



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	
ACADEMIC YEAR	
ANNO ACCADEMICO EROGAZIONE	
SUBJECT	
CODE	
SCIENTIFIC SECTOR(S)	
HEAD PROFESSOR(S)	MARTINELLI FEDERICO Ricercatore Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	
TERM (SEMESTER)	
ATTENDANCE	
EVALUATION	
TEACHER OFFICE HOURS	MARTINELLI FEDERICO Wednesday 14:00 - 17:00 Dipartimento di Scienze Agrarie Alimentari e Forestali Entrata Posteriore dell' Edificio - 2 piano - Ufficio del Prof. Martinelli

DOCENTE: Prof. FEDERICO MARTINELLI

PREREQUISITES	None
LEARNING OUTCOMES	Acquisition of the basics of the structure, replication, modification and expression of genetic material. Knowledge of the principles of inheritance of qualitative (Mendelian) and quantitative traits. Get the basics for understanding the mechanisms of natural selection and breeding methods of plants and animals. Ability to define the basic principles of molecular, Mendelian and quantitative genetics. Understanding of the genetic control of qualitative and polygenic traits, determining the influence of the environment on their expression. Have the necessary tools to evaluate the genetic effect on important characters from the agronomic point of view. Ability to expose, even to a non-expert audience, the basics of agricultural genetics. Knowing how to identify the necessary tools for the protection and enhancement of biodiversity. Capability of participation in discussions regarding the protection of natural biodiversity, the potential and problems of the new methods of genetic improvement.
ASSESSMENT METHODS	The final exam will consist of written tests that may substitute the final exam (written or oral examination). The exam will be structured in around 10-15 questions that will allow to accurately evaluate the preparation of the student. The evaluation is expressed in grades up to thirty . The exam will be passed when the threshold of 18 will be reached . This will happen when the student will demonstrate knowledge and understanding of the topics at least in the general guidelines and has minimum application competencies in resolving concrete cases. The student have to exhibit capability of transmitting their knowledge to the examiner. Below this threshold, the examination is insufficient. The evaluation will be more positive if the student is able to interact with the examiner. The grades will correlate with his knowledge and capacity of application into the discipline up to the maximum grade of thirty/thirty with honors.
EDUCATIONAL OBJECTIVES	The course is structured to provide the basis and the principles of molecular, Mendelian and quantitative genetics. The concepts of the course will allow to understand the mechanisms of inheritance of characters, gene interactions and the regulation of gene expression. The basic tools of agricultural genetics will be provided to subsequently investigate aspects of genetic improvement of crops. The course will include practical exercises on qualitative and quantitative traits by applying statistical methods.
TEACHING METHODS	The course will consist of 48 frontal lectures. Classes will be held by projections of "slides" on the various topics. The course will include 12 hours of exercises regarding mendelian and quantitative genetics. The course will end with a laboratory practice.
SUGGESTED BIBLIOGRAPHY	Lorenzetti et. al (2011) Genetica Agraria – Patron editore. Barcaccia, Falcinelli (2008) Genetica e Genomica – Vol. I e III Genetica Generale – Liguori editore.

SYLLABUS

Hrs	Frontal teaching
10	Introduction to the course. Mendelian principles and heredity (chromosome theory). Mendel's laws: dominance and recessivity, independent segregation and assortment. Homozygosity and heterozygosity. The recombination of independent genes. Multiple alleles. Dominance and recessivity. Gene interactions and atypical segregation models: codominance and epistasis. Heredity and sex.
8	Concepts of molecular genetics. Main experiments for the discovery of the genetic material. Structure of nucleic acids (DNA and RNA). Transcription and translation. Central dogma of molecular biology. Definition of gene. Mechanisms of gene regulation.
4	Modification of the genetic material. Mutations of genes, chromosomes and genomes. Transposons.
8	Heritability of quantitative traits. Characters with continuous distribution. Genotypic and phenotypic values. The influence of environmental factors on quantitative traits. The variance composition. The heritability concepts and repeatability. Statistical analysis of segregation and independent assortment: the chi-squared test.
6	Association, exchange and genetic maps of the major agricultural species: the association (linkage), independent assortment exceptions, calculation of gamete productions. Chromosomal mapping of associated genes, calculating distances of the map in F1, multiple crossing-over effect on the calculation of the distance map, mapping using the three-point test, construction of linkage maps, genetic association analysis in plants.
8	Genetic engineering. Restriction enzymes. Vectors of the exogenous DNA transfer. Analysis of DNA by electrophoretic techniques. PCR and DNA sequencing. Introduction to plant biotechnology.
4	Hardy-Weinberg law. Case of multiple alleles. Factors that disturb the equilibrium of Hardy-Weinberg. Inbreeding and Heterosis.
Hrs	Practice
6	Exercises of Mendelian genetics.

Hrs	Practice
4	Exercises of quantitative genetics.
2	Practical laboratory lesson