

COURSE OF STUDY *Master degree: Food Science and Technology (LM70)*
ACADEMIC YEAR *2023-2024*
ACADEMIC SUBJECT *Genetic and molecular methodologies (6 ECTS) – I.C.
Methodologies for Food Quality (9 ECTS)*

General information	
Year of the course	<i>First</i>
Academic calendar (starting and ending date)	<i>First semester (September 25th 2023 – January 19th, 2024)</i>
Credits (CFU/ETCS):	<i>6</i>
SSD	<i>Agricultural Genetics (AGR/07)</i>
Language	<i>Italian</i>
Mode of attendance	<i>No Compulsory</i>

Professor/ Lecturer	
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Virtual room	<i>Microsoft Teams: code m50pgww</i>
Office Hours (and modalities: e.g., by appointment, on line, etc.)	<i>Monday to Friday by appointment only.</i>

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
<i>150</i>	<i>32</i>	<i>28</i>	<i>90</i>
CFU/ETCS			
<i>6</i>	<i>4</i>	<i>2</i>	

Learning Objectives	The student will acquire knowledge in the food management and control by procedures principally based on traceability. Results of the acquired skills, in terms of ability and knowledge, are reported in the Annex A of the Guidelines of the master's degree of Food science and technology (by using the European Descriptors of Degree; Disciplines of Genetics).
Course prerequisites	Knowledge of Genetics, chemistry and biochemistry. The exam does not include propaedeutics

Teaching strategie	Course topics are addressed with the aid of Power Point presentations, case study analysis, and classroom or laboratory practice.
Expected learning outcomes in terms of	
Knowledge and understanding on:	<ul style="list-style-type: none"> • Description of the main genetic-molecular methodologies for food quality, traceability and traceability
Applying knowledge and understanding on:	<ul style="list-style-type: none"> • Express mastery of application of molecular genetic techniques. • Description of techniques related to identification and certification variety of raw materials and derived food products.

Soft skills	<ul style="list-style-type: none"> • Making informed judgments and choices: <ul style="list-style-type: none"> ○ Correctly guide the use of molecular genetic tools in the agri-food chain ○ Correctly direct the research of genetic-molecular means suitable for monitoring the characteristics and of agro-food products • Communicating knowledge and understanding: <ul style="list-style-type: none"> ○ Describe the molecular genetic techniques for the traceability of agri-food products. • Capacities to continue learning: <ul style="list-style-type: none"> ○ Hypothesize a possible approach for the evaluation of genetic and biotechnological interactions of foods
Syllabus	
Content knowledge	<p>Genomics. Genome structure in plants, Segregation and linkage of genes. Recombination. Linkage maps. Chromosome mapping. Hybridization in situ. Organization of the genome. Simple sequences and simple sequence repeats. Multigenic families Comparative genomics Localization of genes and molecular markers. Quantitative trait Loci QTL, analysis, QTL identification.</p> <p>Markers in genome analysis. Biochemical markers. Molecular markers. RFLP, SSR, AFLP, SNP markers. Chromosome in situ hybridization. Genome in situ hybridisation to identify alien genes.</p> <p>Food traceability. Traceability of food steps production. Rules for food security. Application of biochemical and molecular procedures in food traceability. Traceability of DOP, DOC, IGP, IGT food. Qualitative and quantitative PCR</p> <p>Advanced molecular analysis and bioinformatics Sequencing methods: Sanger, Illumina, Solid. Use of bioinformatics tools in traceability analysis.</p> <p>Genetic transformation and gene expression in plants. Application of recombinant DNA methodologies. Agrobacterium method. Direct genetic transformation. Vectors. Main components of plant genes. Promoters. Selectable markers. Gene reporter. Antisense RNA. Production of GMO selectable markers free.</p> <p>Molecular techniques for analytical control of seeds, plants, and derived products. PCR, Real Time PCR and microarray in GMO evaluation. Protocols for GMO quantification. Approved GMO in Europe, GMO samples analysis and results description</p> <p>Regulation of GMO. GMO, environment and human health. Rules for GMO .</p>
Texts and readings	<ul style="list-style-type: none"> • BIOTECNOLOGIE E GENOMICA DELLE PIANTE. 2014 Idelson-Gnocchi. • GIGLIOTTI C., R. VERGA, 2007 Biotecnologie alimentari, Piccin • Notes of the lectures distributed during the course.
Notes, additional materials	<p>Articles on journals related to genetics and biotechnology ROGGI C., G.TURCONI, 2007 Igiene degli alimenti e nutrizione umana. La sicurezza alimentare.</p>
Repository	
Assessment	
Assessment methods	The exam consists of an oral dissertation on the topics developed during the

	<p>theoretical and theoretical-practical lectures in the classroom and in practical activities (laboratory and educational visits). Students may have a middle-term preliminary exam, consisting of oral exam, relative to the first part of the program, which will concur to the final evaluation and will be considered valid for one academic year (Art. 4 of the Didactic Regulations of the master's degree Course in Food Science and Technology). The result of the mid-term exam is communicated by publication in the student's electronic register and contributes to the assessment of the profit examination by means of calculation of the weighted average. The exam for foreign students may be conducted in English as described above.</p>
Assessment criteria	<ul style="list-style-type: none"> • Knowledge and understanding: <ul style="list-style-type: none"> ○ Description of the main genetic-molecular methodologies for food quality, traceability and traceability • Autonomy of judgment: <ul style="list-style-type: none"> ○ Express mastery of genetic-molecular methodologies for the quality, traceability and traceability of foods. ○ Express mastery of application of molecular genetic techniques. ○ Description of the techniques relating to the identification and varietal certification of raw materials and derived food products. • Communicating knowledge and understanding: <ul style="list-style-type: none"> ○ Correctly guide the use of molecular genetic tools in the agri-food chain ○ Correctly direct the search for genetic-molecular means suitable for monitoring the characteristics of agro-food products • Communication skills: <ul style="list-style-type: none"> ○ Describe the genetic-molecular techniques for the traceability of agri-food products • Capacities to continue learning: <ul style="list-style-type: none"> ○ Hypothesize a possible approach for the evaluation of genetic and biotechnological interactions of foods
Final exam and grading criteria	<p>The assessment of the student's preparation is based on predetermined criteria in accordance with the Didactic Regulations of the master's degree Course in Food Science and Technology (art. 4). The Examination Committee has a score ranging from a minimum of 18 to a maximum of 30 points for a positive assessment of the student's performance. By unanimous vote of its members, the Board may award honours in cases where the final mark is 30.</p>
Further information	