

### **Resources**

#### **Bibliography**

Provided during the course.

#### **Moodle Link**

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