Biotechnical Faculty / STUDIES OF APPLIED AGRICULTURE - MEDITERRANEAN FRUIT GROWING / AGRICULTURAL GENETICS

Course:	AGRICULTURAL GENETICS			
Course ID	**Course status**	**Semester**	**ECTS credits**	**Lessons** (Lessons+Exercises+Laboratory)
8403				
Programs	STUDIES OF APPLIED AGRICULTURE - MEDITERRANEAN FRUIT GROWING			
Prerequisites	None			
Aims	To enable students to acquire knowledge about the basic principles and laws of trait inheritance; the structure and function of genes; methods of hybridization and the creation of new varieties; and the influences of the external environment on traits of agronomic significance. The results of genetic research can be applied in breeding and the creation of new varieties of mediterranean fruit species.			
Learning outcomes	After passing the exam, students will be able to: Explain the morphology, structure, and chemical composition of chromosomes, the structure of DNA and RNA, cell division, and fertilization. Define concepts such as gene, allele, locus, genotype, phenotype. Explain the division of traits based on the number of genes that determine them. Select parental pairs for hybridization based on phenotype. Describe the basic principles and laws of trait inheritance in plants. Determine the mode of inheritance of traits that are of agronomic significance and calculate their heritability. Apply acquired knowledge in hybridization and improvement programs for mediterranean fruit species.			
Lecturer / Teaching assistant	Biljana Lazović PhD - teacher, Slavojka Malidžan MSc -assistant			
Methodology	Lectures, exercises, colloquiums, tests and final exam.			
Plan and program of work				
Preparing week	Preparation and registration of the semester			
I week lectures	Cell and chromosome structure (cell and organelles, morphology, structure, and chemical composition of chromosomes).			
I week exercises	Study of chromosome morphology on permanent preparations.			
II week lectures	Cell division and fertilization (mitosis, meiosis, microsporogenesis, megasporogenesis and fertilization in plants).			
II week exercises	Observing mitosis and meiosis stages in permanent preparations of various plants.			
III week lectures	Structure and function of genetic material (DNA as the carrier of genetic information, genetic code, types of RNA, transcription, translation and protein synthesis).			
III week exercises	Structure and function of genetic material (tasks).			
IV week lectures	Independent separation of genes (Mendels laws, chromosomes and inheritance of traits).			
IV week exercises	Determination and writing of gametes, determining the genetic constitution of parents, and modes of trait inheritance (monohybrids, dihybrids, trihybrids - tasks).			
V week lectures	Multiple alleles and gene interaction (different types of gene interactions, multiple alleles and auto-sterility in plants, lethal genes).			
V week exercises	Multiple alleles, gene interaction, auto-sterility in plants (tasks). Checking experimental results (Chi-square test - tasks).			
VI week lectures	Linked genes and crossing over (mode of inheritance, crossing-over, recombination series, and segregation series, construction of a chromosomal map).			
VI week exercises	Test 1. Calculating the percentage of single and double crossovers from test cross data and F2 generation (tasks).			
VII week lectures	Colloquium I. Sex determination and sex-linked traits (types of sex determination).			
VII week exercises	Sex determination in plants. Inheritance of sex-linked traits (tasks).			
VIII week lectures	Correctional I colloquium. Polygenic inheritance (modes of inheritance and gene effects, components of phenotypic and genotypic variability, heritability).			
VIII week exercises	Inheritance of quantitative traits. Calculating components of phenotypic variability and heritability of traits (tasks).			
IX week lectures	Species and genus hybrids. Methods to overcome difficulties in species and genus hybridization.			
IX week exercises	Homologous genomes, same chromosome number; homologous genomes with different chromosome			

	numbers (tasks). Chromosomal situation in F1 and F2 generations in species and genus hybrids (tasks).
X week lectures	Changes in chromosome number (formation of polyploids in nature, induced polyploids, euploids and aneuploids, chromosomal engineering).
X week exercises	Euploids and aneuploids (tasks).
XI week lectures	Changes in chromosome structure (classification and significance in evolution, deletions, inversions, duplications and translocations).
XI week exercises	Deletions, inversions, duplications and translocations (tasks).
XII week lectures	Mutations (classification, frequency and types of mutations, induced mutations and their practical applications).
XII week exercises	Test 2. Mutations (tasks). Detection of mutations in plants.
XIII week lectures	Colloquium II. Population Genetics (gene and genotype frequencies, Hardy-Weinberg equilibrium). Changes in gene frequencies due to migration, mutation and selection.
XIII week exercises	Population in equilibrium, changes in gene and genotype frequencies (tasks).
XIV week lectures	Correctional II colloquium. Inbreeding and heterosis (inbreeding coefficient, effects of inbreeding in plants). Manifestation of heterosis in plants, combinatorial abilities, practical applications of heterosis.
XIV week exercises	Calculating inbreeding coefficient (tasks). Calculating heterosis (tasks).
XV week lectures	Changes induced by transplantation (chimeras, vegetative hybrids).
XV week exercises	Calculating combinatorial abilities of plant traits (GCA and SCA) - tasks.
Student workload	

Per week	**Per semester**
credits x 40/30=0 hours and 0 minuts 0 sat(a) theoretical classes 0 sat(a) practical classes 0 excercises **0 hour(s) i 0 minuts** of independent work, including consultations	Classes and final exam: **0 hour(s) i 0 minuts x 16 =0 hour(s) i 0 minuts** Necessary preparation before the beginning of the semester (administration, registration, certification): **0 hour(s) i 0 minuts x 2 =0 hour(s) i 0 minuts** Total workload for the subject: **x 30=0 hour(s)** Additional work for exam preparation in the preparing exam period, including taking the remedial exam from 0 to 30 hours (remaining time from the first two items to the total load for the item) **0 hour(s) i 0 minuts** Workload structure: **0 hour(s) i 0 minuts (cources), 0 hour(s) i 0 minuts (preparation), 0 hour(s) i 0 minuts (additional work)**
Student obligations	Attendance of lectures and exercises; completion of tests, colloquiums and the final exam.
Consultations	In agreement with the students, one hour a week.
Literature	Borojević, S., Borojević, K. (1976): Genetics (second edition). University of Novi Sad; Đokić, A. (1988): Plant genetics. Scientific book, Belgrade; Kraljević-Balalić, M., Petrović, S., Vapa, Lj. (1991): GENETICS, Theoretical foundations with tasks. Faculty of Agriculture and Science, Novi Sad; Mišić, P. (1999): Genetics. Parthenon, Belgrade; Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2011): Introduction to GENETIC ANALYSIS (tenth edition). W. H. Freeman Palgrave Macmillan, New York.
Examination methods	Attendance and activity in classes: (5 + 5) 10 points; tests: (2 x 5) 10 points; colloquiums exam: (2 x 15) 30 points; final exam: 50 points. A passing grade is achieved when a minimum of 50 points is accumulated. The grades and corresponding point ranges are as follows: A: (≥ 90 to 100 points) B: (≥ 80 to < 90 points) C: (≥ 70 to < 80 points) D: (≥ 60 to < 70 points) E: (≥ 50 to < 60 points) F: (< 50 points).
Special remarks	
Comment	

Grade:	F	E	D	C	B	A
Number of points	less than 50 points	greater than or equal to 50 points and less than 60 points	greater than or equal to 60 points and less than 70 points	greater than or equal to 70 points and less than 80 points	greater than or equal to 80 points and less than 90 points	greater than or equal to 90 points