

Main course information	
Academic subject	Marine Ecology and protection of marine environment
Degree course	Master's degree in Science of Nature and Environment
Degree class	LM/60 & LM/75
ECTS credits (CFU)	6
Compulsory attendance	Strongly recommended
Teaching language	Italian
Academic Year	2019/2020

Professor/Lecturer	
Name & SURNAME	Porzia MAIORANO
email	porzia.maiorano@uniba.it
Tel.	080-5442495
Tutorial time/day	Tuesday 11-13; Wednesday-Friday 11-12,30

Course details	Pass-fail exam/Exam with mark out of 30	SSD code	Type of class
	Exam with mark out of 30	BIO/07	Lecture/workshop/field trip

Teaching schedule	Year	Semester
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Lesson type	CFU/ECTS	Lessons (hours)	CFU/ECTS lab	Lab hours	CFU/ECTS tutorial/workshop	Tutorial/workshop hours	CFU/ECTS field trip	Field trip Hours
	5.5	44	0	0	0	0	0.5	10

Time management	Total hours	Teaching hours	Self-study hours
	150	54	96

Academic Calendar	First lesson	Final lesson
	October	January

Syllabus	
Course entry requirements	Basic knowledge in mathematics, physic, chemistry, ecology, botanic, zoology.
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)	
<i>Knowledge and understanding</i>	To acquire knowledge on the factors and components of the marine ecosystems as well as on the adaptation of marine organisms with respect to different environmental conditions. To identify the biological components (benthos, plankton, nekton) and to understand the dynamic of marine communities, even in relation to anthropogenic impact. To acquire knowledge on the main rules of the legal framework for the marine environment conservation and management. Such knowledge and understanding, useful for informative and educational purposes, will be acquired through lectures and workshops.
<i>Applying knowledge and understanding</i>	Application of acquired knowledge on structure and complexity of the marine communities aimed to the conservation and management of the marine environment in a sustainable way. During the lessons, the student will be encouraged to compare the different interpretations for the considered issues.
<i>Making informed judgements and choices</i>	Acquisition of autonomy in the evaluation and interpretation of experimental data and of examined studies, functional to the application of management and conservation measures of the marine environment with respect to the various anthropogenic pressures. The students will be encouraged to discuss the case studies presented throughout the lecture.
<i>Communicating knowledge and understanding</i>	Acquisition of the scientific terminology related to the marine ecology with the aim to be able to communicate the scientific knowledge.

Capacities to continue learning	Acquisition of the critical and speculative capacity in dealing with the topics and issues of the marine ecology. The students will be encouraged to acquire this ability through the lectures, the consultation of books and scientific publications as well as the participation to conferences and workshops.
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Syllabus	
Course content	<p><b>Introduction to the marine environment.</b> Physico-chemical parameters of the water. Components and structural, trophic, and functional traits. Life strategies. Comparison between marine and terrestrial ecosystems. Geomorphology, hydrography and biology of the Mediterranean.</p> <p><b>Marine Biodiversity.</b> Measure of the biodiversity. Biodiversity gradients. Biodiversity hot-spot.</p> <p><b>Benthos.</b> Main characteristics and classification of the benthos. Benthic bionomics and biocenoses. Zonation of the benthos. Communities of hard and soft substrates. Biocenoses of particular ecological and conservation importance.</p> <p><b>Plankton.</b> Characteristics and classification of plankton: functional, dimensional and taxonomic. Distribution of the plankton. Plankton organisms. Migration of the plankton and ecological factors. The productivity in the Mediterranean. The food chains in the marine ecosystems. Anthropogenic activities, eutrophication and algal bloom.</p> <p><b>Nekton.</b> Nekton organisms: characteristics and adaptations. Geographic and bathymetric distribution of the nekton. Species and populations of the nekton. Reproduction, behaviour, feeding and life cycles. Nekton migrations. Role of nekton in the trophic web. Trophic cascade in the trophic webs. Direct and indirect effects in the trophic web. Top-down, bottom-up and wasp-waist controls.</p> <p><b>Deep Sea Ecosystems.</b> Characteristics and conditions of deep sea. Adaptation to the physico-chemical and ecological conditions. Biodiversity hot-spot: submarine canyons; seamounts; cold-water corals; hydrothermal vents; cold seep; whale carcass.</p> <p><b>Marine resources, fishery and protection of the marine environment.</b> The exploitation of the marine fishing resources. The management of the fishery resources. International and Community management measures for the Mediterranean. Anthropogenic pressures. Marine litter. Hints on the National and European laws for Biodiversity Protection and Conservation. EU Marine Strategy Framework Directive.</p> <p><b>Workshop I:</b> Field activity as an exercise of studying the marine environment by means of different sampling gears.</p>
Course books/Bibliography	<ul style="list-style-type: none"> <li>• Danovaro R., 2019. Biologia marina, Biodiversità e funzionamento degli ecosistemi marini. Seconda edizione. De Agostini Scuola SpA. UTET.</li> <li>• Castro P., Huber M.E., 2011. Biologia Marina. McGraw-Hill.</li> <li>• Nybakken J.W., 1977. Marine Biology. An ecological approach. Addison-Wesley Educational Publishers Inc.</li> </ul>
Notes	The texts are available in the library of the Biology Department. The student is invited to deepen some topics by means of the available documents in electronic format. Moreover, it's strongly recommended to use the notes from lectures.
Teaching methods	Lectures and seminars by mean of Power Point and field activity. Teacher-student interactions will be encouraged during educational activities.
Assessment methods (indicate at least the type written, oral, other)	Oral examination. The student has to prove the knowledge of issues developed during lectures as well as the ability to link their contents. The final mark will be awarded on the basis of clarity of exposition, language property and educational capability. The constant and active participation to the lectures will contribute to a very positive evaluation.
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>Learning capacity. In addition to the acquisition of concepts, ability to make connections among the various marine ecosystems according to a holistic point of view is evaluated. Knowledge at exclusively notional levels is not evaluated above average values.</p> <p>Ability to apply knowledge and understanding. The knowledge of environmental data collection, experimental studies and ecological models shows maturity in the preparation and is an essential requirement to be positively evaluated during the examination.</p>

	<p>Autonomy of judgment. Knowing how to evaluate and interpret experimental data and case studies useful to the management policy application shows maturity in the preparation and is positively judged.</p> <p>Communication skills. Knowing how to communicate the contents of marine ecology in a clear and scientifically correct way is essential to decision-making and considered essential for the positive outcome of the examination.</p>
Further information	