

**ACADEMIC YEAR 2024/2025**

<b>General information</b>	
Academic subject	<b>NUTRITION AND FEED TECHNIQUE OF AQUATIC SPECIES</b>
Degree course	Science of Marine Productions and Resources (L38)
Academic Year	II year
European Credit Transfer and Accumulation System (ECTS)	6
Language	Italian
Academic calendar (starting and ending date)	I semester
Attendance	Frequency is recommended

<b>Professor/ Lecturer</b>	
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Virtual headquarters	Teams code for tutoring activity:
Tutoring (time and day)	To be agreed by email

<b>Syllabus</b>	
<b>Learning Objectives</b>	The teaching of nutrition and feed technique of aquatic species aims to provide knowledge on the nutritional needs of fish species of zootechnical interest, on the formulation of feed and its administration on farms. This knowledge will be acquired through theoretical lessons and practical exercises.
<b>Course prerequisites</b>	To competently attend the Course on Nutrition and Feed Technique of Aquatic Species, students must have acquired in-depth knowledge of the Anatomy and Physiology of aquatic animals of zootechnical interest.
<b>Contents</b>	<p style="text-align: center;"><b>Part one</b></p> <p>General properties and nutritional roles of food principles: carbohydrates, lipids, proteins, minerals, vitamins. Determination of the chemical composition of feed for livestock use. Review of anatomy and physiology of the digestive system of aquatic organisms. Basal metabolism and metabolic weight. Distribution of dietary energy in fish. Energy and protein value of foods and variation factors.</p> <p style="text-align: center;"><b>Second part</b></p> <p>The intrinsic and extrinsic factors that influence feed ingestion in fish and calculation of the quantities to be distributed based on live weight (%) and water temperature (°C). Calculation of the daily growth rate and feed conversion index. The protein and amino acid requirements, lipids and fatty acids, vitamins and mineral elements of the main species farmed in fresh water (trout, eel, sturgeon, carp, catfish, char) or brackish and marine water (seabass or sea bass, sea bream, mullet, bream, croaker, amberjack). Raw materials used in the preparation of feed for aquatic species. Formulation of complete feeds with optimal protein-energy ratio. Rationing and environmental impact issues. Influence of nutrition on the qualitative characteristics of fish production.</p> <p style="text-align: center;"><b>Part Three</b></p> <p>Regulations relating to the production and marketing of feed. Main processing phases and nutritional and health checks. Organization and operation of the feed mill. Procurement, reception, storage of raw materials. Feed processing systems and techniques (grinding, dosing, mixing, greasing, flaking, extrusion, micronisation,</p>

	pelleting). Technological and nutritional implications of the main treatments implemented in the feed mill. Quality control of raw materials and finished products. Packaging and shipping of feed. The palatability of feed. Feed contamination: bacteria, zooparasites, fungi, toxic substances of vegetal origin, altered fatty substances, putrefying substances, voluntary additives, residues of human activity in agriculture, on animals, in industry. Additives: antioxidants, natural and synthetic; dyes; flavourings.
<b>Books and bibliography</b>	National Research Council. 1993. <i>Nutrient Requirements of Fish</i> . Washington, DC: The National Academies Press. <a href="https://doi.org/10.17226/2115">https://doi.org/10.17226/2115</a> . John E. Halver - Fish Nutrition, "2 <sup>nd</sup> Ed." Academic Press, San Diego, California, USA, 1989. G.GIORDANI, P. MELOTTI. Elementi di acquacoltura, Edagricole
<b>Additional materials</b>	The texts are integrated with the lesson slides and with the exercise sheets, distributed by the teacher during the lessons and exercises

<b>Work schedule</b>			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
<b>Hours</b>			
<b>150</b>	<b>40</b>	<b>10</b>	<b>100</b>
<b>ECTS</b>			
<b>6</b>	<b>5</b>	<b>1</b>	
<b>Teaching strategy</b>	The course includes frontal theoretical lessons. Lessons take place in the classroom with the aid of PowerPoint slides. The course aims to stimulate learning through discussions and clarifications on the topics covered.		
<b>Expected learning outcomes</b>			
<b>Knowledge and understanding:</b>	At the end of the course the student will have acquired knowledge regarding the nutritional requirements of the main farmed species and the raw materials to be used in compound feed to satisfy them.		
<b>Applied knowledge and understanding:</b>	The student should be able to formulate a feed with the optimal ratio between energy and protein, as well as with the balanced contents of the nutrients necessary to ensure the growth performance of the fish species of interest. The student should be able to intelligently interpret the rationing tables proposed by feed manufacturers, adapting them to the data relevant to his specific fish farming. The student should be able to follow the different processing phases of the raw materials for the production of fish feed.		
<b>Soft skills</b>	<p><b>Knowledge and understanding</b> At the end of the course the student should be able to evaluate the growth performance of the fish species fed with artificial feed, as well as the environmental impact and economic efficiency of the farming.</p> <p><b>Communication skills</b> At the end of the course the student will have to demonstrate the ability to highlight any critical and/or strong points of a fish farming conducted with artificial feeding.</p> <p><b>Learning ability</b> The student should be able to independently calculate the dietary requirements of the fish species of interest to him, with the variation of the intrinsic and extrinsic influencing factors of the fish species.</p>		

<b>Assessment and feedback</b>	
<b>Methods of assessment</b>	The oral test consists of a discussion aimed at ascertaining the level of knowledge and ability to understand the topics indicated in the program. The same will also allow to verify the ability to carry out practical rationing of a farmed fish species: calculation of the quantity of food to be distributed, in % of live weight, on the basis of the specific growth data of the farm, calculation of the feed conversion ratio. The final exam aims to ascertain knowledge of the different phases of processing and preparation of fish feed, with particular reference to the technological treatments that affect its nutritional value. Regular attendance and the degree of active participation in the classroom will be elements of additional evaluation.
<b>Evaluation criteria</b>	<p><b>Knowledge and understanding</b> In the final test, the student's commitment to individual study aimed at in-depth study of the program topics and the ability to master the fundamental concepts relating to the satisfaction of the nutritional requirements of the studied fish species, in the different physiological phases, will be evaluated.</p> <p><b>Applying knowledge and understanding</b> In the final test, the student's practical ability to calculate the quantities of food to be distributed based on the rationing tables will be assessed. The ability to empirically evaluate a feed is part of the practical evaluation criteria.</p> <p><b>Communicating knowledge and understanding</b> The student's ability to use the correct scientific terminology relating to the topics covered during the course will be assessed.</p> <p><b>Capacities to continue learning</b> The ability to delve deeper into the concepts exposed during the course will be assessed, also through connections with those acquired in other study courses.</p>
<b>Criteria for assessment and attribution of the final mark</b>	The final grade is awarded out of thirty. The exam is considered passed when the grade is equal to or greater than 18, with 30 as the maximum grade. The student's achievement of an organic vision of the topics addressed, the mastery of scientific language and the practical ability to ration a fish species will contribute to achieving a high evaluation.
<b>Additional information</b>	