emPLANT

master to sucseed

COURSE CATALOGUE

EgeU SEMESTER 3

emPLANT COURSE CATALOGUE

ERASMUS MUNDUS MASTER PROGRAMME IN PLANT BREEDING

Contents

Joint Courses

JOINT COURSES	Description, contents, learning outcomes	Prerequisites	Implementation:	ECTS
Pilot case	Semester 1 and 2: UniLaSalle, SLU Semester 3: UH, UPV, EgeU The pilot case is a case study to apply the project management tools to a breeding program. First students by group have to choose a species to be ameliorated. Then, find a character or several ones as goal for the breeding strategy. The students need to check the market potential for this new variety and verify that farmers will want to cultivate it. Secondly, students will define the potential market for their product (seeds), but also the market for the new variety (consumers). Thirdly, they need to create a structure to breed the new variety, and define the role of each student of the group in this structure (company, association...).	No prerequisites	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 if group members are not located at the same site (LAS/SLU). 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 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 students of S1 and S3 will be able to attend their respective presentations. The juries of S1 and S3 will be carried out on the same day for logistic reasons.	**S1: 3** **S2: 3** **S3: 2**
Bioinformatics	Biological databases, gene analyses, web-based analytical tools, Unix OS, functional genomics, molecular evolution, RNAseq expression analysis, annotation of new genomes	No prerequisites	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.	**S3: 2**
Big Data	Using big data in Plant breeding, Machine Learning Methods (10h lecture, 12h tutorials) Algorithmic/Software Development Clustering Random Forests K-Nearest Neighbors Method/ Kernel Methods Sparse Methods for high dimensional data Databases (Big data) Management (4h lecture 4h tutorials)	Basic Statistics and Probability, Statistical Inference, Regression Models Database using Access	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.	**S3: 2**

	Distributed file systems, Hadoop Parallel, distributed, massive data processing with Map Reduce NoSQL/NewSQL databases			

Semester 3 EgeU

SEMESTER 3 EgeU	Description, contents, learning outcomes	Prerequisites	ECTS
Hybrid breeding	The aim of this course is to provide students with information on genetic principles of F1 Hybrid Cultivar development, to make them understand the basics and practice of new F1 Hybrid variety development, and to teach breeding techniques and methods used in plant breeding. Course content: - Definition, history, significance, aim of F1 hybrid cultivar breeding - Development of segregating populations and pure lines - Analyzing combining abilities - Performing and evaluating dilallel analysis - Developing cytoplasmic-genetic male sterile lines - hybrid breeding for resistance to stress - hybrid breeding for quality - Tissue culture techniques - Recombinant DNA techniques and its applications in F1 hybrid cultivar development	Basic knowledge in plant breeding and genetics	**3**
Vegetable breeding	This is an introductory course designed for students directly or indirectly involved in vegetable breeding. Students who will finish this course are expected to understand the basic principles of vegetable breeding. - Traits of interest. Breeding trends in the past and future. - Designing plant architecture. - Breeders' own knowledge and the need for collaboration. - The flower. Sexually propagated vegetables will be introduced. - Inbreeding-outbreeding. Mechanisms leading to outbreeding will be explained and examples given from vegetables and their wild relatives. - Introduction to variability in vegetable crops. Vegetable genetic resources such as wild relatives, closer relatives, domestic landraces will be explained. - Introducing variability. Collection missions and gene banks will be taught. The importance of exotic vegetables will be outlined. A discussion will be made on a production with landraces and old cultivars by considering in-situ, ex-situ and on-farm conservation strategies. - Creating variability. Mutation breeding, hybridization will be outlined as possible sources of variability. - Assessing variability. Observed variability in vegetables will be classified by a hierarchical method. A comparison will also be made between molecular and morphological variability	Basic knowledge in plant breeding and genetic sources	**4**

QTL analysis	The aim of this course is to teach the principles of genetic mapping in plants, to teach molecular linkage analysis and the use of quantitative genetic mapping in plant breeding program. Content - Meiosis, Mendel's Laws and recombinations - Genetic variations in the populations - Molecular basis of allelic variations - Bulk Segregant Analysis - Mapping populations - Molecular markers - Linkage analysis and software - Principle of quantitative traits analysis - Marker data and phenotypic data for QTL - QTL analysis methods and software	Basic knowledge on molecular markers and genetics	**3**
Fruit breeding/genetics	This course aims to teach genetics and breeding methods in some fruit species - the aim of fruit breeding - Cytology of fruit species - Flower and fertilization biology - Fruit breeding program - Fruit breeding program on stone fruits, pome fruits, nuts, citrus species	Basic knowledge in plant breeding and genetics	**3**
Grapevine breeding/genetics	The aim of the course is to teach the grapevine genetics and breeding. Contents - grapevine genomics - functional genomics, - Breeding for new varieties, and rootstocks - resistance to biotic and abiotic stresses	Basic knowledge in plant breeding and genetics	**4**
Gene Technologies and Biosafety	The aim of this course is to teach the basic principles of plant biotechnology and apply principles of molecular biology/biotechnology in plant production and Biosafety. Content: Gene, genome, Protein synthesis, gene transfer techniques, PCR, recombinant DNA technology, genetic markers, transgenic plant production and analysis, Risks and Benefits Associated with Genetically Modified Plants and Biosafety rules.	Basic knowledge on molecular biology	**4**
Biochemical changes during fruit maturation	Teaching the fundamentals of biochemical changes of fruit development and ripening metabolism. Contents. - Fruit Development And Rıpenıng Metabolism - Fruit Set - Sugar Accumulation And Transport in fruit - Hormonal Control Of Fruit Rıpenıng - Water content in fruit	Basic knowledge on molecular biology and genome function	**3**

	- Potassium - Organic Acids - Nitrogen In Fruits - Phenolics In Fruits - -Amino Acid Composition - pH and Proton Pumps - Polyamines and fruit Set		
Turkish course	This language course aims at providing students with the necessary language tools to interact successfully in everyday life and in basic professional situations. The course takes 12 weeks in a term. Turkish grammar, reading, writing, speaking and listening are offered in the level of A1 (basic level) to C1 (advanced level) every weekday. Contents: Introducing yourself and introducing someone else. Asking questions. Talking about your professional activities. Expressing preferences. Understanding an itinerary. Expressing an intention. Making appointments. Understanding a schedule.	No prerequisites	**2**