

Main course information	
Academic Subject	Animal Ecophysiology
Degree course	Master's degree in Natural and Environmental Science
Degree class	LM-60 & LM-75
ECTS Credits (CFU)	6
Compulsory attendance	Strongly recommended
Teaching language	Italian
Academic Year	2019/2020

Professor/Lecturer	
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Tutorial time/day	16-18 / Monday and Wednesday

Course details	Pass-fail exam/Exam with mark out of 30	SSD code	Type of class
	Exam with mark out of 30	BIO/09	Lectures

Teaching schedule	Year	Semester
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Lesson type	CFU/ECTS	Lessons (hour)	CFU/ECTS lab	Lab hours	CFU/ECTS tutorial/workshop	tutorial/workshop hours	CFU/ECTS field trip	Field trip hours
	5,5	44	0,5	7,5	0	0	0	0

Time management	Total hours	Teaching hours	Self study hours
	150	51,5	98,5

Academic calendar	First lesson	Last lesson
	1/10/2019	31/1/2020

Syllabus	
Course entry requirements	No requirement
Expected learning outcomes(according to Dublin Descriptors) (it is recommended that they are congruent with the learning outcomes contained in A4a, A4b, A4c tables of the SUA-CdS)	
Knowledge and understanding	Acquisition of skills on specific physiological mechanisms in response to changes in environmental parameters. These skills are necessary to set up future discussions and to provide solutions to environmental problems. Such a knowledge, also useful for dissemination and educational purposes, will be acquired through theoretical lessons.
Applying knowledge and understanding	In general, the student will have to apply the knowledge of physiological mechanisms in a global view of ecosystems and in relation to specific environmental problems. The student will be invited to compare the different interpretative proposals related to specific topics developed during the lesson. In particular, the student will learn solving simple numerical exercises and reproducing in graphical form the dependence of physiological parameters on time or on environmental variables.
Making informed judgements and choices	The student learn how to find the solution to a simple calculation problem using an autonomous logical process. The student will be invited first individually and then collegially to discuss case studies proposed during the lesson.
Communication knowledge and understanding	The student should practice a way to speak language that is sufficiently correct to expose complex problems; moreover the

	<p>student should learn writing in a precise, concise and clear but at the same time argued and not dogmatic way.</p> <p>In particular, he should learn how to present the topics regarding the needs of the organisms in response to environmental parameters with the same characteristics highlighted above. The student will be invited to express himself on the topics learned during the lessons.</p>
Capacities to continue learning	<p>The student should acquire the ability to understand the relationships between form and function and their dependence on the environment. The student must be able to update the information acquired and acquire the ability to investigate environmental issues.</p>

Syllabus	
Course content	<p><b>Lectures are given in Italian.</b></p> <p><b>Energy metabolism and thermal relationships.</b> Temperature and metabolism: thermal relations between animals and environment. Effects of temperature and thermal adaptation. Protein temperature and activity. Temperature and functionality of biological membranes. Heat exchanges and body temperature. Relationship between body temperature, endogenous heat production and tolerance to temperature variations. Heterothermic and poikilothermic. Tolerance to freezing. Avoidance of ice formation. Warm adaptations. Endothermia and homeothermia. Control of heat production: Thermogenesis. Control of thermal exchanges. Adaptations to extreme conditions in the endotherms. Cold adaptations. Warm adaptations. Muscular heterothermia.</p> <p><b>The respiratory system.</b> Main gas exchange strategies. Mass transportation. Respiratory exchange modalities based on ventilation. Structures delegated to gas exchange. Aquatic breathing animals. Invertebrates and Vertebrates (Agnatha, Chondrichthyes, Osteichthyes, Amphibians, Reptiles). Air breathing animals (Annelids, Fish, Amphibians, Reptiles, Birds and Mammals). Human adaptations to diving. Oxygen transport. Respiratory pigments. Hemoglobin and myoglobin. Definition of Chlorocruorin, Hemerythrin, Hemocyanin. Carbon dioxide transport.</p> <p><b>The circulatory system.</b> Morpho-functional organization of the circulatory system. Pressure, resistance and flow in vascular systems. Circulating fluids. Hemolymph. Blood. The heart (Invertebrates and Vertebrates). Myocardial tissue. Structural characteristics. Excitability. Excitation-contraction coupling. Automatism and conduction system. Myogenic hearts. Different circulatory system of Vertebrates.</p> <p><b>Osmoregulation.</b> Ionic and osmotic balance. Osmolarity, osmolality and van't Hoff coefficient. The osmotic pressure. Percentage volume of the organism's water compartments. Ion and water exchanges between compartments. Definition of isosmotic and isotonic solutions. Ion and water exchanges between the fluid compartments of the animal organism. Terrestrial aquatic natural environments. Mandatory exchanges of ions and water through the body surface. The surface/volume ratio. The water permeability of the integument. Osmoregulation in freshwater and marine water environments. The responses to habitat dehydration. Osmoregulation in aerial respiration animals. Xerophilous animals. Osmoregulatory organs. Vertebrate osmoregulatory organs.</p> <p><b>Excretion of nitrogen compounds.</b> The fundamental mechanisms of excretory systems. Ammoniothelic, ureothelic and Uricothelic animals.</p>
Course books/Bibliography	"Fisiologia Animale" by Poli <i>et al.</i> , 2014 - EdiSes, Napoli.
Notes	Because of the complexity of the subject, the student should use a textbook. The one I recommend is also the cheapest of those currently available and is available at university libraries. However the student could use a different textbook,

	<p>upon agreement with the Professor.</p> <p>The images projected and studied during the lessons are for the most part contained in the recommended textbook (and therefore subject to copyright). The contents not present in the textbook are available on the Internet in an open source format which is compatible with a simple use and dissemination.</p>
Teaching methods	Lessons are integrated with image projection. These images are collegially discussed. Written calculations of the numerical relations gradually presented, whose solution is discussed collectively.
Assessment methods (indicate at least the type written, oral, other)	Oral examination.
Evaluation criteria (Explain for each expected learning outcome what a student has to know, or is able to do, and how many levels of achievement there are)	<p>It is considered necessary for the student to pursue the following learning objectives.</p> <p><b>Learning capacity.</b> The student must demonstrate to know the contents of the whole course. He must also be able to make connections between the various topics that make up the teaching program. The details of other disciplines are not required, but the ability to link them with the course issues is positively evaluated. Knowledge of only the notions is not considered sufficient.</p> <p><b>Ability to apply knowledge and understanding.</b> The ability to apply knowledge and understanding will be verified by solving simple problems put in an extemporaneous way.</p> <p><b>Autonomy of judgment.</b> The student during the examination must be able to independently develop possible links with other disciplines of the course of study. This ability will lead to a very positive evaluation.</p> <p><b>Communication skills.</b> The ability to express concepts and make interpretations with language properties and clarity will be assessed very positively making use of the specific terminology learned during the course attendance. The student must also demonstrate the ability to apply the acquired knowledge in educational or educational contexts.</p> <p><b>Capacities to continue learning.</b> The student should demonstrate to know how to independently gain further knowledge on the basis of an interdisciplinary preparation. The demonstration of such an ability will increase the final evaluation up to the maximum.</p>
Further information	