General information		
Academic subject	**ANIMAL BREEDING AND SELECTION**	
Degree course	Veterinary Medicine	
Academic Year	2021/2022	
European Credit Transfer and Accumulation System (ECTS)		2
Language	Italian	
Academic calendar (starting and ending date)	III bimester	
Attendance	Mandatory	

Professor/ Lecturer	
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Virtual headquarters	
Tutoring (time and day)	(upon request) Tuesday 2.30 PM - 4.30 PM Wednesday 10.30 AM -12.30 AM

Syllabus	
Learning Objectives	The course aims to train the student on the theoretical and practical aspects concerning the genetic evaluation of livestock species. In particular, it will provide information relating to (i) the collection, management and processing of phenotypic data used in the zootechnical field; (ii) the classical approaches to estimate the values of the indices and their accuracy; (iii) the organization, at a national level, of the institutional and professional figures involved in the genetic improvement of livestock species, (iv) the use of innovative approaches based on the use of biotechnologies.
Course prerequisites	Knowledge of Mendelian genetics and population genetics are required. The students must be familiar with the concepts of kinship, consanguinity, crossbreeding and heterosis. Knowledge on the significance, relevance and management and conservation techniques of genetic diversity is necessary.
Contents	Course introduction (specific training objectives and methods of delivery; methods and criteria for assessing the knowledge, skills and minimum skills to be achieved; placement of the teaching within the training of the Veterinarian). Interactive verification of the knowledge available ex-ante. Recalls and insights on propedeutic topics (Mendelian genetics; population genetics; the concepts of kinship and consanguinity; crossbreeding and heterosis; the conservation of genetic diversity). Study and definition of the distribution of observations of a phenotypic trait (definition of continuous and discontinuous phenotypic variables; descriptive statistics). Correlations between characters and simple linear regression analysis. The infinitesimal model (the concept of phenotypic variance and its decomposition; the concept and estimate of heritability). The concept of repeatability and its field of application. The breeding value of a sire and the schemes for genetic evaluation (performance test, sib test, progeny test, etc.), with examples from real cases. Genetic indices and selection for several characters. Estimation of genetic progress. Critical evaluation of the factors influencing the response to selection. Approaches based on the use of genotypic data as a tool to support selection (marker assisted

	selection and marker-assisted introgression), with examples from real cases. The concept behind genomic selection; genotyping approaches and technologies; the concept of imputation of genotypes; critical analysis of the factors influencing the outcome in genomic selection; application of genomic selection in specific cases (e.g. small populations).
Books and bibliography	- Didactic material provided by the teacher - G. Pagnacco, GENETICA ANIMALE – applicazioni zootecniche e veterinarie II edizione, Casa Editrice Ambrosiana
Additional materials	

Work schedule			
Total 2	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
50	26		24
ECTS			
2	2		

Teaching strategy	Lectures, with the support of multimedia teaching material. Interaction with the teacher and between learners will be encouraged through the analysis of real cases and the use of problem-based learning approaches.
Expected learning outcomes	
Knowledge and understanding on:	○ Acquisition of theoretical knowledge relating to the conceptual models underlying traditional and modern breeding practices; knowledge of the organizational methods and of the main institutional figures involved in the genetic improvement of domestic animal species; critical knowledge of the short and long term implications deriving from the different breeding practices. ○ Acquisition of skills for the critical evaluation of the different genetic improvement schemes and approaches and for the interpretation and critical evaluation of information relating to the genetic merit of a breeder. ○ Ability to identify the best operational choices for the design and implementation of genetic improvement schemes in the different situations of operational practice.
Applying knowledge and understanding on:	○ 1.1 Understand the ethical and legal responsibilities of the veterinarian in relation to patients, customers, society and the environment (eg ethical-legal responsibilities related to the collection of biological material for molecular investigations and the use of "omic" biotechnologies; ethical responsibilities relating to the techniques of conservation of biodiversity and the selection for characteristics of resilience, adaptability and economic and environmental sustainability ..) ○ 1.2 Demonstrate knowledge of the organization, management and legislation relating to veterinary activities (e.g. organization and management of systems related to functional controls and the selection of livestock species) ○ 1.3 Promote, monitor and maintain health and safety in the veterinary field; demonstrate knowledge of quality assurance systems; apply the principles of risk management to their practice (e.g. risk management

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	in the context of ex situ biodiversity conservation actions) ○ 1.4 Communicate effectively with clients, the public, professional colleagues and responsible authorities, using language appropriate to the relevant public (e.g. use of appropriate specialist terminology) ○ 1.8 Be able to critically review and evaluate literature and presentations. ○ 1.11 Demonstrate the ability to cope with incomplete information, face unexpected events and adapt to change. ○ 1.12 Demonstrate recognizing personal and professional limitations and knowing how to seek professional advice, assistance and support when needed. ○ 1.14 Participate in peer group self-assessment and review processes to improve performance (eg knowledge entry test). ○ 1.15 Obtain an accurate and relevant history of the individual animal or group of animals and its / their environment ○ 1.20 Evaluate the physical condition, well-being and nutritional status of an animal or group of animals and advise the client on the principles of breeding and feeding (with particular reference to genetic improvement). ○ 1.21 Collect, store and transport specimens, select appropriate diagnostic tests, interpret and understand the limitations of test results.
Soft skills	• Making informed judgments and choices • Communicating knowledge and understanding • Capacities to learn autonomously 2.2 Research methods and contribution of basic and applied research to veterinary science. 2.4 Knowledge of activities related to the breeding, production and breeding of animals.

Assessment and feedback	
Methods of assessment	The exam consists of an oral test on the topics developed during the lectures. The exam will be aimed at verifying the candidate's learning and evaluating (i) the theoretical knowledge relating to the conceptual models underlying traditional and modern genetic improvement practices, knowledge relating to organizational methods and the main institutional figures involved. in the genetic improvement of domestic animal species; critical knowledge of the short and long term implications deriving from the different breeding practices; (ii) the ability to apply the knowledge acquired for the purposes of critical evaluation of the various schemes and approaches of genetic improvement and for the interpretation and critical evaluation of information relating to the genetic merit of a breeder; (iii) the ability to understand and contextualize the issues faced and to identify the best operational choices for the design and implementation of genetic improvement schemes in the various situations of operational practice; (iv) the ability to clearly present the acquired contents.
Evaluation criteria	**Knowledge and understanding:** • Theoretical knowledge relating to the conceptual models underlying traditional and modern breeding practices; knowledge of the organizational methods and of the main institutional figures involved in the genetic improvement of domestic animal species; critical knowledge of the short

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	and long term implications deriving from the different breeding practices. • Skills for the critical evaluation of the different genetic improvement schemes and approaches and for the interpretation and critical evaluation of information relating to the genetic merit of a breeder. • Ability to identify the best operational choices for the design and implementation of genetic improvement schemes in the different situations of operational practice. **Applied knowledge and understanding:** 1.1 Understand the ethical and legal responsibilities of the veterinarian in relation to patients, customers, society and the environment (eg ethical-legal responsibilities related to the collection of biological material for molecular investigations and the use of "omic" biotechnologies; ethical responsibilities relating to the techniques of conservation of biodiversity and the selection for characteristics of resilience, adaptability and economic and environmental sustainability ..) 1.2 Demonstrate knowledge of the organization, management and legislation relating to veterinary activities (e.g. organization and management of systems related to functional controls and the selection of livestock species) 1.3 Promote, monitor and maintain health and safety in the veterinary field; demonstrate knowledge of quality assurance systems; apply the principles of risk management to their practice (e.g. risk management in the context of ex situ biodiversity conservation actions) 1.4 Communicate effectively with clients, the public, professional colleagues and responsible authorities, using language appropriate to the relevant public (e.g. use of appropriate specialist terminology) 1.8 Be able to critically review and evaluate literature and presentations. 1.11 Demonstrate the ability to cope with incomplete information, face unexpected events and adapt to change. 1.12 Demonstrate recognizing personal and professional limitations and knowing how to seek professional advice, assistance and support when needed. 1.14 Participate in peer group self-assessment and review processes to improve performance (eg knowledge entry test). 1.15 Obtain an accurate and relevant history of the individual animal or group of animals and its / their environment 1.20 Evaluate the physical condition, well-being and nutritional status of an animal or group of animals and advise the client on the principles of breeding and feeding (with particular reference to genetic improvement). 1.21 Collect, store and transport specimens, select appropriate diagnostic tests, interpret and understand the limitations of test results. • Autonomy of judgment: • Communication skills: • Ability to learn autonomously
Criteria for assessment and attribution of the final mark	Praiseworthy (30, 30 and praise); accurate (27-29); satisfactory (23-26); sufficient (18-22); insufficient (<18).
Additional information	

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