

Training Junior Researchers for Sustainability Transitions

Actionable Research for Sustainability Transitions

AUTOMN 2021

6 September 2021 – 17 December 2021 (or 14 January 2022)

Reference of the course: Research for Sustainability transitions

Persons in charge

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General theme of the course

The semester aims to strengthen the training through research of a cohort of students jointly with students from the National School of Chemistry and Polytech Montpellier, two other schools of engineering in Montpellier. The context is deliberately on transitions towards sustainability, preserving energy, natural resources, biodiversity and the environment. The aim is to develop their critical sense, their scientific rigor, their creativity and their taste for innovation while developing the systemic and multidisciplinary vision that characterizes engineers.

The goal is to find a balanced experience including the learning of strong disciplinary bases through Problem-based learning while promoting the interaction with students from the three schools on learning activities dedicated to the practice of research, and and through common Seminars. The students also develop research skills and multidisciplinary (where possible) through a research project in small groups.

The attendees can choose their research theme, benefit from the support of senior researchers and are encouraged to develop co-training. It is a bridge between academic input and research activity, an opportunity for foreign students to exchange with an international pool of student including French local students who prepare a long-term personal research project. It puts the students in the position of managing a research project from the construction of working hypotheses, the acquisition of data, their analysis and the sharing of their research in written and oral form. There is a set of transversal objectives of this module to enable students to develop their ability to conduct a research project (see research skills and disciplinary content).

Scientific disciplines: The scientific topics of the research project are addressed through the field of expertise of l'Institut Agronomique and fit questions related to sustainability transitions. Every year, a team of academics is volunteering for providing expert disciplinary modules and mentoring the students during their project. Available disciplines vary accordingly.

Teaching language

English (minimum TOEIC-B2 level – 785 pts)

Organization and credits

The course is a full-time autumn semester course (September to December) for 26 ECTS with an **optional** extension period of two weeks in January (4 ECTS). the optional period is not eligible for students who would not have taken the rest of the course.

It is organized into three main types of activities:

(i) learning sessions to acquire in-depth knowledge and practical skills for data management and analysis, in particular in R, literature management, data management, good replication practices, scientific writing and oral presentations;

(ii) seminars led by expert scientists organized by the students themselves;

(iii) autonomous scientific small-group projects for 50% of the time. This is not an internship. The students are not located in the research units, but in the heart of the Gaillarde campus in a room dedicated to the course.

Successful completion of this course brings 26 or 30 ECTS depending on whether the optional extension is attended.

(iv) optional period: prepare the scientific communication aimed at the citizen and making it possible to popularize the results obtained by all the research projects.

Books and other reading materials

No books have to be ordered for this course. All required readings are available as downloads from the teaching platform or physical copies in the classroom.

Requirements

The level of the course is pivotal between advanced undergraduate and the start of graduate courses. Good basis in biology, mathematics, physics, chemistry as well as the B2 English capacity are required and will be evaluated.

Although it is not mandatory, having a laptop is useful so the student can work with as much flexibility as possible as the projects requires using multiple workspaces in the campus.

Grades

The evaluation of Grades is based on (i) an evaluation of the disciplinary content on the basis of problem solving (30%). (ii) the project-group scientific article (40%), (iii) the individual peer-review of another article (10%), (iii) the individual 180 seconds flash presentation (20%).

Final note

We hold the right to make modifications [additions, deletions, etc.] to the syllabus, assignments, requirements and expectations for this course; any such modifications will be clearly communicated and communicated in a timely way.

Research skills and disciplinary content

| Research skills | Nb of hours |
|---|--------------|
| Agile Project management (within project) | 12h |
| Literature survey and management (Zotero) | 3h |
| Data analysis and visualization (R Tidyverse) (within project) | 18h |
| Basic programming (R and bash script) | 9h |
| Research Data Management | 6h |
| Reproducible research through code versioning and sharing | 6h |
| Scientific writing | 6h |
| Oral presentation skills | 3h |
| Research Integrity | 3h |
| Disciplinary content | Nb of hours |
| Four optional modules throughout the period (see general Theme) | 100h (4x25h) |

Additional disciplinary content is addressed within the research projects where it is relevant