



# COURSE CATALOGUE

## ULS SEMESTER 3

**emPLANT+ COURSE CATALOGUE**  
**ERASMUS MUNDUS MASTER PROGRAMME IN PLANT BREEDING**

Contents

Joint Courses.....	3
Semester 3 ULS .....	4

## Joint Courses

JOINT COURSES	Description, contents, learning outcomes	Implementation:
Pilot case	<p>The pilot case is a case study to apply the project management tools to a breeding program. First students by group o choose a species to be ameliorated. Then, find a character or several as goal for the breeding strategy. After, they check that there is a potential market for this new variety and verify that farmers will want to cultivate it and consumers too (1-week work) To be accomplished during all the first year. Secondly students are going to define the potential market for their product (seeds), but also the market for the new variety (consumers). Thirdly they need to create a structure who is going to breed the new variety, and define the role of each student on the group in this structure (company, association...)</p>	<p>The introduction to the Pilot Case will take place during the Joint Integration Week where the groups will be formed based on the specialty chosen by the students for Y2. During the first year the students will work in groups with their tutors and via telephone/video conference/email. During S3 the Pilot Case will be finalized with the tutors at the host university and by telephone/video conference/email among the group members. Two juries will be organized. The first jury at the end of S1 will evaluate the content and the form of the work and especially the project management content. At the end of S2 a written report and a second presentation more focused on the breeding schema will be evaluated. At the end of S3 a jury composed of the local tutors, the Coordinators for Y1 and an expert in Project Management will judge the defense of the Pilot Case. The juries of S1 and S3 will be carried out the same day for logistic reasons.</p>
Bio informatics	<p>Biological databases; gene analyses, web-based analytical tools, Unix OS, functional genomics, molecular evolution, RNAseq expression analysis, annotation of new genomes.</p>	<p>This course will be offered via videoconference and tutorials and accompanied by tutors at the host universities. The class will be validated by a computer-based exam.</p>
Big Data	<p>Clustering, Random Forests, K-Nearest Neighbors Method/ Kernel Methods, Sparse Methods for high dimensional data. Databases (Big data) Management Distributed file systems, Hadoop, Parallel, distributed, massive data processing with Map Reduce NoSQL/NewSQL databases</p>	<p>This course will be offered via videoconference and tutorials and accompanied by tutors at the host universities. The class will be validated by a computer-based exam.</p>

## Semester 3 ULS

SEMESTER 3 ULS (30 credits)	Objectives	ECTS
Internship	The student will have to mature his reflection on his professional project, and confirm his professional trajectory, in particular, by direct exchanges with professionals of the chosen sector of activity and function. On this basis, he will choose a company in which he wishes to do his internship and will carry out his external diagnosis. Once in the company, he will have to familiarize himself with the problem of the internship, demonstrate an aptitude for professional practice, assert his skills and develop personally and professionally.	5
Modelling	<p>Being able to run a simulation with a crop model and understand the architecture of a crop model and the different tools and accessories available.</p> <p>At the end of the module you will be able:</p> <ul style="list-style-type: none"> <li>· to create a weather database, a soil profile, an experiment,</li> <li>· to enter experimental data,</li> <li>· to run a simple simulation,</li> <li>· to modify genetic coefficients,</li> <li>· to run a seasonal analysis.</li> </ul>	2
Statistics	Develop knowledge on data distribution, estimation procedures and confidence by examining the area of interval estimation. Acquire the tools to identify the appropriate statistical test to use regarding a scientific question. Perform a variety of univariate and multivariate analyses using R software (coding, data visualization, interpretation). Being able to mobilize skills in various context of data analysis.	3
Breeding Strategies	To be able to define the breeding goals in the midterm and long term, reasoning the breeding strategy adapted to the objectives, species, germplasm, traits to be selected according to the dimension of the breeding program, breeding tools and selection methods.	3
Seeds contracts, marketing & logistics	<p>To be able to understand and stablish seed production contracts.</p> <p>To be able to secure seed supply</p> <p>To be able to anticipate population needs</p> <p>To be able to define marketing strategies upstream and downstream</p>	2

Plant Biology & Biotechnology	The course will provide students with cutting-edge research-based training in plant biology, sciences, molecular biology and biotechnologies, as well as the integration of these disciplines in breeding programs. The teaching consists of the most up-to-date scientific advances in plant molecular biology including genetics, molecular markers, plant cell, plant development, plant physiology and plant metabolism.	6
High throughput phenotyping	To be able to choose captors in order to phenotype in field and greenhouses for the desired trait To understand the need of big data for treat the information and relation with the breeding program. To be able to treat the collected information	1
Philosophy of science	This course aims to introduce students to philosophical concepts and debates that arise in the attempt to identify, justify, and explain the distinctive features of scientific practice and discourse. In this course students will develop skills to identify, criticize and justify scientific methods. They will learn how to explain and justify scientists' choices between various research methods, and how to interpret research results. Along the way, we will also survey key issues that arise in the philosophical study of a particular science, such as biology in general, and plant breeding in particular.	2
French as a foreign language	This language course aims at providing students with the necessary language tools to interact successfully in everyday life and in basic professional situations. The objective is that students get the B1 level in French at the end of the year in order to be able to get the Engineers Diploma.	Certificate