BIO-493

Scientific project design in integrative neurosciences

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

Language of teaching	English
Credits	5
Withdrawal	Unauthorized
Session	Winter
Semester	Fall
Exam	During the semester
Workload	150h
Weeks	14
Hours	**5 weekly**
Courses	2 weekly
Exercises	3 weekly
Number of positions	**20**

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

Remark

only one registration per student to a scientific thinking course

Summary

This course will provide a forum in which students engage themselves in learning how to design a scientific project that bridges scales and allows following the causal chain from one scale to the next.

Content

Unraveling the mysteries of the brain involves exploring it at different scales and with different modalities whether this is in experiment, theory or simulation. While a faithful description at any single scale or modality may be already challenging, the most formidable aspects of this quest is how to do this in an *integrative way*. The students will form one team spending the semester together to design a scientific project demonstrating the *bridging of scales* and amenable to *causal argumentation*. The project can describe the design of an experimental, a modeling or a combined study.
The primary goal of this course is to stimulate independent student thinking and to enhance problem solving capabilities. In addition, the course provides an important component of working together with other students as a team. Learning to organize team work and to recognize strengths of team members is therefore also a critical component of the project success.

Keywords

Innovation, group work, scientific study design in neuroscience, bridging scales.

Learning Prerequisites

Important concepts to start the course

Having read scientific papers and analyzed their methods

Learning Outcomes

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

- Analyze a scientific study setup and recognize flaws.
- Discuss multiple aspects of the selected neuroscience study in a team.

- Characterize elements of a scientific study capable of bridging scales.
- Elaborate a causal chain of argumentation within an experimental setup

Transversal skills

- Set objectives and design an action plan to reach those objectives.
- Access and evaluate appropriate sources of information.
- Demonstrate the capacity for critical thinking
- Make an oral presentation.
- Write a scientific or technical report.

Teaching methods

Students will work together in groups to solve the selected challenge.
Regular meetings with advisors will be scheduled as appropriate.
Two advisors from different fields will be elucidating experimental and modeling approaches to bridging scales.

Expected student activities

Students need to develop an idea that they will explore in more detail through literature searches, with teachers providing advice and guidance.

The students should jointly write a report, supplemented by an individual further written analysis.

The students should give a ~30 minute oral presentation.

Assessment methods

The written report of the group will account for one-third of the final grade.

The written supplemental analysis of each individual student will account for one-third of the final grade.

The oral presentation will account for one-third of the final grade.