COURSE OF STUDY Biological Sciences
ACADEMIC YEAR 2024-2025
ACADEMIC SUBJECT Genetics

General information	
Year of the course	II
Academic calendar (starting and ending date)	01-10-2024/17-01-2025
Credits (CFU/ETCS):	10
SSD	BIO/18
Language	Italian
Mode of attendance	Mandatory, in presence

Professor/ Lecturer	
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Virtual room	Microsoft Teams platform, code 317gzvm
Office Hours (and modalities: e.g., by appointment, on line, etc.)	Every day, after appointment fixed via email

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
250	72	15	163
CFU/ETCS			
10	9	1	

Learning Objectives	The course aims to provide a solid cultural foundation in the field of basic genetics.
Course prerequisites	Basic knowledge of Chemistry, Cytology and Mathematics

Teaching strategies	Lectures with the use of PowerPoint; numerical exercises carried out by students on the blackboars under the guidance of the teacher in the classroom. The course is not delivered in e-learning mode.
Expected learning outcomes in terms of	
Knowledge and understanding on:	○ Acquisition of theoretical and operational skills with reference to basic genetics, in order to learn the molecular aspects, the mechanisms of inheritance and the evolutionary aspects. These skills will be acquired thanks to the attendance of theoretical lessons, individual study and verification of their understanding through two ongoing tests and oral exam.
Applying knowledge and understanding on:	○ the preliminary written test, which foresees the performance of exercises on the classroom topics, will help in the evaluation of knowledge and comprehension skills.
Soft skills	• *Making informed judgments and choices* ○ acquisition of autonomy in areas related to the evaluation and interpretation of experimental data for the study of Genetics.

	• *Communicating knowledge and understanding*
	  ○ assessment of the basic correctness of the lexicon used.
	• *Capacities to continue learning*
	  ○ acquisition of the ability to deepen and read the evolution of the discipline with a critical spirit, through the consultation of texts and databases.

Syllabus	
Content knowledge	**<u>Frontal lessons (9 CFU)</u>** INTRODUCTION (Mitosis, meiosis, cell cycle with reference to the variations of chromosome number and quantity of DNA). CYTOLOGICAL AND MOLECULAR MECHANISMS OF GENETIC INFORMATION TRANSMISSION [concept of genotype and phenotype, Mendel's laws, atypical Mendelian relations, Complementation test, Chromosomal basis of heredity and determination of sex, Statistical analysis of genetic data: the chi square test, Analysis of family trees, Mapping of eukaryotic genes in humans and Drosophila, Linkage, genetic distance and interference, Mapping of genes in Neurospora crassa: analysis of ordered tetrades, Physical maps, Genetics of bacteria (conjugation, transformation and transduction) and bacteriophages (complementation and intragenic recombination), molecular markers, genetic material and its function. Notes on DNA replication and structure, transcription and translation. Lac operon and its regulation. Metabolic pathways. Complementation and deletion maps. Population genetics. CYTOGENETICS AND BACKGROUND OF HUMAN GENETICS (Chromosomal mutations of number and structure and their impact on gametogenesis, the chromosomal non-disjunction). MECHANISMS THAT GENERATE VARIABILITY IN EUKARYOTES (Definition of mutation, spontaneous and induced mutations, mutagenesis tests: ClB test and Ames test). **<u>Numerical exercises (1 CFU)</u>** Students will be invited to solve exercises throughout the program on the blackboard in the classroom
Texts and readings	- Genetics. A molecular approach. Russell, Pearson editor (fifth ed., 2019); - Principles of Genetics. Snustad-Simmons. EdiSES editor (Ed. 2014); - Genetics. An integrated approach. Sanders & Bowman. Pearson editor (Ed.2013) - Genetics. Principles of formal analysis. Griffiths-Doebley-Peichel-Wassarman. Zanichelli editor (Ed.2021) - Genetics. Pierce. Zanichelli editor (Ed.2016). - Genetics. Binelli-Ghisotti. EdiSES Editor. (Ed.2018) - Genetics. From formal analysis to genomics. Goldberg, Fischer, Hood, Hartwell. McGraw Hill (Third Ed., 2022) - (*) Exercises of Genetics. Ghisotti-Ferrari. Piccin editor. Second Edition (2019)
Notes, additional materials	Any text indicated is fine for exam preparation. The text marked with an asterisk (*) is for numerical practice only.
Repository	None

Assessment	
Assessment methods	Oral with pre-assessment of the student's ability to carry out genetic exercises through on-going tests (not mandatory). In case of failure to such tests, or in case

	of insufficient evaluation, the assessment of the aforementioned skills will take place following a preliminary written test, followed by an oral test.
Assessment criteria	• *Knowledge and understanding* ○ the student must demonstrate that he has acquired the basic knowledge of Genetics and that he is able to elaborate it through links between different topics of the subject. • *Applying knowledge and understanding* ○ the preliminary written test, which foresees the performance of exercises on the classroom topics, will help in the evaluation of knowledge and comprehension skills • *Autonomy of judgment* ○ it will be assessed by verifying the ability to self-evaluate the correctness of the exercises carried out and the answers provided to the questions asked during the examination. • *Communicating knowledge and understanding* ○ evaluation of the most suitable terminologies to illustrate the mechanisms of natural and experimental genetic phenomena • *Communication skills* ○ assessment of the basic correctness of the lexicon used • *Capacities to continue learning* ○ assessment of the attitude to carry out in-depth analyses, through consultation of scientific literature and databases, regarding the topics developed within the course.
Final exam and grading criteria	The exam will verify the understanding of the rationale for carrying out the Genetics exercises, and will ascertain the learning of all the molecular and non-molecular aspects related to Genetics. The evaluation will be performed by a score out of thirties (the average value of the two on-going tests or of the written and oral tests); the test will be passed with a mark equal to or greater than 18.
Further information	None