General information	
Academic subject	**GENERAL GENETICS AND GENETIC IMPROVEMENT OF FARMED MARINE SPECIES**
Degree course	Science of Marine Productions and Resources (L38)
Academic Year	I year
European Credit Transfer and Accumulation System (ECTS)	6 (5+1)
Language	Italian
Academic calendar (starting and ending date)	I semester
Attendance	Not mandatory

Professor/ Lecturer	
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Virtual headquarters	Microsoft Teams platform if necessary (Teams code: 6sd80hi)
Tutoring (time and day)	The teacher receives personally by agreement or via e-mail and Teams any day, except for institutional commitments.

Syllabus	
Learning Objectives	The course aims to provide the student with adequate knowledge of general and animal genetics, quantitative and population genetics. The main knowledge acquired will be the structure of the hereditary material, methods of transmission of characters in animals of zootechnical and veterinary interest, and main modifications of the hereditary material. The student will also acquire theoretical and practical knowledge elements aimed at developing and managing genetic selection strategies in the company with particular attention to advanced methods for estimating the genetic value of reproducers. Finally, suitable tools will be provided to understand the different methods of conservation of animal genetic diversity.
Course prerequisites	Principles of physiology and endocrinology of domestic animals. Knowledge of biochemistry, cell biology, basic statistics, and computer science
Contents	**Basic knowledge check** **General genetics**: the discovery of hereditary material through the experiments conducted; organization of genetic material; the concept of splicing; cytogenetics and chromosomes; concepts of genomics; the nuclear and mitochondrial genomes; the C-value; the transmission of characters; genetic code and gene structure; hints on the mechanisms of gene regulation and expression. Mendelism: Mendel's laws, genetic basis of Mendelism; interaction between genes at different loci; modifier genes; co-dominance; incomplete dominance; dominant, recessive and double epistasis; penetrance and expressiveness; pleiotropy; segregation and recombination of independent and associated genes (linkage); lethal genes; freemartinism; multiple allelism; heredity and sex: Fish chromosomes and cytogenetics of fish reproduction, Sex chromosomes and genetics of sex determination; sex-linked, limited, and sex-influenced traits; Barr's body; genomic, chromosomal and gene mutations, notes on mitochondrial and Y chromosome inheritance;

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	Population genetics: concepts of population genetics: gene and genotype frequencies, Hardy-Weinberg equilibrium and the factors that influence it, similarity between individuals: kinship and consanguinity. **Animal breeding**: Inheritance of qualitative morphological traits in fish, Inheritance of quantitative traits in fish, infinitesimal model, EBV estimation and simple genetic indices; selection response; estimation accuracy, TYPES OF breeding programs, DNA genetic markers and their application, Selective breeding and hybridization, chromosome set manipulation and sex control, Genetic engineering and genomics.
Books and bibliography	Book besides of lecture notes: Genetics: Peter J. Russell, P. E. Hertz, B. McMillan, Elementi di Genetica; Animal Breedings: G. Pagnacco, GENETICA ANIMALE - applicazioni zootecniche e veterinarie II edizione, Casa Editrice CEA
Additional materials	1. There are several valid texts; the student is invited to consult the teacher to evaluate their usefulness. 2. The slides and all the material provided by the teacher are available in the Teams channel of the course.

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
150	***50***	***10***	***90***
ECTS			
6	***5***	***1***	

Teaching strategy	
	Theoretical lessons will take place in the classroom, using a personal computer connected to a projector, to show, at the same time as the explanation, PowerPoint slides, and explanatory videos.
Expected learning outcomes	
Knowledge and understanding on:	Knowledge for the understanding of hereditary phenomena and the mechanisms of transmission and modification of genetic-based traits in the main zootechnical species. Knowledge of techniques for the genetic improvement of animals and of the different genetic types available on the market
Applying knowledge and understanding on:	Knowledge of the usefulness of knowing the hereditary mechanisms and implications for the zootechnical profession. Ability to act as a consultant in various professional realities.
Soft skills	Ability to **identify the most suitable** strategies for application in animals of zootechnical interest or in those of affection with particular attention to interactions with other disciplines, in particular, the ability to interact in a team will be of particular importance.

Assessment and feedback	
Methods of assessment	The skills acquired will be assessed towards the end of the course, through questions and practical exercises on topics related to the course. At the end of the course, the student must be able to:
Evaluation criteria	• Knowledge and understanding: ○ Know the main transmission mechanisms of the characters and the biological basis behind these phenomena.

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	○ Understand the different strategies for animal genetic improvement. • Applied knowledge and understanding: ○ Identify the main problems related to the inheritance of traits and their application in the zootechnical and veterinary fields. ○ Establish an adequate strategy against various problems in the zootechnical field using genetic improvement tools and the interpretation of hereditary phenomena. • Autonomy of judgment: ○ Being able to express his opinion independently. • Communication skills: ○ Good ability to present the proposed topics. • Ability to learn: Correct answers to the questions/topics proposed / I.
Criteria for assessment and attribution of the final mark	Verification of learning achieved takes place through an oral test. The mark is expressed out of thirty. The evaluations with the highest score are attributed to students who can use the correct scientific terminology and with good exposition skills. For the part of General Genetics and Population Genetics, an exemption is provided consisting of a written test consisting of multiple-choice questions and supplementary open-ended questions, aiming to ascertain the degree of knowledge of the proposed topics. The final mark results from the arithmetic average of the marks obtained. In any case, the student must acquire a mark greater than or equal to 18/30.
Additional information	

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