



# COURSE CATALOGUE

## SZIU SEMESTER 2

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

Contents

Joint Courses.....	3
Semester 2 SZIU.....	5

## 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>
Intellectual Property & Plant Breeders' Rights	<p>The two systems (plant patent and plant breeders' right) and implication for breeder rights. Breeder's exemption and farmer privilege. From practical examples, lecturers from institutions and companies will bring pros and cons for each system. Infringement cases and violations will be analyzed.</p> <p>UPOV origin and historical steps. DCU and VCU notions.</p> <p>The transgenic varieties, the mutant and somaclonal variants will allow to introduce the notion of Essentially Derived variety (EDV). Current and potential application of molecular markers and next generation sequencing will be discussed.</p>	<p>This course will be offered in form of a UPOV (<a href="http://www.upov.int">www.upov.int</a>) online course. During one month, the student can access and complete 25h of online courses at their own rhythm. The course will be validated by a written online examination. Each first-year university will nominate tutors who will accompany the students. In addition, UPOV will nominate a contact person to accompany the students.</p>
Summer Field Camp at the end of year 1 (June)	<p>The objective of this summer intensive program is to immerse students in two crops breeding chains. One week for a major crop such as corn or wheat and the second on a legume or fruit crop (green bean, apple). During each week students are going to go visit the main actors related to breeding for the selected crop from farmers, to several breeders (diversity</p>	<p>All students will come together after the first year and spend the Field Camp together.</p>

conservation, breeding, laboratory) or public research institutions involved in basic research, seed industry and seed multiplication farmers and maybe food industry to see the quality requirements for the specific transformation. To have a full panorama of this crop.

The main learning objective is to have an integrated view of the food chain from the breeding till the final transformation of the product. Secondary objectives are to understand the different actions of breeding companies, how they integrate the requests of the consumer. To have a deeper knowledge on at least two crops which are managed differently, as are the cereals and the vegetables. And understanding the importance of the seeds quality.

## Semester 2 SZIU

SEMESTER 2 SZIU (30 credits)	Objectives	ECTS
Molecular biology and gene technology methodology	<p>After completing the course, the students will get acquainted with the frequently used methods of molecular biology and gene technology, will have the capability to keep up with the challenges of the rapidly developing methodology of molecular genetics and recombinant DNA techniques; to word and give appropriate answers to the new problems.</p> <p>This course provides the basic theoretical and practical knowledge of the most important methods used in molecular biology and gene technology. Lectures and laboratory practices introduce techniques for gene isolation and cloning, types of vectors for genetic transformation, methods for transformation (direct and indirect e.g. <i>Agrobacterium</i> mediated and biolistic), the most important PCR applications, SNP detection methods, <i>in situ</i> hybridization. The lectures also deal with the types and application possibilities of reporter gene systems and procedures of gene expression analysis. The courses give opportunity for the students to try, use and practice the learned methods in the laboratory, as well.</p>	4
Plant variety, seed testing and certification	<p>This course covers all theoretical and practical knowledge concerning the plant variety testing and certification, the regulation and management of seed propagation, quality control and marketing. The regulations and procedures of the different countries are compared.</p> <p>This course provides students a Historical overview of the evolution of variety and seed certification. The course presents the legal regulation of plant variety registration, certification and protection. The test methods for plant varieties (DUS, VCU) will be presented. All requirement of seed production, the sealing, sampling seed lots, seed testing methods and also the conditions of seed certification, distribution, processing will be discussed. In the practice the students will have the opportunity to visit the plant variety and seed certifying institute. They also have the opportunity to get practice in seed tests (purity, germination, thousand seed/kernel weight, etc.).</p>	4
Functional and structural plant genomics	<p>The students will understand the scientific questions of plant genome analysis, will have the capability to comprehend and word appropriate answers to the new problems; reading and writing publications about plant molecular genetics-related papers.</p> <p>The course deals with the structure and function of gene and genome of higher plants, the characteristics of the nuclear, mitochondrial and chloroplast genomes. It introduces the levels and elements of genetic regulation of gene expression in plants. Students will get acquainted with the methods of gene identification and functional characterization. Both transformation and non-transformation-based procedures are covered (T-DNA mutants, transposon tagging, antisense RNA and RNAi techniques, TILLING, Deleteagene). As case studies the experimental approaches aiming at the clarification of the molecular background of the seven Mendelian pea traits are discussed. Genetic mechanism of male sterility, autoincompability and heterosis is also analyzed.</p>	4
Experimental design and evaluation	<p>After getting acquainted with the fundamental principles of experimental design and evaluation the students will be able to set up their own trials targeting plant breeding objectives.</p> <p>The course introduces the basic theory and methodology of field and laboratory experimentation related to plant breeding; delineates the types of the experiments and the rules of the experimental design and its realization, the methods of data evaluation.; describes the interpretation possibilities of the results, correction of the experimental errors and touches ethical issues.</p>	3

Explorative analysis and data visualization in R	By the end of the course will be able to present and explain some visualization techniques with R script. This course aims to improve the students' data visualization skills, produce a lot of graphs feasible for thesis / conference talk / poster, explore new plotting techniques and practice R coding. For students with basic R knowledge.	3
Cell and tissue culture methodology	After completing the course, students are able to perform sterile <i>in vitro</i> work and to apply the different methods of biotechnology in practice. <i>Cell and tissue culture methodology</i> course focuses on the latest available scientific knowledge on: the principle of plant biotechnology; nutrition medium and surface sterilization; types of <i>in vitro</i> cultures; somaclonal variations; haploid and doubled haploid techniques; protoplast isolation and fusion; <i>in vitro mutant</i> isolation; secondary products from cultured cells and organs.	5
Scientific literature in English	The course comprises studies in basic classical and molecular genetics, recombinant DNA technologies, specific areas of plant and animal biotechnology and breeding. The different topics will be discussed in English with special emphasis placed on technical vocabulary and expressions in both written and spoken English. One of the most important objectives of the course is to give the students ample opportunity to practice their English in informal discussions as well as in formal presentations. It is hoped that the course will enable students to acquire fluency and confidence in the use of the language in professional conversations as well as in delivering lectures. The course also aims to allow students to read technical texts efficiently and to write scientific articles.	3
Internship	Students have the chance to get acquainted with the breeding objectives of the different companies, institutions and participate in the actual season-related breeding activities in July for 4 weeks after the field camp. In their reports they are required to introduce the company including their main breeding programs and describe the work in which they participated.	Certificate
Hungarian studies II. (Language and culture)	The course helps the students to adapt themselves to the Hungarian society by providing a basic language and cultural introduction	Certificate
Spanish as a foreign language	This language course is targeted at students who chose UPV as Y2 destination and who still need to bring their Spanish to a B2 level for everyday life and professional situations.	Certificate