

COURSE: Genetics

ACADEMIC YEAR: 2018 / 2019

TYPE OF EDUCATIONAL ACTIVITY: Characterizing

TEACHER: Prof.ssa Giuseppina Logozzo / Prof.ssa Gioia Tania

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mobile (optional):

Language: Italian

ECTS: 7

(6 lessons e 1
tutorials/practice)

n. of hours: 64

(48 lessons e 16
tutorials/practice)

Campus:Potenza

School: Scuola di Scienze Agrarie,
Forestali, Alimentari ed Ambientali
- SAFE
Program: Food Technology

Trimester: II

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. Basic knowledge of population genetics. Knowledge of the techniques for the identification and traceability of processed and / or treated food products and for the investigation of GMO products. 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

Students are advised to have a good knowledge of the courses attended in the previous trimester

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). DNA barcoding: application in food traceability, criteria for optimal barcode identification. Genetic modified organisms (GMO) and transgenic varieties.

6 ECTS (8 h, lectures)

Genetic data analysis through statistical methods and models and interpretation of results: population and sample, absolute frequencies and relative frequencies, mean and standard deviation, standard error of mean, correlation, regression, statistical tests, variance analysis. Using "computer tools" for statistical analysis of genetic data.

7 ECTS (16 h, practicals)

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 64 hours of teaching between lessons and tutorials/practice. In particular, they are divided into 48 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, in the first part of the course, through periodical discussion of the theoretical concepts and, subsequently, with an oral examination at the end of the course organized in at least three questions by which the student must demonstrate knowledge of the theory and to be able to connect each other for a lesson 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 receives generally on Monday and Friday from 9.00 to 11.00 in the teacher's room (SAFE 4th floor-3A412 room, Viale dell'Ateneo Lucano, Potenza) and she is available at all times for a contact with the students, through its e-mail, telephone, Skype, or Whatsapp.

EXAMINATION SESSIONS (TENTATIVE)¹

05/04/2019, 10/05/2019, 07/06/2019, 05/07/2019, 06/09/2019, 04/10/2019, 08/11/2019, 13/12/2019, 10/01/2020, 07/02/2020, 06/03/2020.

SEMINARS BY EXTERNAL EXPERTS YES NO

FURTHER INFORMATION

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

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