Biotechnical Faculty / PLANT PRODUCTION / GENETICS

Course:	GENETICS			
Course ID	**Course status**	**Semester**	**ECTS credits**	**Lessons** (Lessons+Exercises+Laboratory)
2859	Mandatory	2	4	2+1+1
Programs	PLANT PRODUCTION			
Prerequisites	None			
Aims	Introduction of students to the basic principles of inheriting traits; the structure and functions of genes; methods of hybridization and the creation of new varieties; the impact of the external environment on properties of agronomic significance. The results of genetic research are applied in the breeding and creation of new varieties of agricultural plants. Given that the emphasis on presenting genetic research is on its application in agriculture, we can speak of agricultural genetics (Borojević – 1976).			
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 determining them. Select parental pairs for hybridization based on phenotype. State the basic principles and laws in the inheritance of traits in plants. Determine the mode of inheritance of traits of agronomic significance and calculate their heritability. Apply acquired knowledge in hybridization and improvement programs for fruit species.			
Lecturer / Teaching assistant	Đina Božović 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). Gene mapping using molecular markers (PCR, RFLP, RAPD, AFLP, Microsatellites).			
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	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	Remedial 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, disruption of equilibrium due to migration, mutation and selection (tasks).
XIV week lectures	Remedial 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**
4 credits x 40/30=5 hours and 20 minuts 2 sat(a) theoretical classes 1 sat(a) practical classes 1 excercises **1 hour(s) i 20 minuts** of independent work, including consultations	Classes and final exam: **5 hour(s) i 20 minuts x 16 =85 hour(s) i 20 minuts** Necessary preparation before the beginning of the semester (administration, registration, certification): **5 hour(s) i 20 minuts x 2 =10 hour(s) i 40 minuts** Total workload for the subject: **4 x 30=120 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) **24 hour(s) i 0 minuts** Workload structure: **85 hour(s) i 20 minuts (cources), 10 hour(s) i 40 minuts (preparation), 24 hour(s) i 0 minuts (additional work)**
Student obligations	Attendance of lectures and exercises; completion of tests, colloquiums and the final exam.
Consultations	One hour per week, as agreed upon with the students.
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 participation in classes: (5 + 5) = 10 points; colloquiums exams: (2 x 15) = 30 points; tests: (2 x 5) = 10 points; final exam: 50 points. A passing grade is achieved when a minimum of 50 points is accumulated.
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