BIOENG-457

Neuroengineering of vision

Ghezzi Diego

Cursus	Sem.	Type
Bioengineering	MA3	Opt.
Life Sciences Engineering	MA1, MA3	Opt.
Neuroprosthetics minor	H	Opt.
Sciences du vivant	MA3	Opt.

Language of teaching	English
Credits	4
Withdrawal	Unauthorized
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	**30**

It is not allowed to withdraw from this subject after the registration deadline.

Remark

MA3 only

Summary

This course aims at providing the key knowledge and skills needed by professional bioengineers working in the field of vision restoration with neuroprostheses. During the course the students will work on a project related to the development of a visual prosthesis.

Content

- Fundamentals of vision: anatomy and physiology
- Clinical aspects of blindness
- Designing principles of visual prostheses
- Manufacturing and characterization
- Information processing, coding, and encoding
- Clinical outcomes and validations

Keywords

- Visual prostheses
- Vision restoration
- Visual processing

Learning Prerequisites

Required courses

- BIOENG-448 - Fundamentals of neuroengineering

Recommended courses

- BIOENG-442 - Biomaterials
- MICRO-514 - Flexible bioelectronics
- MICRO-331 - Microstructure fabrication technologies I

Important concepts to start the course

This class requires a basic knowledge of materials science, microfabrication, electrical engineering, signal processing, and encoding/decoding.

Learning Outcomes

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

- Formulate the fundamental concepts behind vision restoration
- Elaborate the main differences among visual prostheses
- Structure a research/industrial project in the field of neuroprosthetics for vision restoration

Transversal skills

- Use a work methodology appropriate to the task.
- Communicate effectively, being understood, including across different languages and cultures.
- Set objectives and design an action plan to reach those objectives.
- Continue to work through difficulties or initial failure to find optimal solutions.
- Assess one's own level of skill acquisition, and plan their on-going learning goals.
- Evaluate one's own performance in the team, receive and respond appropriately to feedback.
- Give feedback (critique) in an appropriate fashion.
- Keep appropriate documentation for group meetings.
- Demonstrate a capacity for creativity.
- Make an oral presentation.
- Write a scientific or technical report.
- Summarize an article or a technical report.

Teaching methods

Lectures and group projects

Expected student activities

- Attending lectures
- Participating in a group project
- Reading material from the course and from literature as preparation

Assessment methods

- Written Exam (50 % of the grade)
- Group Project (50 % of the grade)

Resources

Bibliography

Artificial Sight. Basic Research, Biomedical Engineering, and Clinical Advances; Editors: Humayun, M.S., Weiland, J.D., Chader, G., Greenbaum, E. (Eds.);
http://www.springer.com/de/book/9780387493299?countryChanged=true

Ressources en bibliothèque

- Artificial Sight. Basic Research, Biomedical Engineering