l'institut Agro
agriculture • alimentation • environnement

Montpellier SupAgro

INSTITUT AGRO - Montpellier SupAgro

FRANCE

TRAINING OFFER IN ENGLISH

FOR INTERNATIONAL INCOMING STUDENTS

Academic year 2021/2022

Autumn / Fall semester

Full semester - Junior Research Lab for Agricultural transitions (JRL-AT)

Complete 26 ECTS from September to December or 30 ECTS from September to January in a module that trains junior researchers for sustainability transitions (go)

Full semester - VINIFERA Master

Complete 30 ECTS attending the courses of the Vinifera euromaster about vine&wine (go)

Spring semester

February, March and April - PARCOURS

Choose one Teaching Unit per period. This will be equivalent to full time study.

	Period 1 January 24 -February 18 7 ECTS	Period 2 February 28 – March 25 7 ECTS	Period 3 March 28 – April 22 7 ECTS
Agroecology	What is Agroecology? *(go)*	Agroecology in Depth Knowledge (go)	The Agroecological Transition : Implementation (go)
Plant Science	Designing New Crops for the Future (go)	Training in AGROPOLIS Research Community: special topics in advanced Plant Sciences (go)	Evolutionary applications in agriculture: Evolutionary Concepts for the Management of Agro-Ecosystems (go)
Data Manager for Environmental Projects	Collecting Environmental Data (go)	Environmental Data Processing and Analysis (go)	Mobile and Web Management of Environmental Data (go)
Sustainable Development concepts in Territories and Business		Sustainability and Society (go)	

May and June – Junior Research Lab or Internship (JRL)

During 2 months, join the Junior Research Lab – JRL (14 ECTS) (go) or do an internship (7 ECTS) (go). in one of our Research Units.

End of May to early June - FLOW Spring Course

Join the free FLOW Spring Course (8 ECTS), held this year from 25th of May to 11th of June 2021, entirely online (go).

Full semester – VINIFERA Euromaster

Complete 30 ECTS attending the courses of the Vinifera euromaster about vine&wine (go)

Full semester - COMBINE

When possible, you can combine modules from the PARCOURS, modules of VINIFERA Master, JRL and/or internship.

INTERNSHIP in a RESEARCH LAB

Find information about the Joint Research Labs (go).

Final note

1 ECTS = 20-25 hours of workload completed by the student (lectures, labs, projects, personal work...)
2 European Credits (ECTS) are equivalent to 1 American Credit

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.

AUTUMN / FALL SEMESTER

JRL-AT - Junior Research Lab for Agricultural Transition

AUTUMN / FALL ***September 6 – December 17, 2021 (or January 14, 2022)***

Reference of the course: JRL-AT		***Credits:*** 26 ECTS (September-December) – 30 ECTS (September-January)
Teaching language: English (min B2 level)	***Level:*** 500-600	Europe – 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students

Keywords

Research skills development, learning by researching, international collaboration, project development and management, sustainability transition in agriculture, active learning

Requirements

Solid foundations in biology, mathematics, physics and chemistry.

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.

Persons in charge

Pr. Jacques DAVID (jacques.david@supagro.fr), Pr. Pierre BERTOMIEU (pierre.bertomieu@supagro.fr), Dr. Jean-François MARTIN (jean-francois.martin@supagro.fr)

General theme of the course

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 knowledge, 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 expertise 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 expertise 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). Organization and credits

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, Biochemisty 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 organized on a four weeks basis. Preparing, organizing 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 programing, 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

An optional course in January, Evaluation of Environmental sustainability, brings 4 additional ECTS.

Research skills and disciplinary content

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	75h (3x25h)	
Nature Based Solution and Ecosystem functioning	25h	Ecology
Molecular Evolution	25h	Evolutionary genetics
Agricultural economic policies for the transition	25h	Economy
Structure and functionality of raw materials and bioproducts	25 h	Biochemistry
Gene cloning in plants	25 h	Molecular Physiology
Water cycle and management	25h	Water science
Total Compulsory Disciplinary Content	87h (25%)	
Optional January course		
Evaluation of Environmental sustainability	54h	Life cycle assessment

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
Total Research Skills	69h (20%)
Research Project (Item iii)	200h (55%)
General Compulsory total	356h

Grades

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%).

SPRING SEMESTER

What is Agroecology?

SPRING ***January 24 - February 18, 2022***

Reference of the course: Agrecology UE1			***Credits:*** 7 ECTS
Teaching language: English (min B1 level)	***Level:*** 300	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students	

Keywords

Agroecology, pluridisciplinarity, controversy, human x nature relationship, agroecosystem, agricultural practices, complexity, critical sense

Requirements

Basic knowledge of plant and animal biology, ecology and agronomy (in the broad sense).

Persons in charge

Dr. Aurélie Javelle (aurelie.javelle@supagro.fr), Prof. Magali Jouven (magali.jouven@supagro.fr) and Prof. Stéphane de Tourdonnet (stephane.de-tourdonnet@supagro.fr).

Department of Soil, Water, Crops and Livestock Systems, Department of Biology and Ecology, Department of Economics, Management and Social Sciences

Organization

Full time 4-week-long course with lectures, tutorials, seminars, debates, field trips.

Objectives

The general aim of the course is to apprehend agroecology through an interdisciplinary approach combining agronomy, ecology, social and economic sciences. In this objective, the players and the different dimensions of agroecology (scientific disciplines / social and political movements / sets of practices) are presented and the reference framework on which they are based is analyzed. The objective is not to give a single definition of agroecology but rather to help the students to understand the multiple facets of this concept, to identify how it complies or contrasts with other conceptions of agriculture and to discuss its implications in terms of human x nature relationships and agricultural development.

Course content

The teaching is organized around two main themes:

(i) an historical and scientific approach to understand how agroecology has emerged, has shifted the lines within various disciplines and at their interfaces, and has generated controversies

(ii) an analysis of the diversity of actors and of experiences of agroecology, based on field trips and direct interactions with a variety of stakeholders.

A large importance is given to reflective analysis, comparative analysis and discussion to allow the students to understand the diversity of the agroecology approaches, identify their conceptual and ethical positioning and the modalities for their practical implementation in the field. The students contribute to the MOOC Agroecology which takes place annualy.

The course will combine lectures-seminars, tutorials, analyses of case studies, interviews and on-site visits. Students are required to: (1) attend all classes, tutorials and seminars, (2) participate actively to group work and discussions, (3) develop self-learning, (4) prepare and perform interviews and (5) take a final examination.

Interdisciplinary Content	nb of hours	Disciplines involved
Lectures	19	Ecology Anthropology Sociology Economy Agronomy Animal science Soil science Communication and IT
Conferences by professionals and field trips	12-20h	
Tutorials and seminars	20h	
Self training	25-30h	
Facilitation of interactions between participants in the MOOC Agroecology	8h	
Final exam	3h	

Grades

The final mark will be a weighted average between the individual examination and the evaluation of seminars and presentations carried out in groups during the course.

Partnership

Research Units: Innovation, Cefe, Eco&Sols, System, Selmet, Agap, HortSys et Aida

Associations: Terre & humanisme, semeurs de jardins Civam etc.

Agroecology in depth knowledge

SPRING ***February 28 - March 25, 2022***

Reference of the course: Agroecology UE2			***Credits:*** 7 ECTS
Teaching language: English (min B1 level)	***Level:*** 400	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students	

Keywords

Functional ecology, biological / ecological / technical / social processes, management practices, sociotechnical networks

Requirements

Sequence 1 of the Mooc Agroecology and/or course "What is agroecology ?"

Persons in charge

Ass. Prof. Florian Fort (florian.fort@supagro.fr), Ass. Prof. Aurélie Metay (aurelie.metay@supagro.fr), Ass. Prof. Muriel Tavaud (muriel.tavaud@:supagro.fr), Prof. Stéphane de Tourdonnet (stephane.de-tourdonnet@supagro.fr).

Department of Soil, Water, Crops and Livestock Systems; Department of Biology and Ecology

Organization and credits

The course is a full time 4-week-long course.

Objectives

The general objective of the course is to present the processes underpinning agroecology to mobilize ecological functionality in agro-ecosystems. Students are expected to analyze, evaluate and integrate these processes through a systemic approach conducted at different levels: plot, ecosystem, production system, socio-ecosystem. Teaching is focused on a functional analysis of the agro-ecosystem in order to highlight the key processes of agroecology with their associated concepts and methods and evaluate the ecosystem services provided.

At the end of the module the students will be able to (1) name and describe the biological, ecological and social processes going on in agroecosystems; (2) identify and analyze agronomic practices complying with agroecological principles, at various levels (from the community to the farm level) and their impact on the components of the agroecosystem.

Course content

The teaching will address the following topics: Ecological, Biological, Technical and Social Processes in agroecology, biodiversity and diversity of practices in agro-ecosystems, construction of agroecological knowledge and learning. Students will develop an integrated analysis based on case studies and a field camp.

The course will make extensive use of a digital learning resource developed by the teaching team (MOOC agroecology). During the MOOC session, the students will tutor the participants through forums, act as community managers, facilitate the live events of the MOOC. A dedicated training will enable them to acquire and practice the necessary skills.

The course will combine lectures-seminars, tutorials, and on-site visits. Students are required to: (1) attend all classes, tutorials, e-learning activities (2) participate actively to group work and discussions, (3) develop self-learning, (4) work on a project during the field camp, and (5) take a final examination.

Disciplinary Content	**nb of hours**
Biology and genetic	6
General and soil ecology	14
Agronomy	10
Pest and diseases management	4
Livestock systems	6
Water and soil management	3
Sociology	3
Field activities, measurement, data analysis	14
Self learning and group work	40

Grades

The final mark will be a weighted average between an individual exam (40%), continuous assessment (20%) and a group project on field camp results (40%).

Partnership

Research Units: Innovation, Cefe, Eco&Sols, System, Selmet, Agap, HortSys et Aida

.

The Agroecological Transition: implementation

SPRING ***March 28 – April 22, 2022***

Reference of the course: Agroecology UE3			***Credits:*** 7 ECTS
Teaching language: English (min B1 level)	***Level:*** 400	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students	

Keywords

Agroecological transition, innovation, ecological engineering, design and evaluation of agroecosystems, public policies, short food supply chains, certification

Requirements

Prerequisites: sequences 1 to 4 of the MOOC Agroecology and/or course "What is agroecology?" and "Fundamentals of agroecology"

Persons in charge

Prof. Ronan Le Velly (ronan.le-velly@supagro.fr), Prof. Stéphane de Tourdonnet (stephane.de-tourdonnet@supagro.fr).

Department of Soil, Water, Crops and Livestock Systems, Department of Biology and Ecology, Department of Economics, Management and Social Sciences

Organization and credits

The course is a full time 4-week-long course.

Objectives

The general objective of the course is to analyze the evolution of practices and systems, as well as the innovation and transition processes towards agroecology. The course will present the levers (public and research policies, devices to co-design technical systems, support systems and socio-technical networks ...) to guide the agroecological transition and address issues such as adaptation to climate change, reduction of inputs, development of sustainable food systems.

The concepts, approaches and instruments of the agroecological transition are presented in order to strengthen the students' ability to drive change and to assess the corresponding impacts at the economic, social, agricultural and ecological levels. Most of the course consists in a project where the students will work in groups to address the various aspects of the design of a "real" sustainable agroecosystem complying with the principles of agroecology.

Course content

The teaching will address the following topics: Innovation and agro-ecological transition, Greening of public policy, Technical, organizational and economic lock-ins and levers for agroecology, Evaluation methods and (co) design of agro-ecological systems, Ecological Engineering.

Small groups of students will have to work on a project in relation with external partners (community, association, cooperative etc.) to conceive and evaluate ex-ante the agroecological transition within a farm or small territory.

The course will combine lectures-seminars, tutorials, and project-based learning through the analysis of a real-world case study. Students are required to: (1) attend all classes, tutorials and discussion, (2) develop self-learning, (3) work in groups on a project, and (4) take a final examination.

Disciplinary Content	**nb of hours**
Economics, Sociology	20%
Agronomy, Zootechnics, Soil Sciences, Ecology	30%
Project	50%

Grades

The final mark will be a weighted average between an individual exam and a group project.

Partnership

Research Units: Innovation, Cefe, Eco&Sols, System, Selmet, Agap, HortSys et Aida

Every year changing professional partner for the project)

Designing new crops for the future

SPRING ***January 24 - February 18, 2022***

Reference of the course: Plant Sciences UE1			***Credits:*** 7 ECTS
Teaching language: English (min B1 level)	***Level:*** 300	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students/ MSc students	

Keywords

Climate change, societal expectations, crop pests, food security, diversification of agricultural production, ideotype, biocontrol, tolerance to biotic and abiotic constraints, genotype/environment interaction, genetic innovation, biotic interaction, genotype, phenotype, multi trait combination, genetic recombination, perception towards innovation, public acceptability, production processes, genome editing, participatory plant breeding, legal issues

Requirements

Basic knowledge in biology of organisms, plant protection, genetics and breeding.

Persons in charge

Dr. Dominique THIS (dominique.this@supagro.fr), Dr. Florian FORT (florian.fort@supagro.fr)

Department of Biology and Ecology

Organization and credits

The course is a full time 4-week-long course, with one item per week and a four-weeks applied transversal project.

General theme of the course

Changes affecting agriculture at the world level (environmental and societal changes) bring questions about paradigm shift in crop breeding and health. This course aims at guessing and designing the upcoming crop varieties and plant protection strategies to be developed in future production chains.

This course will bring scientific bases and methods to reflect on evolutions of plant breeding and plant protection at the global level. Students will learn how to design new plant ideotypes and plant protection systems in line with natural resources preservation, and integrate them into either innovative or traditional farming systems. Finally, this course aims at making students acquire additional operational skills and discover careers in plant breeding and crop protection sectors.

Course content

The course will combine lectures-seminars, laboratory, field and/or company on-site visits and project-based learning.

1. **First week theme:** To analyze and predict the impacts of climate and societal changes on cropping systems
2. **Second week theme:** To define suitable crop ideotypes well adapted to environmental constraints and new-coming agricultural systems
3. **Third week theme:** Available methods to be developed to go towards the engineering of the desired crop ideotypes
4. **Fourth week theme:** Technical, societal and legal challenges

Students are required to: (1) attend all classes, discussion and on-site visit sections, (2) informally and formally participate in class and all exercises, (3) prepare an essay on a synthesis case study, and (4) take a final oral examination.

Disciplinary Content	**nb of hours**
Sociology and economy	3
Agro-ecology	5
Eco-physiology	7
Phytopathology and pest management	7
Environmental sciences	3
Genetics	10
Breeding	6
Legislation	4
English	4,5
Multidisciplinary Project	**10,5** (+40h group work)

Grades

Grades are based on (i) evaluation of individual participation to classes and to the different exercises; (ii) evaluation of a written report (10 pages max) and (iii) final oral examination (15 minutes)

Training in Agropolis research community: special topics in advanced Plant Sciences

SPRING ***February 28 - March 25, 2022***

Reference of the course: Plant Science UE2			***Credits:*** 7 ECTS
Teaching language: English (min B1 level)	***Level:*** 400	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students/ MSc students	

Keywords

scientific approach, communication, team-work, experimentation, research, plant biology, plant breeding, crop protection, ecology

Requirements

Basic knowledge in biology of organisms, plant protection, genetics and breeding.

Persons in charge

Dr. Anna Medici (anna.medici@supagro.fr, Dr. Jean-Jacques Kelner (jean-jacques.kelner@supagro.fr), Dr. Véronique Marie-Jeanne (veronique.marie-jeanne@supagro.fr) .

Department of Biology and Ecology

Organization and credits

The course is a full time 4-week-long course.

General theme of the course

The attractiveness of the Montpellier Research Campus in the field of plant science is mainly due to the excellence of the scientific research and higher education network of Agropolis (www.agropolis.fr). However, this community is not well known by students. Also, some of the research units do not know the potential of the students coming to Montpellier SupAgro as future trainees or staff. This course aims at filling this gap by introducing the students to the richness of the Montpellier scientific network in plant sciences, ecology and crop protection. Students will participate to a scientific project conducted within an Agropolis research unit and supervised by our research partners. They thus will learn the different steps of the scientific approach: to carry out a state-of-the-art, to formulate scientific hypotheses, to implement an experimental process and to discuss the results. This will contribute to develop scientific rigor, scientific communication, ability to work in a team, and more generally the adaptation to a professional environment.

Course content

The course will be based on project-based learning as well as practical exercises. The students will work in small groups. Students will also attend scientific seminars and develop self-learning.

1. **First week:** Presentation of the scientific environment and analysis of the state-of-the-art relative to the research project (bibliography)
2. **Second week:** Establishment of the methodology and start of the experiments
3. **Third week:** Development of the experiments and collection of results
4. **Fourth week:** Analysis of the results and presentation of the work

The week-to-week progress of the work will depend on the subject the student will work on.

Students are required to: (1) attend all classes, discussion and practical exercises, (2) report on their work on a weekly basis, and (3) make a final oral presentation of their work. The course requires a full time investment in the projects

Disciplinary Content	**nb of hourS**
Experimental Sciences (biology / biotechnology / plant breeding / plant protection / ecology depending on groups)	30 (+60h personal work)
Scientific communication	5
English	5

Grades

Grades are based on (i) evaluation of individual participation to classes and to the different exercises; (ii) evaluation of a written report (10 pages max) and (iii) final oral examination (15 minutes)

Evolutionary applications in agriculture: evolutionary concepts for the Management of Agro-Ecosystems

SPRING ***March 28 – April 22, 2022***

Reference of the course: Plant Science UE3			***Credits:*** 7 ECTS
Teaching language: English (min B1 level)	***Level:*** 400	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students/ MSc students	

Keywords

molecular diversity, evolutionary and selection footprint, co-evolution, barcoding, microbiome.

Requirements

Basic knowledge in Mendelian genetics, General concepts of molecular Biology (meiosis, recombination), Probability (mean, variance, binomial distribution) and Statistics and R (p-value, PCA).

Persons in charge

Pr. Vincent Ranwez (vincent.ranwez@supagro.fr) and Dr. Jean-François Martin (jean-francois.martin@supagro.fr)
Department of Biology and Ecology

Organization and credits

The course is a full time 4-week-long course.

General theme of the course

Modern agro-ecosystem management must resolve the potentially conflicting objectives of short-term, intensive production and long-term sustainability whilst simultaneously reducing negative environmental impacts. This course aims at providing students with the key theoretical background elements needed to comprehend and assess the agro-ecosystem within an evolutionary framework.

Relevant evolutionary concepts will be used to shed light on processes such as: domestication and its impact on cultivated plants; adaptive potential to biotic or abiotic stresses; identification of candidate genes for adaptation; community dynamics influencing host/pathogen, plant/microbiome or arthropod-related interactions; the spread of invasive species. To achieve this goal, students will be introduced to the essential theoretical background from population genetics, molecular evolution and phylogeny, as well as community dynamics and interactions.

Course content

The course will combine lectures-seminars, tutorials, analyses of real-world case studies and project based learning. Students are required to: attend all classes, tutorials and discussion, develop self-learning, work on a project, and take a final examination.

Tutorials will aim at mastering F-statistics, sequence alignments, advance queries on EnsEMBL and NCBI databases, molecular phylogeny, taxonomic identification as well as understanding the fundaments of tests used to detect selection/adaptation or to characterize microbiomes.

Students are expected to develop their ability to read scientific article and question methodological choices, to apprehend agronomic question in a broader evolutionary framework, to propose biological interpretation based on molecular data analysis and to suggest further analysis to validate those hypotheses, to work with others: being able to emit/accept constructive criticism, being open-minded and inquisitive, being respectful of other point of view, being diligent and punctual.

1. **First week:** Genetic resources in agriculture and conservation biology (molecular diversity): Characterizing genetic/genomic diversity via high-throughput molecular methods, Understanding evolutionary processes shaping allelic distribution, Quantifying molecular diversity, Conducting taxon identification and phylogenetics analyses for diagnostics and classification
2. **Second week:** Molecular breeding, dynamics of adaptation, candidate gene identification (footprints of selection): Establishing a null hypothesis to detect selection for adaptation to biotic and abiotic conditions, Detecting selection at the genome level for adaptation to biotic and abiotic conditions
3. **Third week:** Domestication history, epidemiology, emergence of resistances and geographical expansion (spreading): Understanding how molecular diversity is shaped by organism reproductive traits, Deciphering the history of populations at different time and space scales, Retracing phylogeography and geographical expansion to understand the past and predict the future
4. **Fourth week:** Community evolutionary dynamics (interactions): Understanding co-evolution and how it can be tested, Knowing the importance of soil microbiome and how metagenomics allows to characterize it, Understanding that the plant level is not the sole relevant level

Disciplinary content	**nb of hours**
Genetics	31
Molecular ecology	9
Evolution and Phylogenetics	9
Multidisciplinary project (data analysis)	20 (+24h personal work)
English	7

Grades

The final mark will be a weighted average between an individual exam and a group project.

Collecting Environmental data

SPRING ***January 24 - February 18, 2022***

Reference of the course: Data Manager for environmental projects UE1		***Credits:*** 7 ECTS
Teaching language: English (B1 level)	***Level:*** 300	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students

Keywords

Sensors and Metrology, Wireless Sensors Networks (WSN), Arduino platform, Networks, Metadata and Data formats

Requirements

Very basic skills in programming (any language) may be useful.

Persons in charge

Ass. Prof Hazaël JONES (hazael.jones@supagro.fr)

Department of Sciences for Agro-Bio-Processes

Organization and credits

The course is a full time 4-week-long course.

Objectives

Measurement is one of the major components of environmental monitoring, whether for water quality, atmospheric conditions. It forms the basis on which hazard management strategies or policies related to the protection and management of the natural environment can be implemented. The objective of this teaching unit is to provide with students the physical and organizational principles for collecting information to describe the natural environment. This module will introduce the first steps of geo-referenced data project management with the application of sensors and their connection to a communication network. The sampling, data validation and representation of information issues will also be considered

Course content

The course will combine lectures-seminars, tutorials, interviews and on-site visits and project-based learning.

The goal for the students is to be able to perform an effective environmental data collection in order to carry out an agri-environmental project. To achieve this goal, the following program will be done:

- First week: Sensors and Arduino, Data Format: this week is about how to concretely manage sensors with basic knowledge of sensors and their characteristics for agro-environmental applications. Development of measuring system based on Arduino open-source platform within the framework of agro-environmental project is done. An introduction about data for agronomy and agriculture is also given.
- Second Week: Wireless Sensor Network (WSN) and Arduino, Computer networks, Metadata: this week will give theoretical knowledge about how computer networks work and how wireless sensor network are managed with Arduino. An introduction about what are metadata and why they are useful for environmental data projects is given.
- Third Week: Statistics and Sampling, In-field data acquisition: this week will give the basics on how to perform a good sampling for data acquisition; it will then be concretely achieved in the field on a concrete application.
- Fourth Week: Data processing, Geomatics and Geographic Information System (GIS) basics, Global navigation satellite system (GNSS). This week will be about the first steps of data processing once the data have been gathered. As many data are of spatial nature, geomatics, GIS and GNSS notions will be investigated.

Disciplinary Content	**nb of hours**
Sensor and Metrology	2
Prototyping with Arduino platform	15
Networks and IoT	3
Data Format, Semantic Networks, Ontologies and Metadata	5
Statistic and Sampling	6
In field data acquisition and Data processing	15
Geomatics and Geographic Information System (GIS) basics, Global navigation satellite system (GNSS)	2

Grades

Grades are based on evaluation of individual participation to classes and a group project.

Partnership

Research Units: UMR MISTEA (SupAgro | INRAE) and UMR ITAP (SupAgro | INRAE)

Environmental Data Processing and Analysis

SPRING ***February 28 - March 25, 2022***

Reference of the course: Data Manager for environmental projects UE2		***Credits:*** 7 ECTS
Teaching language: English (B1 level)	***Level:*** 400	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students

Keywords

Spatial Data, Data Science

Requirements

Basic knowledge in: Statistics (sampling, estimation, principle of statistical tests), Databases (tables and simple SQL queries) and statistical free software R.

Persons in charge

Ass. Prof. Bénédicte Fontez (benedicte.fontez@supagro.fr)

Department of Sciences for Agro-Bio-Processes

Organization and credits

The course is a full time 4-week-long course.

Objectives:

To propose a set of methods and tools to study complex data (georeferencing, temporal data and so on) in order to predict a variable of interest or identify consistent sub-sets and to represent these results in the form of maps and charts.

Course content

The course will combine lectures-seminars, tutorials, interviews and on-site visits and project-based learning.

Disciplinary Content	**nb of hours**
Applications : project (tutorials with R, QGIS) and advanced level in R	8
Distributed spatial data extraction and management, Databases, Big data, Semantic Networks	20
Statistics (Spatial autocorrelation and regression)	18
Variogram – Kriging	5
Geomatics	6

Grades

Grades are based on evaluation of individual participation to classes and a group project.

Partnership

Research Units: UMR MISTEA (SupAgro INRAE) and UMR ITAP (SupAgro IRSTEA)

Mobile and web management of environmental data

SPRING ***March 28 – April 22, 2022***

Reference of the course: Data Manager for environmental projects UE3		***Credits:*** 7 ECTS
Teaching language: English (B1 level)	***Level:*** 400	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students

Keywords

GIS, Mobile and web applications, spatial data analysis

Requirements

Very basic skills in: Web design (basic knowledge of HTML tags and CSS), Programming (any language), GIS

Persons in charge

Pr Bruno Tisseyre (bruno.tisseyre@supagro.fr) and Pr Philippe Vismara (philippe.vismara@supagro.fr)

Department of Sciences for Agro-Bio-Processes

Organization and credits

The course is a full time 4-week-long course.

Objectives:

To provide decision support at different level (local, national, regional and international) environmental data and land use information must be available for many different activities and stakeholders. Sharing and dissemination of environmental data is therefore a challenging issue which largely relies on web and mobile technologies. The first goal of this teaching unit is to provide with the student an overview as well as a description of the main technologies available to tackle the issue of dissemination of environmental data. The second goal is to involve the student in a project management aiming at applying these technologies to real environmental project with collecting platforms (crowd-sourcing, sensor networks, and so on) and dissemination of information. Spatial data like maps and remote sensing image will be the core of the project.

Course content

This module is mainly based on project-based training with a few lectures-seminars and tutorials.

- First fortnight theme: Designing a mobile web application for on-site collecting data
- Second fortnight theme: Project in precision agriculture

Students are required to: (1) attend all classes, tutorials and discussion, (2) develop self-learning, (3) work on a project and contribute to the restitution seminar.

Disciplinary Content	**nb of hours**
mobile and web applications (HTML, CSS, PHP, JavaScript), web services	30
GIS and spatial data analysis	10
Remote sensing	5
Collective Project management	15 + (40 personal project)

Grades

Grades are based on evaluation of individual participation to classes and a group project.

Partnership

Research Units: UMR MISTEA (SupAgro INRAE) and UMR ITAP (SupAgro IRSTEA)

Sustainability and Society

Spring ***February 28 - March 25, 2022***

Reference of the course: TED2 UE2		***Credits:*** 7 ECTS
Teaching language: English (B1 level)	***Level:*** 400	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students

Keywords

Agricultural commodity markets; Life Cycle Analysis; Consumer behaviour; Social Corporate Responsibility; Marketing

Requirements

Basic notions in management, economics and public policies.

Persons in charge

Ass. Prof. Anne-Sarah Chiambrietto (anne-sarah.chiambretto@supagro.fr) and Ass. Prof. Clara Roussey (clara.roussey@supagro.fr)

Department of Economics, Management and Social Sciences

Organization and credits

The course is a full time 4-weeks-long course.

Objectives and course content

This teaching unit provides tools for a systemic understanding of sustainable practices, from a social science perspective. Mixing interventions in marketing, management, economics, engineering sciences and finance, it links value chains to life cycle analyses, and proposes an interdisciplinary approach to sustainable behaviors.

From a management perspective, the course focuses on sustainable issues and practices at work throughout the value chains, from producers to consumers.

It aims at understanding the Corporate Social Responsibility (CSR) appearance and development mainly characterized by the proliferation of voluntary standards and multi-stakeholders' initiatives at national and international scales and the introduction of new practices concerning social and environmental management. Based on case studies using strategical, political and critical approaches, students will analyze CSR practices to grasp their impacts, limits and transformative potential.

In terms of sustainable consumption, the course aims at understanding the relationships between food consumption practices, market devices (rules and standards, advertising and packaging, supply chains and retail places…) and sustainable development goals (waste reduction, environmental protection, development of small producers…). At the end of the unit, students should be able to grasp the complexity of sustainable consumption practices (attitude-behavior gaps, contradictions…), to understand the way these practices are shaped and enabled by the market devices, and to analyze the various impacts in terms of sustainability of the different ways of agencing sustainable consumption.

The students will also be involved in an interdisciplinary exercise linking economics and life cycle analysis using the example of biofuel development. First, the exercise will focus on how economic modelling can help us to understand the complex interactions between land and labor markets, international agricultural prices and demand for agricultural commodities. Second, they will implement a life cycle analysis of biofuels in order to understand the impact of their development on the environment. This exercise both allows to acquire new skills and knowledge but also to grasp the challenges linked to the development of interdisciplinary studies.

Disciplinary Content	**nb of hours**
Economics	15
Engineerins sciences	10
Management	25

Key concepts

The key concepts are related to sustainable consumption and production, from concerns to behavior and production processes. The course mainly relies on life cycle analysis, CSR and basic notions of finance.

Tools and methods

The tools used require the students to participate actively in the construction of the course. Part of the course is based on field studies. The objective is to understand, based on a precise case study, the interrelations between production, distribution and consumption; understand what are the sustainability issues at stake on this precise case; study how consumers deal with these sustainability issues and how they act (consumer survey). Moreover, the student will also be introduced to the methodology of life cycle assessment methods.

Grades

Continuous exams.

Junior Research Lab

SPRING ***May 2 – June 24, 2022***

Reference of the course: JRL		***Credits:*** 14 ECTS
Teaching language: English (B2 level)	***Level:*** 500 - 600	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students

Keywords

Research skills development, Learning by researching, international collaboration, project development and

Requirements

Good basis in biology, mathematics, physics, chemistry as well as the B2 English capacity are required and will be evaluated.

Persons in charge

Pr. François Colin (francois.colin@supagro.fr), Pr. Jacques David (jacques.david@supagro.fr), Dr. Jean-François Martin (jean-francois.martin@supagro.fr)

Organization

The course is a full time 8-week-long 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) weekly seminars led by expert scientists organized by the students themselves;

(iii) autonomous scientific small-group projects for at least 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 JRL.

Research skills and disciplinary content

The Junior Research Lab (JRL) is a teaching unit dedicated to learning through research. Students 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 students to exchange with students from other disciplines, other countries and to prepare a long-term personal research project. It puts 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 scientific and transversal objective of this module is therefore to enable students to develop their ability to:

0. Improve autonomously their academic knowledge through the reading of scientific literature and the development of their critical thinking skills

1. Conduct a research activity,
2. Manage a scientific project using the AGILE methodology,
3. Plan the phases of acquisition, analysis and sharing of the products of their research,
4. Use analytical tools,
5. Organize their approach with a view to reproducibility and quality of results.
6. Work in a small (4/5) multicultural group, both face-to-face and at a distance,
7. Write a scientific article that is a product of their research,
8. Present a scientific project orally in English in 180'.

Scientific disciplines: The scientific topics of the research project are addressed through the field of expertise of l'Institut Agronomique, i.e, mainly in biology, ecology, sol sciences, agronomy, rural economics. Every year, a team of academics is volunteering for mentoring the students during their project. Available discipline varies accordingly.

Research skills & Disciplinary content	**Nb of hours**
Agile Project management	12h
Literature survey and management (Zotero)	3h
Data analysis and visualization (R Tidyverse)	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
All disciplinary content is addressed within the research projects where it is relevant	

Grades

The evaluation of Grades is based on (i) the project-group scientific article (50%), (ii) the individual peer-review of another article (20%), (iii) the individual 180 seconds flash presentation (20%) and (iv) the ongoing scientific network exercise.

FLOW Spring Course

SPRING 2021 ***25 May – 11 June 2021***

Undergraduate Engineering Summer School

Online courses

May 25th – June 11th 2021

FLOW

Grand Industrial Challenges in France

Polytech Montpellier, South of France

FLOW Grand Industrial Challenges in France

Food, Living Organisms, Water

Wine and Beer
Milk to Yogurt and Cheese
Food Engineering and Food Safety
Urban Flood and Risk Mitigation
Assuring Clean Water
Sustainable Aquatic Ecosystems

Sustainable Energy and Materials

From Nuclear to Solar Energy
Materials for Sustainable Development
Nanomaterials and Nanotechnologies
Welding Technologies

Data and Information Processing

Data Science
Agility for Management
Interfacing Computers and Sensors
Internet of Things
Programmable digital and analog electronics

Tuition and fees

Regular fees: 900 €
Students from partner universities: 0 €
including:
Scientific lectures and activities (45h, 5 ECTS*)
Cross-disciplinary project on sustainability (15h, 2 ECTS*)
French courses and virtual intercultural program (15h, 1 ECTS*)

* *2 European Credits (ECTS) are equivalent to 1 American Credit*

Who can apply ?

Undergraduate students with a major in Engineering who have completed their first or second year of study and plan to major in one of the three topics of *FLOW*

How to apply ?

Contact:
polytech-flow@umontpellier.fr

Visit our website

Application deadline:
February 15th 2021

CONTENT

- Scientific courses Food, Living Organisms, Water (lectures, labs + scientific visit) (6 ECTS
- Tutored cross-disciplinary project on Sustainability (1 ECTS*)
- French language and culture, Interculturality (1 ECTS*)

For Information about ***data and information processing*** and ***Sustainable Energy and Materials***, please consult : https://www.polytech.umontpellier.fr/international/summer-school

*1 ECTS = 15 - 20 hours of workload completed by the student (lectures, labs, projects, personal work...)
2 European Credits (ECTS) are equivalent to 1 American Credit

SCIENTIFIC COURSES: FOOD - LIVING ORGANISMS – WATER

45h (lecture, labs, project...) + 45h (personal work) – 6 ECTS

This track offers about 45 hours of lectures and projects related to some challenges in the fields of food and water sciences. First sessions will present the major unit operation in food processing systems and how to master them to improve sustainability. The second session will give a synthetic presentation of one of the most fermented beverage iconic of the South of France: wine, from harvest to winemaking and aroma. The last sessions will focus on conventional and innovative technologies for water treatment, waste management and on ecological systems and biodiversity preservation. During these 3 weeks you will be interacting with researchers, experts in various fields of food and water, and discovering the activities developed in the South of France. In addition, you will have free access to an international specific module on vine and wine. Lecturers are members of two major engineering schools of Montpellier: Polytech Montpellier and Institut Agro (SupAgro Montpellier). The syllabus of the track is detailed below. It includes some references that might support you during the school or guide your way for a more thorough exploration of the covered material.

INTRODUCTION TO FOOD ENGINEERING (15h)

Dr. Kurt ROSENTRATER - Iowa State University

Analyzing and designing major unit operations in food processing systems

- Introduction to food industry, food engineering, engineering basics
- Impacts on chemistry,
- Energy sources, energy balances
- Psychrometrics, thermodynamics
- Heat transfer
- Preservation
- Drying, dehydration
- Thermal processing
- Fluid flow
- Extrusion processing
- Examples, exercises

Assessment: Written exam, multiple-choice questions, calculation questions, short questions

WINE TECHNOLOGY (8h + 6-9h MOOC + virtual visit)

Dr. Patrice LALLEMAND, Dr. Aurélie ROLAND - L'institut Agro - Montpellier SupAgro

A synthetic presentation of two most consumed fermented beverages

- Wine 1 (4h): Lecture: Understanding wine technology from harvest to winemaking.
  Selection of grape variety, “terroir”, vineyard management and quality of wine. Process of white, red, sweet and sparkling wine-making, fermentations, aging.
- Wine 2 (4h): Lecture: Aroma compounds in wines (how they are formed during winemaking and wine aging) and sensory evaluation of wines (methodology and explanation of wine sensory attributes). Presentation of the Mediterranean wines (category, food matching, history, market).
- Virtual Visit
  Virtual visit of wine estate of experimental research Domaine du Chapitre, located at Villeneuve les Maguelone (34750), near Mediterranean Sea. This visit will allow discovering last innovation for vine sciences in the framework of the projet « Mas Numérique ».

- Free access to the MOOC Vine and Wine (Mandatory
  (https://www.fun-mooc.fr/courses/course-v1:supagro+120002+session02/about)

  * 1st week: Biology of the Vine
  The annual cycle and the history of vine cultivation
  Ecophysiology of the vine, relationships between soil-plant-climate
  Development and ripening of the berries
  Innovations with vine varieties

* 2d week: Viticulture
The annual viticultural cycle and installing the vineyard
Analysis of the 'terroirs' and of plant production
Vineyard management, irrigation, fertilization and illnesses
Innovations in viticulture

* 3rd week: Oenology
Biochemistry and grape must chemistry
Technical strategies, vinification and stabilization technology
Fermentation and microbial actions
The chemistry of wines, aromas and quality testing

Assessment: Multiple-choice questions

WATER SCIENCE AND TECHNOLOGY (15h + visit)

Dr. François ZAVISKA, Pr. Catherine ALIAUME - Université de Montpellier, Polytech MONTPELLIER

ASSURING CLEAR WATER (4h with students + 3.5h work at home)

Lectures + small projects: Conventional and innovative technologies for water treatment and waste water management. Water contamination can be very diverse and can be harmful for both environment and human health. The content of this course will be divided into three main parts. The first part will be dedicated to the presentation of the different type of water contaminants/pollution (anthropogenic or natural pollution) and how it can affect the ecosystem and human health. In a second part, the different water treatment techniques will be presented for both wastewater management and drinking water production. Finally, a presentation of innovative water technology based on membrane processes for specific applications will be details in the last part of this lecture.

SUSTAINABLE AQUATIC ECOSYSTEMS (4h with students + 3.5h work at home)

Lectures and small projects on the ecosystem ecological status and biodiversity preservation. This course aims at introducing ecological basic knowledge of a river system and aquatic organisms, and providing tools to evaluate the ecological status of rivers. Human impacts (such as dam construction) jeopardize ecosystem functioning and biological resources sustainability, and solutions for the ecological continuity restoration are presented.

Assessment: multiple-choice questions, small-project

FRENCH LANGUAGE AND CULTURE, INTERCULTURALITY

15h face-to-face + 5h of independent work - 1 ECTS

- Presentation of France and immersion in the Occitanie Region (Regional economy, Art of living in Occitanie)
- Basic French vocabulary (gastronomy and culture)
- Introduction to interculturality and to the cultural specificities of France

This track of about 20 hours offers a presentation of France et an immersion in the Occitanie Region (Regional economy, Art of living in the South of France).

In small working groups you will learn the basic french vocabulary (gastronomy and culture). During these 3 weeks you will also benefit from an introduction to interculturality and the cultural specificities of France.

FRANCE AND OCCITANIE REGION (3h face-to-face)

Geographical, economic and cultural presentation of France and Occitanie.
- France (1h): presentation of the richness and diversity of France from a geographical, social, cultural and culinary point of view.
- Occitanie (2h): presentation on the geographical and natural specifications. Focus on some key cities.

REGIONAL ECONOMY (4h face-to-face)

- Economic assets: work on the specificities of the Occitanie Region. Comparison between clichés and reality (2h)
- The South de France products (2h): coastal specificities, agriculture, wine and food products of Occitanie.

ART OF LIVING IN OCCITANIE (4h face-to-face)

- Great traditions of various festivals: work around drama, dance, music, Mediterranean cinema.
- Regional specialties: Provence markets, Camargue races, culinary specialties.

INTERCULTURALITY (3h face-to-face)

- The concepts of culture, cultural dimensions, intercultural relations, culture shock (1h)
- Specificities of the French culture and links with its History, Settlement, Geography (2h)

Assessment: production of a personal video integrating the linguistic and cultural concepts presented and discussed.

TUTORED CROSS-DISCIPLINARY PROJECT ON SUSTAINABILITY

15h - 1ECTS

This course consists of a tutored project on sustainable development in an international context. During the 3 weeks, you will work in small teams supervised by a professor. The objective of the project is to work in groups from different cultures and scientific disciplines in order to write the specifications of an innovative product/service responding to one of the 17 sustainable development issues established by the Unated Nations. During the 3 weeks, the projects will be conducted by alternating face-to-face learning sessions and non-face group work sessions. This project also covers an intitiation to project management.

Assessment: Oral defence of the project

IF YOU HAVE ANY QUESTIONS, PLEASE CONTACT :

polytech-flow@umontpellier.fr
https://www.polytech.umontpellier.fr/international/summer-school

AUTUMN SEMESTER and/or SPRING SEMESTER

VINIFERA EUROMASTER

https://en.montpellier-supagro.fr/training/vinifera-euromaster

Vinifera EuroMaster is a master's degree awarded by EMaVE, a European consortium of six major institutions that includes Montpellier SupAgro (in charge of coordination), Hochschule Geisenheim University (Germany), Universidad Politécnica de Madrid (Spain), and the Universities of Lisbon (Portugal), Turin (Italy) and Udine (Italy).

This international master's degree responds to a demand for the training of high level international executives able to accompany the development and modernization of the vine and wine industry in many producing countries. It offers multidisciplinary scientific and technical knowledge to adapt to developments in the world wine sector and its markets.

Vinifera courses of the M.Sc 1 level can be taken throughout the year, over a full semester or combined with other courses, the JRL and/or an internship during the spring semester when calendars allow it.

Important note:

the follow-up of courses throughout the year as an exchange student does not lead to the validation of the first year of the master's degree and therefore to access to the 2nd year.

SPRING / AUTUMN or FULL YEAR ***7 September 2020 – 4 June 2021***

beginning	end	Course	ECTS
07/09/2020	18/09/2020	Company and terroir auditing	2 ECTS
21/09/2020	09/10/2020	Vine Biology	5 ECTS
12/10/2020	06/11/2020	Economics for the wine industry	6 ECTS
09/11/2020	04/12/2020	Enology	7 ECTS
14/12/2020	18/12/2020	exams	
04/01/2021	29/01/2021	Wine processing	7 ECTS
01/02/2021	12/02/2021	Project management in science	6 ECTS
22/02/2021	12/03/2021	Wine analysis	5 ECTS
15/03/2021	09/04/2021	Vine ecology and physiology	8 ECTS
12/04/2021	16/04/2021	exams + retakes	
26/04/2021	28/05/2021	Viticulture + study trip (optional)	7 ECTS (+ 1 ECTS study trip)
31/05/2021	04/06/2021	exams + retakes	
June-July		Internship (optional - max 2 months)	4 ECTS/month

Terroir and Company Auditing

AUTUMN ***7 September 2021 – 18 September 2020***

Reference of the course:			***Credits: 2 ECTS***
Teaching language: English (min B1 level)	***Level:*** 400	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students	

Teaching language

English

Requirements

Basic knowledge in chemistry, physic, biochemistry, botany and plant biology usually obtained in former Bachelor studies in plant production or Food Sciences.Knowledge of the economics module

Persons in charge

Patrice Lallemand - Montpellier SupAgro – patrice.lallemand@supagro.fr

Organization

Offered during the 2-week long Immersion period* at Montpellier SupAgro and Pech Rouge (experimental field station/winery in Gruissan, Aude):
The aim of the Immersion Period is: 1) to organize all necessary administrative matters and to introduce the international dimension into the new study environment (local and regional), 2) to introduce the students to the structure and organization of the Vinifera EuroMaster degree programme.

Lectures (55 h): viticulture 15 h; oenology 15 h; inter cultural workshops 5 h; auditing 20h
Practical exercises: 10 h (tasting and wine-making) 10h (auditing)
Study trip: 1 day
Personal studies including literature studies to bridge existing gaps and project 40 hours

Targeted learning outcomes

Students
- have a first overview concerning worldwide viticulture
- know the history of viticulture and grape production-know the basic technologies for the cultivation of grapevine and the production of grapes for wine making-are aware of the main characteristics and challenges of the Wine Sector
- understand the on-going activities in vineyards and cellars around Montpellier and know the special professional features of this region-have the chemical, biochemical and physical bases necessary to follow the enological courses. These bases are common to food science and processing in general and also in beverage and wine production.
- know the basic technologies and equipment for winemaking-know about the diversity of the skills needed by oenologists -have experience in intercultural communication and in working in multicultural groups-have first experience in Sensory Analysis of wines-know about the financial aspects of wine company management
- understand the interactions between vineyard, wine production and commercial aspects (systematic approach)-can apply practical methods in company auditing

Course content

Introduction to viticulture and enology: • worldwide Viticulture • technologies and approaches in grapevine cultivation and grape production-history of viticulture and grape production • special features of the agriculture, viticulture and enology of the Languedoc-Roussillon region (including study trip) • workshops on harvest and wine-making at PechRouge research station-fundamentals in biochemistry and their application in wine making-fundamentals in chemistry in relation to wine making • laboratory analyses techniques • fundamentals in physics in relation to the application in wine making • extraction and separation techniques-biological transformations-temperature control • hygiene measures and materials • Intercultural learning-workshops on intercultural communication-workshops on intercultural experience
Company Auditing: • Methodology of company auditing (wine making aspects and economic aspects) • Audit coaching -Study visit

Grades

Auditing: Written examination (group and individual evaluation Powerpoint presentation on company audit 50 %) - 4 ECTS
Group Project (1 ECTS)

Vine Biology

AUTUMN ***21 September 2020 – 9 October 2020***

Reference of the course:			***Credits: 5 ECTS***
Teaching language: English (min B1 level)	***Level:*** 400	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students	

Teaching language

English

Requirements

None

Persons in charge

Enrico Peterlunger, Prof. (Università degli studi di Udine, Italy)

Organization

PU Vine Anatomy and Genetics: Face to face lectures: 24 h; Directed exercises (laboratory course with stereo microscope): 4 h; Field visit: 2 h
PU Ampelography: Face to face lectures: 9 h; Directed exercises 8 h; field visit 4 h
Student's personal study time in the module: 70 h.

Targeted learning outcomes:

PU Vine Anatomy and Genetics:

- students have acquired basic knowledge of higher plant internal and external anatomy, at a whole plant level, as well as organ and tissue level.
- -they understand the principles of grapevine development and adaptation mechanisms that determine usual practices of grapevine management (pruning, hedging, yield control...)
- they are introduced to the principles of Mendelian, quantitative and molecular genetics and to the genetic peculiarities of the grapevine genome
- they learn strategies for genetic improvement of a perennial heterozygous crop and how molecular/biotechnological approaches are applied to speed up breeding programmes

PU Ampelography:

- Students can apply the methods used in ampelography
- know the systematics of species and rootstocks and main grapevine cultivars-can determine the main cultivars in the field

Course content

PU Vine Anatomy and Genetics:

• Morphology and anatomy of the grapevine organs. • Root, trunk, shoot, cane, leaf, bud, leaf, flower, berry, seed. • Systematics of the genus Vitis (basic knowledge). • Cultivated species and their use. • Annual cycle of the grapevine, vegetational phases. • Qualitative and quantitative aspects of the annual cycle: description of the modification of organs and evaluation of biomass involved. • Evolution of storage substances along the annual cycle. • Foundations of classical genetics. • General features of the grapevine genome. • Origin and genetic diversity in domesticated grapevines. • Conventional breeding and genetic engineering. • Genetic control and improvement of agronomic traits.

PU Ampelography:

• Ampelographic methods, •Systematics and species, Rootstocks, Wine varieties and clonal selection

Grades

Written examination

Economics for the Wine Industry

AUTUMN ***12 October 2020 – 6 November 2020***

Reference of the course:			***Credits: 6 ECTS***
Teaching language:	***Level:***	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree	
English (min B1 level)	400	USA - Bachelor Junior students/ Bachelor senior students	

Teaching language

English

Requirements

None

Persons in charge

Luigi Galletto, Prof. PhD (University of Padova)

Organization

PU Wine economics: Face to face lectures: 48 h; Case Studies 3 h; Study trips 9 h
Student's personal study time in the module: 70 h

Targeted learning outcomes:

- students have a macro and meso economic view of the wine markets, its structures and regulatory systems (OIV, CMO...)
- they will understand the production and consumption situation, international trade, bulk wine markets, and the economics of international firms who operate in the wine sector.
- Students have a managerial view of the wine market, with a special emphasis on international business strategies of wine companies, and marketing, both at strategic and operational level.
- They know about the market planning, business positioning, marketing mix management,

Course content

• Introduction to economic analytical approaches and theoretical backgrounds: macro, meso and micro economics. • Description and analysis of the wine production system, consumption, and international trade. • Relevant drivers in these systems, including coordination and institutional devices at global or local levels. • Global and local factors that influence wine prices, with a special insight into the bulk market.
• Performance drivers in different types of businesses (private and cooperative, large and family business). • Introduction to marketing with a particular focus on marketing-mix techniques. • Product launch, quality management, branding, communication, packaging, distribution and pricing in the wine sector. • Wine tourism economics.

Grades

Written examination and presentation

Enology

AUTUMN ***9 November 2020 – 4 December 2020***

Reference of the course:			***Credits: 7 ECTS***
Teaching language: English (min B1 level)	***Level:*** 400	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students	

Teaching language

English

Requirements

Basic knowledge in Enology as delivered in the module "Immersion" during the immersion period.

Persons in charge

Jorge M. Ricardo-da-Silva, PhD HDR (Universidade de Lisboa)

Organization

PU Grape & Wine Composition: Face to face lectures: 40h
PU Microbiology & Fermentation: Face to face lectures: 31h
Student's personal study time in the module: 91 h

Targeted learning outcomes:

PU Grape & Wine Composition:
- Students know the major and minor components in musts and wines
- technical repercussion of must components
- sensorial repercussion of musts and wine components
- nutritional repercussion of musts and wine components

PU Microbiology & Fermentation:
Students gain knowledge about the metabolism of yeast and bacteria relevant for wine making (alcoholic & malolactic fermentations),
- populations dynamics from vineyard to the fermentation processes (AF & MLF), also comparing spontaneous fermentation with usage of microbial starter cultures
- impact of yeast and bacteria nutrients on course of fermentation and formation of positive and negative aroma compounds
- selection procedures for yeast and bacteria
- impact factors on fermentations
- construction of genetically engineered wine yeasts and their properties
- microbial spoilage of grapes, musts and wine,
- lagging and stuck fermentations and problem solving operations
- Biochemistry of yeast autolysis and impact onwine aroma

Course content

PU Grape and Wine composition: • Nitrogen compounds: Proteins. Peptides. Enzymes. Aminoacids. • Phenolic compounds I –Anthocyanins: Chemistry, Grape contents, Anthocyanins during fermentation and aging. • Organic acids: From grape and must. Formation during yeast fermentation. Formation during MAF. • Glucid compounds: Sugars, Polyalcohol, Polysaccharides. • Phenolic compounds II: Flavanols, flavanols, flavanols, phenolic acids, stilbens, • Varietal aroma and other volatile aroma compounds, Mineral compounds.

PU Microbiology and Fermentation: • Yeast cell biology and taxonomy; special carbon metabolism and by-products of fermentations, fermentation cycle. • Yeast physiology, nutrition and stress factors. • Nitrogen and sulphur metabolism; sulfite production and sulfite management. • Role and effects of fermentation additives on fermentation performance. • Nutritional demands of yeasts and strain differences. • Genetic improvement of wine yeast and risk assessment.
• Lactic acid bacteria: taxonomy, metabolism, nitrogen and oxygen management. • Wine spoilage by yeast and bacteria.
• Targeted impact of yeast and bacteria on wine flavour (de novo synthesis of compounds and hydrolysis of bound aroma substances from precursors.
• Spontaneous fermentations versus usage of starter cultures; selection scheme for starters. • Mixed yeast cultures and simultaneous usage of yeast and bacteria starter cultures. • Control of fermentation. • Biochemical post-fermentation processes during yeast autolysis: formation of sensorially relevant compounds.

Grades

Written examination

Wine Processing

AUTUMN - SPRING ***4 January 2021 – 29 January 2021***

Reference of the course:			***Credits: 7 ECTS***
Teaching language: English (min B1 level)	***Level:*** 400	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students	

Teaching language

English

Requirements

Basic knowledge in Enology as delivered in the module "Immersion" during the immersion period.

Persons in charge

Aude Vernhet, Prof. PhD HDR - Montpellier SupAgro – anne.vernhet@supagro.fr

Organization

PU Wine making: Face to face lectures: 43h
PU Post-vinification: Face to face lectures: 27h; directed exercises 4 h; study visit 8 h
Student's personal study time in the module: 100 h

Targeted learning outcomes:

PU Wine Making:
- students know wine making process in white and rosé wines
- they know wine making process in red wines
- they understand ageing of white and red wines (vat/barrel)
- and know other kinds of wines: Sparkling, fortified, sweet wines

PU Post-vinification:
- students know about the main physico-chemical changes and alterations liable to occur in wines;
- they know the methods used to assess the risks and the stabilization methods (unit operations, fining, additives...) implemented to prevent them and ensure product conservation;
- students have acquired theoretical and applied basis for the implementation and control of the unit operations used for wine (must) clarification and microbiological stabilization;
- they know basics about wine packaging technologies.

Course content

PU Wine Making: • Engineering of pre-fermentative processes White and rosé wines: Preparation of must and juice (Destem, Crush, Pressing, SO2addition.). • Fermentation.Red Wines: Preparation of must and juice (Destem, Crush, SO2 addition). Maceration/Fermentation. • Maceration techniques-increasing the extraction, Pressing. MLF.Barrel Aging of white and red winesSpecial wines/Special techniques-Thermovinification-Flash expansion-Carbonic maceration-Special vinifications-Sparkling wines-Fortified wines-Botrytis spoiled wines

PU Post-vinification: • Wine clarification and stabilization: necessity and objectives • Main colloidal instabilities in wines –risk assessment and stabilization methods. • Theoreticaland practical aspects of wine fining. • Wine (must) clarification: principle of the different unit operations and their control in enology (centrifugation/floatation, dead-end filtrations, cross-flow microfiltration) • Crystallization of tartaric salts in wines: origin and stabilization methods (nucleation and crystal growth, impact of wine constituents, TID, Tsat and ISTC 50 tests, cold stabilization, electrodialysis, additives). • Microbiological stabilization (membrane filtration, flash pasteurization, pasteurization, hotfilling, tunnel pasteurization). • SO2and other additives. • Glass bottle production, PET bottle production, bottle inspection, bottling of glass bottles, PET bottles, Tetra Pak, Bag in Box and kegs, flash pasteurization, pasteurization, hot filling, membrane filtration, corks, crown corks, screw closures, Vino Lok, level adjustment and control, labelling.

Grades

PU Wine Analysis: Evaluation of the written reports of the laboratory sessions and personal participation in the lab sessions.
PU Wine Sensory Analysis: Continuous assessment of knowledge during tasting sessions

Project Management in Science

SPRING ***1 February 2021 – 12 February 2021***

Reference of the course:			***Credits: 6 ECTS***
Teaching language: English (min B1 level)	***Level:*** 300-400-500 ou 600	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students	

Keywords

Teaching language

English

Requirements

Basic statistics and data organisation and basic worksheet skills

Persons in charge

Bénédicte Fontez, PdD - Montpellier SupAgro – benedicte.fontez@supagro.fr

Organization

PU Experimental methodology and statistics: Face to face teaching 20h; tutored application of statistic programmes 25 h

PU Research project organization: Workshop on project definition and organisation 4 h; intermediate and final workshops with project presentation and discussion 14h

Student's personal study time in the module: 80 h

Targeted learning outcomes:

PU Experimental methodology and statistics:

- Students can design simple experiments
- know how to avoid observation errors and prejudice
- know and can apply the statistical methods commonly used in viticulture, enology and wine economics-are able to interpret the results obtained by using statistics
- they have knowledge in less common statistical methods (e.g. principal component analysis, cluster analysis, discriminant analysis)

They can use statistical programmes for data analysis

PU Research project organisation:

- Students can identify the technical and scientific questions and problems-make a bibliography to know the current state of art on a specific topic-are able to propose experimental designs (factors analysed, measurements, replicates required)
- can handle, analyse and discuss data
- can present research results to a public-can write and summarise scientific reports-are able to work in research teams (coordination and structure, milestones)

Course content

PU Experimental methodology and statistics:

• Methodology of scientific research • The scientific method and the experimental design • Hypothesis testing • Samples and populations, confidence limits • Analysis of Variance (ANOVA) • Linear and nonlinear regressions • Modelling and optimisation (e.g. Response surface methodology) • Data Analysis (e.g. Principal components analysis, Cluster analysis, Discriminant analysis) • Applications of statistical programmes in case studies in viticulture, enology or wine economics.

PU Research project organisation:

• Methodology of project organization • Scientific working methods (literature research, report writing) • Presentation techniques

Grades

Written examination on statistics experimental methodology and statistics (50 %)
Project presentation and written report (50 %)

Wine Analysis

SPRING ***22 February 2021 – 12 March 2021***

Reference of the course:			***Credits: 5 ECTS***
Teaching language:	***Level:***	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree	
English (min B1 level)	400	USA - Bachelor Junior students/ Bachelor senior students	

Teaching language

English

Requirements

None

Persons in charge

Sofia Catarino, Prof. PhD HDR - Universidade de Lisboa

Organization

PU Wine analysis: Face to face lectures 10 h; directed exercises 15 h;
PU Wine sensory analysis: Montpellier: Face to face lectures 6 h; practical sensory analysis 28 h; Bordeaux: 10h (3h lectures + 7h TD)
Student's personal study time in the module: 56 h

Targeted learning outcomes:

PU Wine Analysis:
- students understand the role of analytical chemistry on grape and wine quality control
- are able to interpret the wine analyses results in order to decide and to control the wine treatments as well as the assessment of legal and commercial wine specifications.

PU Wine Sensory Analysis:-
- students know the theoretical back ground of sensory analysis
- they know the main principles and techniques applied in sensory analysis
- they are aware of the flavor development and can distinguish the differences between varieties and the influence of the terroir and regions
- with these principles and techniques they are able to carry out quality control from the harvest to the final product ready for the customer
- they know how Descriptive Sensory Analysis permits product traceability
- students know a vast field of application implying varied techniques covering comparative and descriptive tests
- students will have indispensable skills in Sensory Analysis extremely useful in any field of vine.

Course content

PU Wine Analysis: • Grape vine ripeness control: analytical control of sugars and acidity; concepts and analyses of technological and phenolic maturity indexes • Wines, quality and quality control: quality characteristics; critical control points in wine processing; legal and commercial wine specifications. Classical and modern wine analysis; regulatory requirements. • Wine contaminants: ochratoxin A, biogenic amines and ethyl carbamate; occurrence and oenological strategies to reduce the risk of contamination.

PU Wine Sensory Analysis: • Introduction to Sensory Analysis in general and specially of wine; • Data analysis Selection and training of judges called for Sensory Analysis; • Make up of homogeneous jury adapted to the different test; • Different tests applied in Sensory Analysis (parametric or not) and statistical analysis of results; • Different steps of practical descriptive tastings; Semantics of descriptive Sensory Analysis and its various techniques of application in tastings, use of vocabulary (free or pre-established). • Tasting grids. • Descriptive Sensory Analysis versus the influence of quality factors (terroir, grape varieties)

Grades

PU Wine Analysis: Evaluation of the written reports of the laboratory sessions and personal participation in the lab sessions.
PU Wine Sensory Analysis: Continuous assessment of knowledge during tasting sessions

Vine Ecology and Physiology

SPRING ***15 March 2021 – 9 April 2021***

Reference of the course:			***Credits: 8 ECTS***
Teaching language: English (min B1 level)	***Level:*** 400	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree USA - Bachelor Junior students/ Bachelor senior students	

Teaching language

English

Requirements

Basic knowledge in Viticulture as delivered in the module "Immersion", basics in soil sciences, module "Vine Biology"

Persons in charge

Anne Pellegrino, PhD - Montpellier SupAgro – anne.pellegrino@supagro.fr

Organization

PU Vine Ecology: Face to face lectures 32h; directed exercises (practices) 4 h

PU Vine Physiology: Face to face lectures 25h; directed exercises 19h, Student's personal study time in the module: 28h

Student's personal study time in the module: 28h

Targeted learning outcomes:

PU Vine Physiology:

- To get theoretical knowledge on basic grapevine physiology, growth and development,
- To learn about the interaction between abiotic factors, vine physiology, development, fruit growth and composition,
- To learn about the eco-physiological differences across various grapevine varieties,
- To understand specific aspects of nutrient acquisition,
- To be able to apply research methods for physiological studies
- To be able to use specific decision making tools to measure vine and fruit physiological parameters
- To get a first insight in remote sensing approaches

PU Vine Ecology:

- To know how the sites characteristics (soil and climate) interact with viticultural practices (irrigation, soil preparation, cover crops; nutrient supply),
- To learn how to evaluate/measure the soil and climate parameters,
- To be able to assess and to correct soil problems: soil acidity, pH, erosion, poor organic matter content, salinity,
- To understand the potential impact of climate factors –temperature (including winter and spring frosts), light, rainfall, hail,and wind – on vine and vineyard performances
- To be able to characterize current or new sites/terroir from a soil and climate perspectives.

Course content

PU Vine Physiology: • Vegetative growth, Fruitfulness • Water Relations, Source-sink Relations (carbohydrates, nitrogen) • Root to shoot chemical communication • Nutrition-minerals:analytical methods and data interpretation • Berry development & composition/biochemistry • Remote and proxy sensingof physiological parameters • Phenology modelling, applications for the prediction of abiotic and biotic risks • Canopy light interception and water use efficiency under abiotic constraints and stresses
Practices: • Phenology modelling • Light interception modelling • Experimental project: initiation to ecophysiological methods • Sequential harvest and wine profiles

PU Vine Ecology: • Vineyard soils:basic concepts • Soil Ecology • Water balance model (field, site) • Copper and vineyard soil • Climate factors affecting vine growthand yield: temperature (including frosts), hail, rain, wind • Climate index & soils classifications • Climate change and Viticulture
Practicals: • Climate and soil indexes

PU Vine Physiology & PU Vine Ecology: General discussion: Have you noticed controversies across the Physiology and Ecology lectures? Great, then let's talk about it!

Grades

PU Vine Physiology: Oral presentation and written report or poster per group (50%)
PU Vine Ecology: Individual written report (50%)

Viticulture

SPRING ***26 Avril 2021 – 28 May 2021***

Reference of the course:			***Credits: 7 ECTS***
Teaching language:	***Level:***	Europe - 3d year of Bachelor's degree/ 1st year of Master's degree	
English (min B1 level)	400	USA - Bachelor Junior students/ Bachelor senior students	

Teaching language

English

Requirements

Basic knowledge in Viticulture as delivered in the module Terroir and Company Auditing and during the Vine Biology, Ecology & Physiology modules.

Persons in charge

Pilar Baeza Trujillo, Prof. PhD (Universidad Politécnica de Madrid); Manfred Stoll, PhD (Hochschule Geisenheim University)

Organization

PU Vineyard Management (3.5 ECTS): Face to face teaching: 24 h of lectures + 3 h of field visits (partly together with PU Vine pest control) + 3 half-day seminars; Personal study: 30 hours minimum.

PU Vine Pest Control (3.5 ECTS): Face to face teaching: 27 h of lectures + 3 h of directed exercises, Personal study: 30 hours minimum.

Targeted learning outcomes:

- know about the choice of cultivation practices in relation to the ecophysiology of the vine and the environment
- know innovative techniques closely linked to research
- know about adaptation of the vineyard management to either the valuation of terroir in the context of sustainable viticulture, or to an industrial approach of wine productions and derivatives
- know about global aspects of technical approaches for temperate, worm/dry and tropical viticulture
- know about the biology and epidemiology of the main pests, diseases and weeds of vines in the world, how they interact and to understand integrated and organic strategies of control
- know tools for the diagnosis of pests and diseases

Course content

• Techniques needed to set up a vineyard • Soil management strategies • Irrigation equipment and monitoring • Canopy management, trellising • Cool/dry/warm viticulture • Steep slope and tropical viticulture • Mites in vineyards • Cicadellids and transmitted phatogens • Grape moths and other insects • Viruses of vines • Coccoids and transmitted pathogens • Nematodes and transmitted pathogens • Grapevine wood diseases • Vine fungi and bacteria • Pedology and Soil zoning • Methodology of soil mapping • Study visits

Grades

Evaluation of practical work and written examination

INTERNSHIP

International students can apply for a research internship in one of the 21 **Montpellier SupAgro Joint Research Unit (UMR).**

- Students must personally take steps to find the internship. For that, they should consult the list of the UMR, at the end of this document and/or consult the UMR websites in French **(**https://www.montpellier-supagro.fr/recherche/dispositifs-de-recherche) or in English (https://en.montpellier-supagro.fr/research/scientific-policy/research-units)
- Students should send a message to the contact persons of the chosen UMRs of interest, and indicate the period they are interested in and the topics they would like to work on.
- The application may be accepted if the project is compatible with the work in progress and the availability of the targeted research teams.

Internship can begin at any time of the year and may last from 2 to 6 months. Internships of more than two months are remunerated but more difficult to obtain.

Proficiency is required in French or in English. In some cases, other languages can be accepted.

BE Department – Biology and Ecology

AGAP Institute – Genetic Improvement & Adaptation of Mediterranean and Tropical Plants
Contact: dominique.this@supagro.fr - nathalie.pivot@cirad.fr -- laurent.torregrosa@supagro.fr

UMR PHIM – Plant Health Institute Montpellier
Contact: claire.neema@supagro.fr - gerben-martijn.ten_hoopen@cirad.fr - gilles.bena@ird.fr

UMR BPMP – Biochemistry and Molecular Physiology of Plants
Contact: pierre.berthomieu@supagro.fr - anna.medici@supagro.fr

UMR CBGP - Centre for Biology and Management of Populations
Contact: marie-stephane.tixier@supagro.fr - serge.kreiter@supagro.fr - jean-francois.martin@supagro.fr

UMR LEPSE – Ecophysiology Laboratory of Plants under Environmental Stress
Contact: anne.pellegrino@supagro.fr

CEFE – Centre for Functional and Evolution Ecology
Contact: elena.kazakou@supagro.fr

MPRS Department - Soils, Water, Crops and Livestock Systems Department

UMR Eco&Sols – Functional Ecology & Biogeochemistry of Soils
Contact: claire.marsden@supagro.fr

UMR LISAH - Laboratory for the Study of Interactions between Soil, Agro-Systems and Water Systems
Contact: Julien.fouche@supagro.fr

UMR LSTM – Tropical and Mediterranean Symbioses Laboratory
Contact: brigitte.brunel@supagro.fr

UMR SELMET – Livestock Systems in Mediterranean and Tropical Regions
Contact: nathalie.agbagla@supagro.fr - charles-henri.moulin@supagro.fr

UMR ABSys - Crop Systems Tropical and Mediterranean Cropping Systems functioning and management
Contact: aurelie.metay@supagro.fr

SABP Department - Department of Sciences for Agro-Bio-Processes

UMR G-EAU - Water Management, Actors, Uses
Contact: gilles.belaud@supagro.fr - francois.colin@supagro.fr - armand.crabit@supagro.fr

UMR IATE – Agro-Polymer Engineering and Emerging Technologies
Contact: maeva.subileau@supagro.fr - eric.dubreucq@supagro.fr

UMR ITAP – Information and Technology for Agro-Processes
Contact: bruno.tisseyre@supagro.fr

UMR MISTEA – Mathematic, Computing & Statistic for Environment and Agronomy
Contact: benedicte.fontez@supagro.fr

UMR QUALISUD – Integrated Quality Food System
Contact: manuel.dornier@cirad.fr - antoine.collignan@supagro.fr

UMR SPO – Sciences for Enology
Contact: bruno.blondin@supagro.fr

SESG Department - Sciences Economiques, Sociales et de Gestion

UMR INNOVATION – Innovation and Development in Agriculture and Agri-Food Sector
Contact: stephane.de-tourdonnet@supagro.fr

UMR CEE-M – Center of Environmental Economics- Montpellier
Contact: pauline.lecole@supagro.fr

UMR MoiSA – Montpellier Interdisciplinary center on Sustainable Agri-food systems (Social and nutritional sciences)
Contact: lucie.sirieix@supagro.fr

UMR SENS – Gouvernement, Risque, Environnement, Développement
Contact: pascale.maizi@supagro.fr - marie-jeanne.valony@supagro.fr