

COURSE: Genetics

ACADEMIC YEAR: 2018 / 2019

TYPE OF EDUCATIONAL ACTIVITY: Characterizing

TEACHER: Prof. Pierluigi SPAGNOLETTI ZEULI

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mobile (optional):

Language: Italian

ECTS: 6 (5 lessons e 1 tutorials/practice)	n. of hours: 56 (40 lessons e 16 tutorials/practice)	Campus:Potenza School: Scuola di Scienze Agrarie, Forestali, Alimentari ed Ambientali - SAFE Program: Agricultural Technology	Trimester: III
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EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The main objective of the course is to provide students with basic and applied knowledge in the field of genetics and breeding with emphasis on the mechanisms underlying the reproduction and transmission of characters. Knowledge of apply biotechnologies to improve quality and quantity production of food agricultural products.

Knowledge and understanding: Knowledge of gene expression, organization and transmission of hereditary material. Knowledge of basic concepts on chromosomal mapping of associated genes. Knowledge of transposable elements and mutations, inheritance of quantitative characters and basic principles of population genetics. Knowledge of basic methodologies for the analysis of hereditary material and the analysis of genetic variability. Knowledge of molecular markers and 'omics' technologies. Knowledge of biodiversity protection and preservation.

Applying knowledge and understanding: Ability to recognize Mendelian gene interactions and those that do not respond to classical mendelism. Ability to analyze genetic mechanisms and their interactions with the environment. Ability to develop a strategy for identifying associated characters and not. Ability to identify the tools needed to protect biodiversity. Ability to use software to estimate genetic variation and to analyze genetic diversity.

Making judgements: Ability to understand and describe the genetic mechanisms that regulate the expression of quanti-qualitative characters of agri-food interest.

Communication skills: Ability to communicate with a technically and scientifically correct language. Ability to interact and communicate with food business operators. Ability to communicate clearly to non-technical audiences.

Learning Skills: Ability to access bibliographic sources and computer tools to integrate and deepen knowledge in the field of formal and molecular genetics.

PRE-REQUIREMENTS

Good knowledge Biology fundamentals.

SYLLABUS

1 ECTS (8 h, lectures)

Mendel laws and chromosome theory of heredity. Linkage and genetic maps. Heredity and heritability of quantitative characters. DNA: composition and structure; replication; biochemistry of replication; extraction, purification and electrophoresis; restriction and ligation; amplification of DNA using the polymerase chain reaction; DNA sequencing; sequencing of genomes.

2 ECTS (8 h, lectures)

The gene and its expression: RNA and protein synthesis. Organization and transmission of hereditary material. Transposable elements and mutations. Mendelian inheritance.

3 ECTS (8 h, lectures)

Association, exchange and genetic maps: fundamental concepts. Exceptions of the independent assortment. Crossing over and recombination of associated genes. Genetic markers and genetic maps. Transposable elements and mutations. Genomic mutations. Chromosomal mutations. Gene mutations. Mutations and gene structure. Spontaneous mutations and induced mutations.

4 ECTS (8 h, lectures)

Genetic engineering elements: DNA cloning; Cloning vectors; Gene constructs; Gene markers and reporter genes; Genetic transformation. Identification and study of the function of genes. Genetic engineering applications. Inheritance of quantitative characters: elementary concepts of statistics. Genotype-environment interaction. Molecular genetics and quantitative characters.

5 ECTS (8 h, lectures)

Genomic analysis and molecular markers applications: DNA fingerprinting, microsatellite and AFLP markers, definitions and classification of molecular markers. Applications: varietal identification, phylogeny, molecular maps development, marker assisted selection (MAS). Genetic modified organisms (GMO) and transgenic varieties.

6 ECTS (16 h, lab)

Methods and techniques related to:

- extraction, purification and DNA electrophoresis
- DNA amplification by polymerase chain reaction
- primer design
- use of genetic "tools" for analysis of genetic variability
- use of genetic "tools" for analysis of genetic traceability in the food industry

TEACHING METHODS

The course includes 56 hours of teaching between lessons and tutorials/practice. In particular, they are divided into 40 hours of frontal lectures and 16 hours of tutorials/practice in the laboratory tutorials and in the computer lab. The topics of the course will be treated with the help of multimedia equipment. During the tutorials/practice hours students actively participate in laboratory experiments that aim to provide the basic genetic tools useful in the agro-food sector.

EVALUATION METHODS

Learning will be assessed through periodical discussion of the theoretical concepts and midterm and final written test and colloquium at the end of the course. The student should show knowledge of the theory and should be able to relate different topics. Verifying the learning of teaching is to find the level of achievement of the previously mentioned educational goals and is through an oral examination. To pass the test students must acquire at least 18 points out of 30.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- VERONESI F. Genetica Agraria (IV edizione), Pàtron Editore
- BARCACCIA G., FALCINELLI M. Genetica e genomica, Volumi I, II e III, Liguori Editore
- Lecturer's note of the course and PDF files, reprints, ect

INTERACTION WITH STUDENTS

At the beginning of the course, after describing the objectives, program and test procedures, teacher collects the list of students accompanied by name and email.

The teacher meets students after classes and on Monday and Tuesday from 13.00 to 15.00 in his room (SAFE 4th floor-3A413 room, Viale dell'Ateneo Lucano, Potenza) and he is available for contacts by e-mail, telephone,



Skype, or Whatsapp.

EXAMINATION SESSIONS (TENTATIVE)¹

SEMINARS BY EXTERNAL EXPERTS YES NO

FURTHER INFORMATION

Professor Pierluigi Spagnoletti Zeuli (President commission), Professor Giuseppina Logozzo (member), Professor Tania Gioia (substitute)

¹Subject to possible changes: check the web site of the Teacher or the Department/School for updates.