

## Junior Research Lab for Agricultural Transitions

**AUTUMN 2021**

**26 ECTS : 6 September 2021 – 17 December 2021**

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Reference of the course: JRL-AT

In the USA classification, this course would be offered to Bachelor Senior students and to early graduates and would receive a range between 500-600.

Under the European classification, this course is appropriate to last year of Bachelor's degree and first year of Master's degree.

### **Compatibility with other courses for additional credits**

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The JRL-AT is designed to be compatible with additional courses :

- August 16 - September 3 : A Language & Culture Summer School + scientific French, see [French language training](#) (2 ECTS)
- September-December: A Second language weekly course, 1h30/week (spanish, portuguese or german) (1 ECTS, Thursday morning)
- September-December : A French language weekly course, 2h/week (1 ECTS, thursday or evening course)

### **Optional JRL-AT course on Environmental Sustainability**

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- January 3-14 : Evaluation of environmental sustainability, 54h, (4 ECTS) : see JRL-AT booklet

### **Persons in charge**

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### **General theme of the course**

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The context of the course is deliberately oriented towards sustainability transitions, preserving climate, energy, natural resources, biodiversity and the environment. The module is based on the acquisition of transversal research skills and disciplinary knowledges, and their deployment on a research project since we deeply believe that providing students with the practices of a proper and ethical scientific approach will help them to think, explore, test and validate ways for the transitions needed to mitigating and adapting to the global change, whether they have the project to become professional scientists or not.

The goal is to find a balanced experience including the learning of strong disciplinary fundamentals through Problem-based learning, while promoting the interaction and interculturality among students, learning activities dedicated to the practice of research and common masterclasses.

The semester aims to strengthen the scientific background of the students, to get them trained through real and collaborative research activities within a cohort of French and International students, to develop their critical sense, their scientific rigor, their creativity and their taste for innovation and research while developing the systemic and multidisciplinary vision that characterizes engineers in the French Grande Ecole assertion (equivalent to MSc).

**The disciplinary scientific knowledge** will be obtained as follows

- Disciplinary courses based on a problem-based learning delivered by academics from Institut Agro | Montpellier SupAgro and associated with professional scientists of the large Agropolis and Montpellier University (MUSE) communities will be offered (25% of the schedule). The offer will span the field of expertises of l'Institut Agro | Montpellier SupAgro on a catalog available online in the spring 2021. Advanced Ecology, Advanced and Applied Evolution, Sociology, Water management will be offered on a regular basis. Supplementary offers may complement those courses on a year to year basis.
- Four masterclasses will be organized by the students and led by external experts on the theme of sustainability transitions

- Scientific skills and further disciplinary knowledge will then be deepened on a case-by-case basis during a group-based research project where it is necessary.

**A research project** (for 55% of the schedule) will be carried out from start to finish in a highly autonomous manner by a small group of students under the mentoring of academics and scientific experts.

In contrast with a traditional internship in a lab, the attendees will choose their research theme in a context previously defined by an academic staff, benefit from the support of senior researchers to think and design their own project and will be encouraged to develop co-training. It is a bridge between academic input and research activity, an opportunity for developing international interculturality. 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.

The research projects are addressed through the field of expertises of l'Institut Agro | Montpellier SupAgro and fit questions related to sustainability transitions. Every year, a team of academics is volunteering to provide expert mentoring of the students during their project. Available themes vary accordingly and their expertise and are made available online at the Spring previous to the next enrollment period.

**Transversal skills for managing a real scientific project** will also be acquired through active learning sessions (20% of the schedule). The set of transversal objectives of this course to enable students to develop their ability to conduct a research project is provided in the "research skills" section at the end of this syllabus).

### ***Teaching language***

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English - Attending the course requires a minimum TOEIC-B2 level (785 pts) or equivalent (will be evaluated before enrollment)

### ***Organization and credits***

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The course is an autumn semester course (September to December) for 26 ECTS. It is organized into three main types of activities:

Item i) Disciplinary courses provided through Problem-based Learning (6 ECTS). Three courses (2 ECTS each) will be chosen among a catalog of modules covering Ecology, Evolution, Water science, Economy, Biochemistry and year-to-year offers of the Institut Agro | Montpellier SupAgro and the large number of associated research units of the Agropolis and Montpellier University MUSE communities. Each course schedule will be organised on a four weeks basis. Preparing, organising and participating in masterclasses led by expert scientists is also part of the exercise (1 ECTS)

Item ii) Full and autonomous scientific small-group research projects for more than 50% of the schedule (14 ECTS) from the acquisition of the scientific literature, definition of a tractable research question, experimental or modelization design, data acquisition / in silico programming, data analysis, writing and oral communication. When not in labs or in the field, students are located in a dedicated room on campus, the HIVE (the Highly Innovative and Versatile Environment), where they get courses but also realize their group and personal work. When necessary, research activities will be performed either in campus facilities or in research laboratories according to the themes and needs defined by the students and supervisors.

Item iii) Active learning sessions to acquire in-depth knowledge and practical skills for research (5 ECTS), including data management and analysis, in particular in R, literature management, good reproducibility practices, scientific writing and oral presentations, ethics and integrity in science and social network communication

Successful completion of this course brings 26 ECTS.

### ***Books and other reading materials***

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There are no mandatory Textbooks to be ordered for this course. All required readings and materials are available as downloads from the teaching platform or physical copies in the classroom.

Students will be provided full access to scientific literature servers and databases.

### ***Requirements***

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The level of the course is pivotal between advanced undergraduate and the start of graduate courses. Solid foundations in biology, mathematics, physics, chemistry as well as the equivalent to a B2 English capacity (TOEIC 785) are required and will be evaluated before enrolment.

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

## Grades

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The evaluation of Grades is based on (i) the evaluation of the acquisition of disciplinary knowledge on the basis of problem solving (23%), (ii) evaluation of the student implication and preparation of masterclasses (4%) (iii) good scientific practices as evaluated throughout the research project (literature survey, data management, analysis reproducibility, scientific networking etc.. ) (19%), (iv) an individual oral communication (16%) (v) the collaborative writing of a scientific article (26%) (vi) an individual peer-review exercise(12%).

## Final note

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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 in a timely way.

## Research project, transversal skills and disciplinary content

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Disciplinary content (Item i)	Nb of scheduled hours	Disciplines
Plenary masterclasses	12h (4x3h)	
Three elective courses throughout the semester (item i) taken among the following list (see details in accompanying booklet)	75h (3x25h)	
<ul style="list-style-type: none"><li>• Nature Based Solution and Ecosystem functioning</li></ul>	25h	Ecology
<ul style="list-style-type: none"><li>• Molecular Evolution</li></ul>	25h	Evolutionary genetics
<ul style="list-style-type: none"><li>• Agricultural economic policies for the transition</li></ul>	25h	Economy
<ul style="list-style-type: none"><li>• Structure and functionality of raw materials and bioproducts</li></ul>	25 h	Biochemistry
<ul style="list-style-type: none"><li>• Gene cloning in plants</li></ul>	25 h	Molecular Physiology
<ul style="list-style-type: none"><li>• Water cycle and management</li></ul>	25h	Water science
<b>Total Compulsory Disciplinary Content</b>	<b>87h (25%)</b>	
Optional January course		
<ul style="list-style-type: none"><li>• Evaluation of Environmental sustainability</li></ul>	54h	Life cycle assessment

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Research skills (Item ii)	Scheduled hours
Agile Project management (within project)	12h
Literature survey and management	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
Scientific networking	3h
Research Integrity	3h
<b>Total Research Skills</b>	<b>69h (20%)</b>
<b>Research Project (Item iii)</b>	<b>200h (55%)</b>
<b>General Compulsory total</b>	<b>356h</b>

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