emPLANT

master to sucseed

COURSE CATALOGUE

UH 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 UH

SEMESTER 3 UH	Description, contents, learning outcomes	Prerequisites	ECTS
Plant Breeding Module	Breeding of crop plants (4 ECTS) Introduction to the practical breeding of agricultural and horticultural plants. Lectures by expert breeders. Presentations by students. The student will become acquainted with the practical breeding of agricultural and horticultural crop plants. Forest Tree Breeding (4 ECTS) Recent results and theories concerning the physiological basis and restrictions of yield production implications for breeding. Patterns of adaptation and variation in forest trees with a special reference to northern environments. The student will become acquainted with modern theories and practices in forest tree breeding. Selection theory (5 ECTS) Genetic (co)variances, heritability, genetic correlation, breeding value, breeding goal, total merit index, selection, mating systems, expected genetic response and controlling risk in the selection scheme. **:** After the course students know the concept of breeding value and genetic correlation in quantitative traits. Students understand how to define the breeding goal and how to select for multiple traits simultaneously. Students can predict the selection response in a breeding program and control the risk (rate of inbreeding) in a breeding scheme.	Basic knowledge in plant breeding or related disciplines. Basic course in statistics	**13**
Forest Biotechnology	Basic biotechnology applications in forestry (3 ECTS) Biotechnology: history, processes and potentials in Forestry; Forest trees and their microbial partners; Tree health problems; Application of DNA/molecular techniques in fungal biodiversity analyses; Endophytes in biotechnology; Biological control: Principles and applications in tree health protection; Fungal Biotechnology: secondary metabolites, lignocellulose bioconversion, first and second generation biofuel; Biodegradation and biodeterioration technology. Outcome: Appreciation of diverse areas of biotechnology process that are relevant in forestry; Understand the historical background on applied and modern biotechnology; Develop awareness on how biotechnology can impact on forestry practices in the coming decades; Identify key topic areas that might require immediate or long term intervention with biotechnology tools. Forest microbiology (8 ECTS) Microbes in the forests: friends or foes; Microflora of roots and stems; Fungal pathogenicity factors; Host resistance mechanisms; Pathogenesis related- proteins; Mutualistic mycorrhizal fungi; Diseases of forest tree nurseries. Outcome: Appreciation of forest microbiology concepts and the diverse nature of microbiomes associated with various organs and tissues of forest trees; An understanding of the many functions of micro-organisms in the uptake and cycling of nutrients in forest ecosystem; Appreciation of the diverse and complex nature of parasitic, saprotrophic and mutualistic interactions of microbes with their forest tree hosts; Develop an awareness on potential impact of invasive and emerging fungal diseases on forest trees; At the end of the course, students should be able to acquire skills on basic molecular biology technique (DNA and RNA isolation as well as PCR and phylogenetic analysis).	Basic background knowledge in forest sciences and biological sciences	**11**

Finnish course	The topics range from introducing and telling about oneself to greetings, family, food, shopping, weather and telling the time. The topics also include daily activities, living, transport and the immediate surroundings. The aim is to introduce students not only to the basic structures of Finnish, but also to the Finnish way of life. Simple everyday conversation is practised.	No prerequisites	3 ECTS