**Università degli Studi di Milano-Bicocca**

**DEPARTMENT OF EARTH AND ENVIRONMENTAL SCIENCE**

##### Student Guides

##### Academic Year 2017/2018

MASTER’S DEGREE IN

**MARINE SCIENCES**

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Master’s Degree in

MARINE SCIENCES - SCIENZE MARINE

Ministerial Degree nr. 270 of 22/10/2004

Course Regulations – Academic Year 2017/2018

**ART. 1 INTRODUCTION**

|  |  |
| --- | --- |
| *Original course name:* | **MARINE SCIENCES - SCIENZE MARINE** |
| *Course name in English:* | **MARINE SCIENCES** |
| *Program LM-75 Master’s Degree:* | **Program in Sciences and Technologies for the Environment and Landscape** |
| *Primary Faculty:* | **Associated Faculties** |
| *Primary Department:* | **DIPARTIMENTO DI SCIENZE DELL'AMBIENTE E DELLA TERRA (DEPARTMENT OF EARTH AND ENVIRONMENTAL SCIENCES - DISAT)** |
| *Associated Departments:* | **DEPARTMENT OF BIOTECHNOLOGIES AND BIOSCIENCES** |
| *Normal Course duration:* | **2 years** |
| *Credits:* | **120** |
| *Address of the Master’s Degree course:* | **Piazza della Scienza, 1 e 4 – 20126 – MILANO (MI)** |
| *Website:* | [**http://www.disat.unimib.it**](http://www.disat.unimib.it) **-** [**didattica.unimib.it/F7502Q**](http://www.didattica.unimib.it/F7502Q) |
| *Degree awarded:* | **Master’s Degree in MARINE SCIENCES - SCIENZE MARINE** |
| *Joint degree:* | **Yes** |
| *Partner universities:* | **The Maldives National University** (agreement of 16/12/2015) |

**ART. 2 COURSE PRESENTATION**

The Master’s Degree course in Marine Sciences - Scienze Marine (program LM-75) is an international study course jointly established with the Maldives National University.

The postgraduate degree course provides advanced level instruction preparing students for professional careers requiring high-level specialist qualifications in the field of Marine Sciences. The Faculty is made up of experts from the Università degli Studi di Milano-Bicocca, the Maldives National University, as well as other non-Italian universities and research organizations.

The Course has a duration of two years. The Master’s Degree in Marine Sciences-Scienze Marine carries 120 University Education Credits (CFUs), and entails 12 exams, to be passed in compliance with Italian laws in force. The Master’s Degree is jointly awarded by the Università degli Studi di Milano- Bicocca and the Maldives National University.

The official language of the Master’s Degree course is English.

**ART. 3 SPECIFIC AIMS AND STRUCTURE OF THE COURSE**

The Master’s Degree course fully complies with the standards of the European reference framework for Environmental Sciences, delivering training in specialist skills with particular focus on marine biology, chemistry, ecology, the Earth Sciences, and socio-economic and legal aspects pertaining to the marine environment. Particular emphasis is placed on the study and assessment, from a sustainable marine management perspective, of natural processes and human activities impacting oceans. Special focus is given to integrated coastal management and maritime spatial planning (MSP) systems using advanced IT tools together with field and laboratory analyses as part of an interdisciplinary approach to in-depth assessment of the marine habitat. This interdisciplinary approach to the complex interactions between the natural environments - the geosphere, hydrosphere, biosphere and atmosphere - and human activities in the various oceanic settings allows students to assess and envisage appropriate use of natural resources in compliance with Europe’s modern Marine Strategy.

The Master’s Degree course is designed to build on the knowledge acquired by students during the first level Bachelor’s degree course, providing in-depth training in specific areas of study. The postgraduate course will also prepare students to apply the latest methods and technology used by the Environmental Sciences and allied fields in order to collate a range of different data from a variety of sources.

The Master’s Degree course trains graduate students to independently develop solutions and strategies for marine and coastal area problems, with particular focus on the following:

- the study and analysis of the natural processes of the marine ecosystem, including related chemical, biological, environmental, and earth science aspects, and their allied risks;

- the study and analysis of human interaction with the marine system, involving socio-economic and legal considerations, with a view to developing sustainable management policies and offsetting hazards to the coastal and oceanic environment caused by man.

***The learning activities aim to ensure that graduate students acquire:***

- a solid grounding in the marine environment (compulsory activities);

- specialist knowledge enabling them to identify and develop specific methods of in-depth investigation and data analysis of particular aspects of the marine system (compulsory, multiple- choice, student-selected activities);

- knowledge of scientific methods and conceptual tools geared to identify, assess, manage, and avert risks and safeguard humanity and the environment (compulsory, multiple-choice, student- selected activities);

- the ability to apply the principles of sustainability and environmental ethics to tackle monitoring, control and management problems concerning the structure and functioning of marine and coastal environments, also in relation to human activities (compulsory multiple choice, student-selected activities);

- the skills required to assess resources and environmental impacts using the models and methods available to the natural sciences, social economics, legal studies and environmental planning (compulsory, multiple-choice, student-selected activities).

***The following activities will also help graduate students achieve their learning objectives:***

- individual study of specific subjects with the aid of academic literature and specialist international reviews;

- oral and/or written reports and individual or group seminars in English;

- independent hands-on use of specialist tools – IT systems, specific software – in institutional laboratories and in the field, completing retrieval and data-processing assignments of data available from online databanks;

- extramural activities such as internships/placements with companies, public administration facilities and laboratories, as well as study periods at non-Italian universities within the framework of international agreements.

The Master’s Degree course delivers teaching based on the scientific and cultural expertise available within the University and in light of specific requests from the labor market. The overall aim of the course is to create experts with specialist skills in a range of fields, such as:

1. Ecology and Marine Biology,

2. Earth Sciences,

3. Human and Natural Ecosystems,

4. Maritime Sociology.

**Expected learning outcomes are expressed with European Descriptors**

(Min. Decree 16/03/2007, art.3, para. 7)

***Knowledge and understanding, and applying knowledge and understanding Knowledge and understanding***

The knowledge and understanding gained during the Master’s Degree course builds on, and broadens to other sector disciplines, the competences gained during the first level (Bachelor’s) degree course, enabling graduate students to develop and apply methods of analysis, assessment and management in the marine environment. More specifically, graduates with a Master’s Degree will:

* be fully conversant with the scientific method and have a holistic understanding of the environment, especially the marine environment and related disciplines such as chemistry, bio-ecology, Earth Sciences, technology and assessment methods;
* be fully conversant with the methods of analysis used in the different disciplines and how differently sourced data can be represented and integrated into broader regional information systems;
* be able to assess data and information regarding marine ecosystems and understand the interaction between the natural world and the different aspects of human activity, with particular focus on the attendant social, legal and economic issues (legal and economic disciplines).

Knowledge and understanding are acquired by attending face-to-face classroom lectures, hands- on practical and laboratory sessions, seminars, internships/placements, and with individual study. The knowledge and skill sets acquired will be assessed by examination.

***Ability to apply knowledge and understanding***

Graduates of a Master’s Degree will acquire an in-depth understanding of environmental issues. They will be able to apply the innovative, interdisciplinary skills acquired to solve environmental problems. More specifically, graduates will be able to:

* operate autonomously in a managerial capacity in the marine, coastal or laboratory environment;
* apply assessment methods and investigation techniques to coastal and marine environments using tools from a range of allied scientific disciplines such as chemistry, biology, the Earth Sciences, ecology, legal studies and economics;
* plan monitoring, control and management activities in the marine environment and nearby coastal areas with a view to safeguarding humanity and the ecosystem from natural and manmade risks;
* apply ethical and sustainability criteria to assess humanity’s impact on the marine environment and the quality of its natural resources;
* promote and coordinate activities to support the environmental policies of public administrations and private bodies, and contribute to raising public awareness of the results of man's interaction with the environment;
* actively participate in integrated coastal management and successful maritime spatial planning, applying their expertise in environmental impact and strategic environmental risk assessments, pollutant control measures and treatment plant management, remediation programs, waste disposal management, and pollution cleanup techniques.

The ability to apply knowledge and understanding is achieved by attending face-to-face classroom lectures, hands-on practical and laboratory sessions, seminars, internships/placements, and with the preparation of a final dissertation.

Learning outcomes and the skill sets acquired will be assessed by examinations and a final dissertation.

**Marine Biological Sciences**

***Knowledge and understanding***

Graduates with a Master’s Degree will have an in-depth skill set in biology and ecology that includes the

sampling, analysis and investigation capabilities needed to characterize the biological/ecological features of a given environment and assess risks and hazard levels in marine and coastal areas. The course will also prepare graduate students in the biological assessment of water resources and their management. Other fields of knowledge will also be dealt with during the course.

***The ability to apply knowledge and understanding***

The knowledge and understanding acquired in marine biology and ecology will allow graduates to conduct basic and applied research in the marine sector, and include data on the biosphere in framework studies of the hydrosphere, geosphere, and atmosphere.

The Master’s Degree offers the following courses whose learning outcomes will be assessed by examination:

* Introduction to Marine Biology, BIO/5 - 6 credits
* Biodiversity and Marine Ecology, BIO/07 -12 credits
* Biodiversity module, BIO/07 - 6 credits
* Marine ecology module, BIO/07 - 6 credits
* Marine Invertebrate Zoology, BIO/05 – 6 credits
* Marine Vertebrate Zoology, BIO/05 – 6 credits
* Coastal and Marine Botany, BIO/01 – 6 credits
* Management of Aquatic Resources: Fisheries, BIO/07– 6 credits
* Marine Molecular Biology, BIO/11 – 6 credits
* Marine Environmental Microbiology, BIO/19 – 6 credits Marine Geological Sciences

**Marine geological sciences**

***Knowledge and understanding***

Graduates earning a Master’s Degree will have a knowledge and understanding of the geomorphology and geophysics required to conduct marine geological and geophysical characterization surveys in order to assess risks and hazard levels for continental platforms and slopes. Geobiology expertise, including sea-bed and water-column sampling techniques, will enable graduates to assess the interaction between the biosphere, hydrosphere, and geosphere, as well as gain an understanding of biogeochemical flows that allow comparison of present-day and past marine environments, also as a function of ongoing climate change.

***The ability to apply knowledge and understanding***

The knowledge and analytical capability acquired on the Master’s Degree course may be put to use to conduct basic and applied marine environment research in order to draw up geomorphological, bathymetric, sediment and geological surface maps, and to provide the geophysical, sediment and geomathical data needed for detailed habitat maps. Graduates will also be able to contribute significant data to analyze changes to marine ecosystems during the Pleistocene and Holocene. They will also be able to contribute to future scenario forecasting.

The Master’s Degree offers the following courses whose learning outcomes will be assessed by examination:

* Introduction to Marine Physical Geography, GEO/04 - 6 credits
* Physics of the Sea, FIS/06 - 6 credits
* Geobiology, GEO/01 – 6 credits
* Biofacies, GEO/01 – 6 credits
* Paleoceanography and Paleoclimatology, GEO/01 – 6 credits
* Applied Geomorphology and Habitat, GEO/04 – 6 credits
* Waves and Turbulence, GEO/12 – 6 credits
* Coastal Risks and Dynamics, ICAR/02 – 6 credits
* Applied Marine Geology, GEO/01 – 6 credits The Human and Natural Ecosystem

**Human and natural ecosystem**

***Knowledge and understanding***

Graduates of the Master’s degree course will have knowledge and skills in the social, legal, anthropic and political processes that have a bearing on marine, coastal and island regions and marine life. They will be familiar with the tools and models used in spatial analyses and social research, with particular emphasis on geopolitical issues regarding the sea, environmental change, resource protection, tourism, human ecology, island and coastal system, the law of the sea, and maritime sociology. Graduates will be able to understand and interpret these issues within the framework of the continual (and complex) processes of transformation that marine, coastal and island regions are undergoing in our contemporary age. They will also be able to understand the specificities of maritime life and manage the underlying complexities.

***Applying knowledge and understanding***

Students of the Master’s course will learn to operate with concepts deriving from different disciplines, enabling them to understand and work with the social and environmental interactions that characterize marine, coastal and island regions, namely: the geopolitics of the sea, risk management, the safeguard of anthropic systems, socio-environmental resilience, the impact of tourism on coastal areas, and the specificity and complexity of the social relations inherent to maritime activities. This body of knowledge can be put to use in a range of professional fields such as international relations, law and marine resources management.

The Master’s Degree offers the following courses whose learning outcomes will be assessed by examination:

* Chemistry of the Marine Environment, CHIM/12 - 6 CFU
* Coastal and Marine Hazard and Resilience, M-GGR/02 – 6 CFU
* Political Geography and Geopolitics of the Sea, M-GGR/02 – 6 CFU
* Human geography of Small Island Systems, M-GGR/01 – 6 CFU
* International Law of the Sea and Marine Environment Protection, IUS/13 - 6 CFU
* Food Law and Policy, IUS/10 – 6 CFU
* Coastal and Maritime Tourism, M-GGR/02 – 6 CFU
* Maritime Sociology, SPS/08 – 6 CFU

***Making judgments***

Graduates with a Master’s Degree will be able to work independently in positions of responsibility in the field of Marine Sciences. During the course, they will be trained to characterize and assess the reliability of information gathered, the level of uncertainty presented by data and assessments, and the complexity of the models available to solve specific problems. As a result, graduates will be able to make independent judgments regarding problems and put forward solutions even on the basis of limited or incomplete information. In addition, graduates will acquire an ability to assess the environmental and socio-economic consequences of choices and solutions. Learning objectives are attained by personal study and in-class discussion of real cases, internships, and preparation of the final dissertation. Achievement of the learning goals will be assessed by examination.

***Communication skills***

Graduates will be trained to communicate the results of their assessments and solution proposals succinctly and effectively, both to a specialist public at conferences or before colleagues, and to a general audience, such as customers or public meetings. They will learn how to dialogue with experts from allied sectors, recognizing and appreciating complementary views.

Graduates will be expected to prepare written papers on subjects th ey have researched independently as well as make oral presentations at seminars on specified topics. Written and oral communication skills will be assessed by examination.

***Learning skills***

The course will train graduate students how to locate and make use of the main sources of data and information in order to build their knowledge base and enable them to tackle environmental and social problems in the marine and coastal environment.

Graduate students will learn a scientific method that will serve as a tool with which to work by objectives, both as a team or independently.

Learning skills will be a focus throughout the course. The level of achievement will be assessed by examination and in light of the final dissertation.

**ART. 4 CAREER OPPORTUNITIES**

Career opportunities for Master’s Degree graduates include positions as marine environment analysis and management experts, marine biologists and ecologists, marine and coastal resources experts, marine and coastal environmental policy experts, and human relations experts in maritime activities.

**4.1 Functions**

Graduates with a Master’s Degree can find international level employment in both the public and private sectors in the assessment and management of marine systems subject to varying degrees of anthropic pressure.

The public sector offers diverse employment opportunities at several levels, ranging from jobs with central authorities, such as ministries and national research organizations, to posts with regional entities and different types of local administrations and bodies. Marine Science graduates will be qualified to occupy positions requiring an ability to assess the specific measures needed in a given environmental system in light of cost/benefit parameters and, in more complex situations, of social and economic considerations.

In the private sector, companies producing goods and services offer positions of responsibility involving the organization, assessment, and management of all issues connected with the interaction of company production operations with coastal marine systems.

Graduates with a Master’s Degree in Marine Sciences – Scienze Marine are admitted to the state examination (where this is a statutory requirement) to accede to certain professions.

**4.2 Competences**

The course will provide training in the following sectors:

* Natural resources: management of reserves and protected areas, tourism cultural training programs;
* Dissemination of scientific information;
* Coastal protection: regional planning, advisory services on coastal erosion, depletion of biodiversity on account of anthropic activity;
* Fisheries and aquaculture: provision of expert consultancy services on fishing activities and fish farming;
* Maritime spatial planning: advisory services on natural, social, legal and regional planning issues. Focus on: implementation of experimental projects, the use of key lab analysis techniques, data analysis, field sampling, national and international environmental safeguard regulations, specialist knowledge of species and habitats protected by national and international laws, expertise in key environmental management issues and the legal instruments covering them, environment characterization and impact assessment techniques, analysis of the specific social relations arising in the maritime transport and offshore infrastructure sector.

**4.3 Job Openings**

The Master’s Degree opens up job opportunities in both the public and private sectors. In the public sector, graduates can carry out scientific research in universities and research institutions, applied research and risk monitoring services with ministerial or local bodies with responsibility for the management of marine and coastal areas, consultancy on environmental issues and protected areas, and dissemination of scientific information.

In the private sector, there are employment opportunities with companies producing good and services offerings positions of responsibility involving the organization, assessment, and management of all issues involving interaction of company production operations with coastal marine systems. In particular, there are employment possibilities in: environmental consultancy and impact assessment of coastal and offshore infrastructure; management responsibilities in laboratories conducting environmental quality and food safety controls; advisory services on anthropic activities in coastal and marine areas; and scientific dissemination services.

The course prepares graduate students to the enter the following professions:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Program | | Category | | Professional Unit | |
| 2.3.1 | Life Science specialists | 2.3.1.1 | Biologists, Botanists, Zoologists and allied professions | 2.3.1.1.1 | Biologists and allied |
| 2.3.1 | Life Science specialists | 2.3.1.1 | Biologists, Botanists, Zoologists and allied professions | 2.3.1.1.6 | Zoologists |
| 2.3.1 | Life Science specialists | 2.3.1.1 | Biologists, Botanists, Zoologists and allied professions | 2.3.1.1.7 | Ecologists |
| 2.6.2 | University researchers and graduate technical operators | 2.6.2.2 | Researchers and graduate technical operators in life sciences and health | 2.6.2.2.1 | Researchers and graduate technical operators in the biological sciences |

**ART. 5 ADMISSION RULES**

Applicants to the Master’s Degree in Marine Sciences - Scienze Marine must possess a first-level, three-year (Bachelor’s) university degree or diploma, or a recognized qualification from a non-Italian institution.

More specifically, admission to the Master’s Degree course in Marine Sciences - Scienze Marine providing specialist knowledge and skills is subject to applicants being in possession of at least 18 credits (CFUs) testifying to a basic grounding in the following disciplines:

- Chemistry and allied areas (CHIM/01, CHIM/02, CHIM/03, CHIM/06),

- Biology and allied areas (BIO/01, BIO/05),

- Earth Sciences (GEO/04, GEO/07),

- Ecology and allied areas (BIO/03, BIO/07).

Candidate selection will be made on the basis of the applicants’ CV and an interview whose procedures will be established by the Course Board and published on the University website.

If, at the conclusion of the interview, the candidate is accepted for the course, a training path considered most suitable will be suggested.

The English language skills - equal to a B2 level - of candidates must also be certified by the University or an institution accredited by the University.

**ART. 6 ADMISSION PROCESS**

Assessment of applicants’ suitability to attend the course will be carried out by means of a written examination and an interview to evaluate their basic knowledge of geology, biology, chemistry and geography, all necessary prerequisites to complete the proposed course successfully. The preliminary exam and interview are also an opportunity to indicate areas requiring further study, and suggest personalized remedial study plans. Should candidates have significant knowledge gaps, they will be advised on the particular subjects/exams requiring further study in order to be accepted on the Master’s Course. Both the written examination and interview will be conducted in English. The dates and details of these will be posted on the Master’s Degree course website: http://www.disat.unimib.it.

**ART. 7 ORGANIZATION OF THE COURSE**

The Master’s Degree course in “Marine Sciences - Scienze Marine” entails 48 university credits (CFU), earned by successfully completing (compulsory) core subjects that together provide common interdisciplinary knowledge and competence in the field of environmental studies.

In addition, graduate students must take 4 “related or supplementary” subjects - 2 in the first, and 2 in the second year – that carry a further 24 educational credits (CFU).

12 more educational credits (CFU) are to be earned from student-selected learning activities, i.e. “independently chosen by the student”. 4 further credits are earned in “Training and Orientation learning activities” to be acquired with internships/placements pertinent to the preparation of the student’s final dissertation, to be carried out in Italian and/or international laboratories, companies, bodies and institutions with which the University has stipulated specific agreements. Another 4 credits have to be earned in the area of “further language skills”.

The Final Examination (the dissertation) carries 28 educational credits (CFU)

The course subjects are geared to investigating a range of environmental issues such as: marine environment sustainability; the sustainability of human activities and their effects on the marine environment; land-use management; assessing and managing marine resources; assessing the quality and remediation of coastal and marine environments; assessing the hazards posed by human activities; management of the effects of climate change.

**Course Structure**

**1st YEAR**

**COMPULSORY SUBJECTS**

* Chemistry of Marine Environment, CHIM/12 - 6 credits –1 exam
* Introduction to Marine Biology, BIO/05 - 6 credits – 1 exam
* Introduction to Marine Physical Geography, GEO/04 - 6 credits – 1 exam
* Biodiversity and Marine Ecology, BIO/07 -12 credits – 1 exam
* Biodiversity module - 6 credits
* Marine Ecology module - 6 credits
* Physics of the Sea, FIS/06 - 6 credits – 1 exam
* International Law of the Sea and Marine Environment Protection, IUS/13 - 6 credits – 1 exam

**STUDENT SELECTED COMPULSORY SUBJECTS**

Students must choose 2 of the following courses:

* Marine Invertebrate Zoology, BIO/05 – 6 credits – 1 exam
* Marine Vertebrate Zoology, BIO/05 – 6 credit – 1 exam
* Geobiology, GEO/01 – 6 credits – 1 exam
* Biofacies, GEO/01 – 6 credits – 1 exam
* Political Geography and Geopolitics of the Sea, M-GGR/02 – 6 credits – 1 exam
* Human Geography of Small Island Systems, M-GGR/01 – 6 credits – 1 exam
* Applied Geomorphology and Habitat, GEO/04 – 6 credits – 1 exam
* Marine Environmental Microbiology, BIO/19 – 6 credits – 1 exam

**2nd YEAR**

**COMPULSORY SUBJECTS**

* Coastal and Marine Hazard and Resilience, M-GGR/02 - 6 credits – 1 exam
* Subjects chosen by the student – 12 credits- (1 exam)
* Practical training - 4 credits
* Further linguistic knowledge – 4 credits
* Final examination – 28 credits

**STUDENT SELECTED COMPULSORY SUBJECTS**

Students must choose 2 of the following courses:

* Coastal and Marine Botany, BIO/01 – 6 credits – 1 exam
* Management of Aquatic Resources: Fisheries, BIO/07 – 6 credits – 1 exam
* Marine Molecular Biology, BIO/11 – 6 credits – 1 exam
* Applied Marine Geology, GEO/01 – 6 credits – 1 exam
* Paleoceanography and Paleoclimatology, GEO/01 – 6 credits – 1 exam
* Waves and Turbulence, GEO/12 – 6 credits – 1 exam
* Coastal Risks and Dynamics, ICAR/02 – 6 credits – 1 exam
* Food Law and Policy, IUS/10 – 6 credits – 1 exam
* Coastal and Maritime Tourism, M-GGR/02– 6 credits – 1 exam
* Maritime Sociology, SPS/08 – 6 credits – 1 exam
* Communication Skills and Interpersonal Relation Management, M-PSI/08 – 6 credits – 1 exam

**7.1 Core subjects**

The study course has compulsory core subjects covering the fields of “Biology” (6 credits), “Chemistry” (6 credits), “Earth Sciences” (6 credits), “Ecology” (12 credits), “Agricultural science, technologies and management” (6 credits), and “Legal, economics and evaluation methods" (12 credits).

**7.2 Related or supplementary subjects**

The study course also includes “related or supplementary” learning activities designed to complete students’ specialist training in fields such as Ecology and Marine Biology, Earth Sciences applied to the seas and oceans, the Geography of Marine, Coastal and Island Regions, and Maritime Sociology.

Pertinent scientific courses are: BIO/01 (6 credits), BIO/05 (12 credits), BIO/07 (6 credits), BIO/11 (6 credits), BIO/19 (6 credits), GEO/01 (24 credits), GEO/04 (6 credits), GEO/12 (6 credits), ICAR/02 (6 credits), IUS/10 (6 credits), M-GGR/01 (6 credits), M-GGR/02 (12 credits), SPS/08 (6 credits), M-PSI/08 (6 credits).

**7.3 Student-selected learning activities**

Students can earn 12 credits with learning activities of their choice, choosing either an internship pertinent to the preparation of the student’s final dissertation, to be carried out in Italian and/or international laboratories, companies, bodies and institutions with which the University has stipulated specific agreements, or, as an alternative, courses offered by the University’s various Master’s Degree courses. The student-selected learning activities are an integral part of the course and as such must be approved by the Teaching Coordination Council as consistent with the Master’s Degree Course. It should be noted that pursuant to the laws in force regarding the total number of examinations required to obtain the Master’s Degree, the evaluation obtained by students for their own-choice learning activities will count towards one examination only.

**7.4 Further language skills**

4 credits for “further language skills” can be earned as described below:

Italian students:

- passing a University foreign language examination, the equivalent of a B2 level, in either French,

Spanish or German or

- passing the University’s English language examination, the equivalent of a C1 level.

In both cases, students already in possession of language proficiency certificates testifying to language competence equivalent to or higher than a B2 level for French, Spanish or German, or equivalent to or higher than a C1 level in English, will be exonerated from sitting the further language skills exams and the credits already acquired will be recognized by the University for purposes of the Master’s Degree Course.

Non-Italian students:

- passing the University’s Italian language examination, the equivalent of a B2 level.

Students already in possession of language proficiency certificates testifying to language competence equivalent to or higher than a B2 level will be exonerated from sitting the further language skills exams and the credits already acquired will be recognized by the University for purposes of the Master’s Degree Course.

Details of the language examinations are established by the University and will be made available on the University website: http://www.unimib.it/go/262336.

**7.5 Teaching formats**

Achievement by students of the required competence and professional skill sets will be measured in university education credits. Credits represent the learning outcomes achieved by a full time student and include the learning activities delivered by the Master’s Degree Course, individual study and other personal learning activity. One credit (CFU) corresponds to 25 hours of work, calculated as hours of classroom lessons, exercises performed, seminars, internships, fieldwork, and individual study.

Teaching will be exclusively in English and will be delivered in a blended learning/mixed-mode format (both as face-to-face classroom and remote-teaching practices) as follows:

- face-to-face classroom lectures (in the classroom, videoconference, streaming), supported by multi- media audio-visual teaching aids;

- blended learning;

- exercises (also in blended learning);

- seminars;

- fieldwork.

Depending on the type of teaching activity, the hour/credit ratio is as follows:

- face-to-face classroom lectures: 1 credit = 7 hours

- exercises: 1 credit = 12 hours

- fieldwork: 1 credit = 10 hours

Internships and preparation of the final dissertation will have the following hour/credit ratio:

- internships: 1 credit = 25 hours

- preparation of final dissertation: 1 credit = 25 hours

**7.6 Assessment of learning outcomes**

Examinations may be:

- oral examinations

- oral and written examinations

Examinations are graded out of a total of 30, with pass grades ranging from 18 to 30. Internships and placements shall be subject to an “approval” by the responsible faculty member.

**7.7 Attendance**

Attendance of the Master’s Course is compulsory for at least 75% of the practical learning activities (classroom exercises in blended learning and field work) for each academic year of the course.

**7.8 Curriculum**

The curriculum comprises compulsory learning activities, compulsory but student-selected learning activities, and subjects chosen independently by the student in compliance with the course regulations.

Students are automatically assigned a statutory curriculum when they enroll in the first year. Student must then submit their own personal study plan, including an indication of the (compulsory) elective and self-selected subjects they intend to take.

Study programs must be approved by the Teaching Coordination Council.

Processes and deadlines for submitting study programs are decided by the University. Students may sit exams relating to the learning activities included in their last approved study program.

Additional information can be found in the University’s Regulations for Students.

**7.9 Compulsory first-hurdle requirements**

Students are advised to give priority to acquiring competences in the compulsory first-hurdle areas required for the first year.

**7.10 Guidance and Tutoring**

Tutoring by Faculty involved in the course is offered students especially in the first academic year to provide counseling on the choice of subjects.

**7.11 Schedules for learning activities and exam sessions**

At least eight exam sessions will be scheduled during the academic year in the periods when teaching is temporarily suspended. Examination sessions are scheduled as follows: 2 exam sessions at the end of the first semester (January/February), 2 sessions at the end of the lessons of the second semester (June/July), 2 sessions in September, and 2 exam sessions in the period when teaching is temporarily suspended (1 in March/April, and 1 in November). Up to 2 extraordinary exam sessions may be held at the motivated request of students.

The course is delivered in two semesters, generally during the following periods:

* First semester: From October to January;
* Second semester: From March to June.

The course timetable, exam session calendar – location, room and time – will be published on the website: www.disat.unimib.it

**7.12 Agreements on international student mobility**

Within the framework of special agreements, the Teaching Coordination Council promotes study periods at non-Italian universities in other countries. The following universities host students in the environmental and geological sciences as part of mobility agreements coming within Erasmus+ mobility program:

* Université Aix-Marseille
* Université Nice Sophia-Antipolis
* Universidad de Córdoba
* Czech University of Life Sciences, Prague – Faculty of Environmental Sciences
* University of Aberdeen
* Johannes Gutenberg Universität - Mainz
* Université d'Athènes Ethniko kai Kapodistriako Panepistimio Athinon
* Universiteit Utrecht

A cooperation agreement has also been stipulated between the Master’s Course and the Universidade Federal do Paranà (UFPR), Brazil, that also provides for student exchange arrangements.

A Memorandum of Understanding has also been stipulated with Rome’s Università “La Sapienza”.

In addition, at its meeting on February 24th 2017, the Teaching Coordination Council set up an Erasmus and Internationalization Commission coordinated by Prof. Daniela Basso.

Details of the opportunities available to students attending the course can be found on the following link: http://www.unimib.it/go/45776.

**ART. 8 FINAL EXAMINATION**

The final examination consists of a Final Dissertation, written by the student under the guidance of a Supervisor, and presenting original scientific data. The Final Dissertation must be written and discussed in English.

**ART. 9 FINAL EXAMINATION PROCEDURE**

The final dissertation will have an experimental approach and deal with a specific topic connected with the marine environment, and also reference the experience acquired during the internship period.

The final dissertation will be discussed at a public session, which may also be via conference call link, before a commission made up of Faculty members. The overall assessment for the entire Master’s Degree will be expressed on a 110-point scale, with eventual cum laude honors.

To be admitted to the Final Dissertation session, students must have earned the requisite number of credits for the training activities making up the course, which, together with the credits assigned for the final dissertation, will total 120 credits.

**ART. 10 RECOGNITION OF CREDIT POINTS (CFU) AND TRANSFERS**

Students transferring from another study course may submit a request for previously earned education credits to be recognized as valid for the new course. The request will be examined by a special committee appointed by the Teaching Coordination Council. Credit recognition will depend on the extent to which the previous course aligns with the new course the student intends to attend. Partial recognition of a teaching activity may be awarded.

At least 50% of student credits obtained from degree courses of the same program will be recognized (Min. Decree nr. 155 of 16/03/2007).

In compliance with Min. Decree 270/2004 and Law 240/2010, universities may recognize as university education credits individually certified professional skills and abilities pursuant to the relevant regulations in force and other skills and abilities acquired during post-secondary learning activities that the university helped design and deliver, for a maximum of 12 credits, taking into account both first-level (Bachelor’s) and Master’s Degrees.

Any proposal by the examining committee to recognize such credits must be approved by the Teaching Coordination Council that appointed the committee.

**ART. 11 RESEARCH ACTIVITIES SUPPORTING CORE COURSE LEARNING ACTIVITIES**

National and international multidisciplinary research is carried out by the University in the following areas:

- Physics: Environmental Physics, Atmospheric Physics, Physics of the Sea, and Physics of Climate.

- Chemistry: Chemical Physics of the Environment; Computational Chemistry; Low Environmental- impact Processes; Environmental Chemistry; Atmospheric Chemistry; Analysis and Reactivity of Organic Micropollutants.

- Earth Sciences: Marine Geomorphology; Geosphere-biosphere Interaction, Risk Assessment of Exogenous and Endogenous Processes; Climate Change; Geographic Spatial Analysis; Geographic Information Systems Applied to Environmental Processes.

- Ecology: Marine Ecology; Landscape Ecology; Marine Biodiversity; Marine Resource Management.

- Biology: Environmental Botany; Marine Invertebrate Zoology; Bio-indicators and Biodiversity; Fauna Monitoring and Management; Ecological Networks; Environmental Microbiology.

- Law: International Law; Maritime Law; Environmental Law.

- Geography, Sociology and Psychology.

The Departments conduct numerous national and international research projects. For details, please go to the website: www.disat.unimib.it

**ART. 12 FACULTY**

Faculty from the Università degli Studi di Milano - Bicocca

BASSO DANIELA MARIA, PA, GEO/01

BENZONI FRANCESCA, RU, BIO/05

BOLZACCHINI EZIO, PA, CHIM/12

CITTERIO SANDRA, PA, BIO/01

CORSELLI CESARE, PO, GEO/01

DELL'AGNESE ELENA, PA, M-GGR/01

FRANZETTI ANDREA, PA, BIO/19

GALLI PAOLO, PA, BIO/07

GRASSO MARCO, PA, M-GGR/02

MALINVERNO ELISA, RU, GEO/01

ORLANDI IVAN, RU, BIO/11

PASQUERO CLAUDIA, PA, GEO/12

SAVINI ALESSANDRA, RU, GEO/04

SCHMIDT MULLER DI FRIEDBERG MARCELLA, PA, M-GGR/01

SCOVAZZI TULLIO, PO, IUS/13

STREPPARAVA MARIA GRAZIA, PA, M-PSI/08

Faculty from the Maldives National University - MNU

MOHAMED SHAZLA, (BIO/07)

RIYAZ MAHMOOD, (BIO/05)

Faculty from other Universities and Research Organizations:

DEL RIO-RODRIGUEZ RODOLFO ENRIQUE, (BIO/07), University Of Campeche, Mexico PEREIRA PEREIRA BOEGER WALTER ANTONIO, (BIO/11), Universidad de Paranà, Brasil

Course Faculty:

BASSO DANIELA MARIA, PA, GEO/01 - (1.0)

BENZONI FRANCESCA, RU, BIO/05 - (1.0)

GALLI PAOLO, PA, BIO/07 - (1.0)

MALINVERNO ELISA, RU, GEO/01 - (1.0)

PASQUERO CLAUDIA, PA, GEO/12 - (1.0)

SAVINI ALESSANDRA, RU, GEO/04 - (1.0)

MOHAMED SHAZLA, (BIO/07) - (1.0)

**ART. 13 USEFUL INFORMATION**

The address of the Master’s Degree course in Marine Sciences - Scienze Marine:

Dipartimento di Scienze dell'Ambiente e della Terra (Department of Earth and Environmental Sciences) – Edificio U1 e U4 – Piazza della Scienza, nr. 1 e 4 – zip code. 20126 Milan, Italy.

Director of the Faculty Committee:

Prof. Cesare Corselli

Director of the School of Science:

Prof. Andrea Zanchi

Director of the Department of Earth and Environmental Sciences (Scienze dell'Ambiente e della Terra):   
Prof. Marco Orlandi

More information can be found on the website: <http://www.disat.unimib.it> - [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q)

Enrolment procedures and deadlines, information regarding transfers, and instructions for submitting Study Programs can be found at www.unimib.it.

These Regulations are subject to minor amendments. More specifically, self-chosen subjects will be accepted only if the minimum number of student enrolments is reached.

The tables below describe learning activities based on their type, field and scientific sector, and breakdown by course year.

## Structure of the course

### ****1st Year****

| **COMPULSORY SUBJECTS (1st Year)** | **YEAR** | **SSD** | **Credits** | **Sem.** |
| --- | --- | --- | --- | --- |
| [F7502Q001] –Chemistry of Marine Environment | 1 | CHIM/12 | 6 | 2 |
| [F7502Q002] –Introduction to Marine Biology | 1 | BIO/05 | 6 | 1 |
| [F7502Q003] – Introduction to Marine Physical Geography | 1 | GEO/04 | 6 | 1 |
| [F7502Q004] – Biodiversity and Marine Ecology | 1 | BIO/07 | 12 | 1 |
| [F7502Q005] – Physics of the Sea | 1 | FIS/06 | 6 | 1 |
| [F7502Q006] – International Law of the Sea and Marine Environment Protection | 1 | IUS/13 | 6 | 1 |
| **COMPULSORY SUBJECTS** **TO CHOOSE (two 1st Year – 12 Credits)** | | | | |
| [F7502Q011] – Marine Invertebrate Zoology | 1 | BIO/05 | 6 | 2 |
| [F7502Q012] – Marine Vertebrate Zoology | 1 | BIO/05 | 6 | 2 |
| [F7502Q013] – Geobiology | 1 | GEO/01 | 6 | 2 |
| [F7502Q014] – Biofacies | 1 | GEO/01 | 6 | 2 |
| [F7502Q015] – Political Geography and Geopolitics of the Sea | 1 | M-GGR/02 | 6 | 2 |
| [F7502Q016] – Human Geography of Small Islands | 1 | M-GGR/01 | 6 | 2 |
| [F7502Q021] – Applied Geomorphology and Habitat | 1 | GEO/04 | 6 | 2 |
| [F7502Q035] – Marine Environmental Microbiology | 1 | BIO/19 | 6 | 2 |

### ****2nd Year****

| **COMPULSORY SUBJECTS (2nd Year)** | **YEAR** | **SSD** | **Credits** | **Sem.** |
| --- | --- | --- | --- | --- |
| [F7502Q007] – Coastal and Marine Hazard Resilience | 2 | M-GGR/02 | 6 | 2 |
| **COMPULSORY SUBJECTS** **TO CHOOSE (two 2nd Year – 12 Credits)** |  |  |  |  |
| [F7502Q017] – Coastal and Marine Botany | 2 | BIO/01 | 6 | 1 |
| [F7502Q018] – Management of Aquatic Resources: Fisheries | 2 | BIO/07 | 6 | 1 |
| [F7502Q019] – Marine Molecular Biology | 2 | BIO/11 | 6 | 1 |
| [F7502Q020] – Paleoceanography and Paleoclimatology *(activate 2018/2019)* | 2 | GEO/01 | 6 | 1 |
| [F7502Q022] – Waves and Turbulance | 2 | GEO/12 | 6 | 1 |
| [F7502Q023] – Coastal Risks and Dynamics | 2 | ICAR/02 | 6 | 1 |
| [F7502Q024] – Food Law and Policy | 2 | IUS/10 | 6 | 2 |
| [F7502Q025] – Coastal and Maritime Tourism | 2 | M-GGR/02 | 6 | 1 |
| *[F7502Q026] –* *Maritime Sociology (deactivate)* | *2* | *SPS/08* | *6* |  |
| [F7502Q027] – Communication Skills and Interpersonal Relation Management | 2 | M-PSI/08 | 6 | 2 |
| [F7502Q029] – Applied Marine Geology *(activate 2018/2019)* | 2 | GEO/01 | 6 | 1 |
| **Subject to Choice of the Student (12 Credits) Practical training** [F7502Q008] – Practical Training (4 Credits)  **Further Linguistic Knowledge to choose  (4 Credits)** [F7502Q030] – Further Linguistic Knowledge – English – C1 Level (Or Higher) [F7502Q031] – Further Linguistic Knowledge – French – B2 Level (Or Higher) [F7502Q034] – Further Linguistic Knowledge – Italian – B2 Level (Or Higher) [F7502Q033] – Further Linguistic Knowledge – Spanish – B2 Level (Or Higher) [F7502Q032] – Further Linguistic Knowledge – German – B2 Level (Or Higher)  **Final Examination** [F7502Q010] – Final Examination (28 Credits) | | |

**Syllabus Subjects**

1st YEAR

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **CHEMISTRY OF MARINE ENVIRONMENT** | **F7502Q001** | **6** | **1** |
| **Lecturers:  Dott. Luca Ferrero** | | | |
| Aims The course aims to provide students with knowledge about the processes and mechanisms that regulate the chemical composition of the sea and oceans. Contents The course CHEMISTRY OF MARINE ENVIRONMENT provides an understanding of the chemical composition of seawater. Equlibrium and steady state conditions in aqueous solution are discussed. A particular attention is given to priority pollutants. Detailed program Properties of Water. Isotopes in seawater. Salinity and major constituents of seawater. Air-sea exchange of gases. Equilibrium and steady state models. Acid-base reactions. pH, chemical composition, buffer intensity in seas and oceans: CO2,HCO3-, CO32- equilibria in oceans and seawater. Log C – pH diagrams. Acidity and alkalinity. Concept of ocean acidification. Solubility, solubility-pH diagrams. Trace metals; metal ions speciation. Redox reactions in seawater. Organic matter in the sea. Nutrients. Microplastics. Organic pollutants (i.e. hydrocarbons, pesticides, dioxins and PCBs, flame retardants, and endocrine substances). Atmospheric-ocean interaction: marine aerosols and their photochemistry and atmospheric aerosol as a source of nutrients. Geo-engineerng climate and the oceans. Prerequisites Basics of inorganic and organic chemistry. Teaching form Frontal lessons. Textbook and teaching resource Slides and two textbooks:  1- An Introduction to the Chemistry of the Sea, 2nd ed., Michael EQ Pilson, Cambridge University Press, 2013.  2- Chemical Oceanography, 4th Ed., Frank J. Millero, CRC press, Taylor & Francis Group, 2013 Semester Second semester. Assessment method Oral exam with written parts. Office hours Office at 3rd floor of U1 building (Piazza della Scienza 1, Milano). Office hours usually 10:30-12:30 a.m. on tuesdeay. More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **INTRODUCTION TO MARINE BIOLOGY** | **F7502Q002** | **6** | **1** |
| **Lecturer:  Prof. Mahmood Ryiaz** | | | |
| Aims This course examines different biological and ecological aspects and processes of ocean ecosystems. Topics include the distributions, abundances, and interactions of marine organisms characterizing the main zones and the different systems of the marine environment. The impact of multiple stressors and the problems affecting the marine habitats are also discussed. Contents Patterns in the Marine Environment, Secondary Production, Rocky and Sandy Shores, Pelagic Ecosystems, Continental Shelf Seabed, Deep sea, Fisheries, Disturbance, Pollution and Climate Change Detailed program **Patterns in the Marine Environment**  Introduction, Biogeography, Biodiversity, Abundance and size.  **Secondary Production**  Introduction, Measuring secondary production, Drivers of secondary production, Size structuring in marine food-webs, Human impacts on secondary production.  **Rocky and Sandy Shores**  Introduction, What is the shore?, Environmental gradients and the shore, Causes of zonation, The organization of shore communities, The shore network, The future of rocky and sandy shores.  **Pelagic Ecosystems**  Introduction, Definition and environmental features, Pelagic inhabitants: consequences of size, Temporal and spatial variability in pelagic ecosystems, Sampling the open ocean, Pelagic fisheries, Regime shifts in pelagic marine ecosystems, The future of pelagic marine ecosystems.  **Continental Shelf Seabed**  Introduction, Definitions and environmental features, The seabed habitat and biota, Food webs in shelf systems, Characterization of seabed communities, Specific habitats.  **Deep sea**  Introduction, Definitions and environmental features, Food supply to the deep sea, The organisms of the deep sea, Hydrothermal vents-islands in the deep sea.  **Fisheries**  Introduction, Global fisheries, Fish production, Fished species and their fisheries, Fish population biology, fishing methods, Fish stock assessment, the management process, environmental impacts of fishing.  **Disturbance, Pollution and Climate Change**  Introduction, Ecological role of disturbance, Measuring the effects of human activities, Agents of change, Climate change, Interaction of multiple factors. Prerequisites None. Teaching form Lectures. Textbook and teaching resource Slides with the support of the book:   * Marine Biology: Function, Biodiversity, Ecology (3°edition). Jeffrey S. Levinton, Oxford University Press * Marine Ecology: Processes, Systems, and Impacts (2° edition). Michel J. Kaiser et al., Oxford University Press * Scientific Papers  Semester First semester. Assessment method Oral examination  Mark range:18-30/30 Office hours By appointment by sending an email to the teacher. More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **INTRODUCTION TO MARINE PHYSICAL GEOGRAPHY** | **F7502Q003** | **6** | **1** |
| **Lecturer:  Prof.ssa Alessandra Savini** | | | |
| Aims Provide knowledge on the processes that form and shape coastal and submarine landforms, controlling their short-term and llong-term evolution through time. Provide a basic knowledge about seafloor mapping techniques and methods for submarine geomorphological mapping. Contents - Data and methods in Marine Geomorphology. Seafloor mapping, seafloor sampling and visual surveys: tools and survey design.  - Coastal landforms and processes. Beach and nearshore systems, coastal sand dunes, delta and estuaries, barrier systems. Rocky coasts and coral reefs.  - Submarine landforms and processes. Drivers of seafloor geomorphic change in submarine environment (tectonic, sedimentology, oceanography and biology). Continental shelf landforms, submarine landslides, submarine canyons and gullies, channel and fans, contouritic drifts, oceanic islands and seamounts, mid-ocean ridges, fluid-escape features, abyssal hills and plains, trenches, bioconstructions. Detailed program **Frontal lectures (4 CFU - 28 hours):**  Introduction: Marine Phyisical Geography, Oceanography and Marine Geomorphology.  Research methods in submarine geomorphology. Seafloor mapping, seafloor sampling and visual surveys: tools and survey design  Geomorphology of the ocean seafloor. A global map of the ocean seafloor and classification of large-scale submarine landforms (continetal margins, oceanic islands and seamounts, mid-ocean ridges, abyssal hills and plains, trenches).  Drivers of seafloor geomorhpic changes in submarine environments. Winds and ocean circulation (effects on coastal and submarine landforms). Waves and tides. Sea-level changes (geomorphological indicators). Submarine sedimentary processes, environments and landforms: Continental shelf landforms, Contourites, sediment waves and bedforms, resedimentation processes, submarine slides, submarine canyons and gullies, channel and fans. fluid escape features.  Coastal systems: terminolgies and classification of coastal systems. Delta, estuaries and beaches. Rocky coasts and coral reefs.  **Laboratory lectures (2 CFU - 24 hours):**  Submarine geomorphological mapping: techniques and methods for data acquisition and processing. Prerequisites Fondamenti di matematica, fisica e chimica. Teaching form - Lessons: 4 credits  - Tutorials: 2 credits Textbook and teaching resource  * Alan P. Trujillo & Harold V. Thurman. Essential of Oceanography. Pearson * Micallef A., Krastel S., Savini A. Submarine Geomorphology. Springer * D.A.V. Stow, H.G. Reading, Collinson J.D – Deep Seas. In: H.G. Reading, Sedimentary environment: Processes, Facies and Stratigraphy (Cap. 10). Blackwell Science. * NC Mithcell. Submarine Geomorphology. Elsevier * G. Masselink & Hughes M.G. An introduction to coastal processes and geomorphology. Cambridge * A selection of scientific journal articles will be provided by the teachers.  Semester First semester. Assessment method Oral examination. Office hours Thursday 10:30-12:30 am. More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **BIODIVERSITY AND MARINE ECOLOGY** | **F7502Q004** | **12** | **1** |
| **Course Part I: BIODIVERSITY  Course Part II: MARINE ECOLOGY** |  | **6 6** | **1** |
| **Lecturers:  Prof. Paolo Galli, Dott. Simone Montano, Dott. Davide Seveso, Prof. Shasla Mohamed** | | | |
| Aims This course examines biological aspects of ocean ecosystems and the physical processes that regulate them. Topics include the distributions, abundances, and interactions of marine organisms; interactions between organisms and the transformation and flux of energy and matter in marine ecosystems; and aspects of physiology related to marine species distributions, abundances and roles.  Lectures facilitate understanding  1) the complex nature of the process that affect and control marine biodiversity;  2) become familiar with multiple definitions and measures of marine biodiversity;  3) identify threats to marine biodiversity and what mechanisms are developing to identify and manage biodiversity loss;  4) of the impact and rapid spread of non-indigenous marine species, methods of introduction and spread, and current control measures;  5) gain knowledge of how major fisheries management programs relate to biodiversity loss and conservation.  6) measure the success/failure of current action strategies, such as Marine Protected Areas, by applying lessons learned and incorporation of emerging methods and data sources. Contents **Course part I**  Introduction to Marine Biodiversity; Biodiversity of Plankton, Benthos and Nekton; Spatial and Temporal Patterns of Marine Biodiversity; Global threats and for global Biodiversity and Anthropogenic Impacts; Coral Reef's biodiversity; Marine fisheries and Biodiversity.  **Course part II**  Processes of Marine Organisms and Systems, Primary Production in Marine Environments, Structure and Dynamics of Marine Communities, Functioning of Marine Ecosystems. Detailed program **Syllabus Course part I: Biodiversity**  **1- Introduction to Marine Biodiversity**  Definition of Biodiversity , Who “owns” Biodiversity?  How is it measured and why is it important: Genetic diversity; how is it defined/measured? genes, populations; Species diversity; how is it defined/measured?;  Ecosystem diversity; Functional diversity; The magnitude of the known marine biodiversity  **2- Marine Biodiversity – Plankton, benthos, nekton**  Planktonic diversity classification by size, distribution, lifestyle, general description of the realm, major taxa, magnitude of diversity and biodiversity functioning; Benthos diversity classification by size, distribution, habitat, lifestyle, feeding behaviour. General description of the realm, major taxa, magnitude of diversity and biodiversity functioning; Nekton diversity classification by, size, distribution, habitat, lifestyle, feeding behaviour. General description of the realm, major taxa, magnitude of diversity and biodiversity functioning.  **3- Spatial and Temporal pattern of Marine Biodiversity and Conservation of the Ocean**  ***Spatial and temporal patterns***  Factor in Biodiversity (speciation-extinction); Biogeographic factors; Major gradient of species diversity (latitudinal, longitudinal, bathymetric); Explanation of regional diversity differences; Expansion and Extinction in the Past; How extinctions change biodiversity: (a) Two kinds of extinctions; natural, induced – extinction rate-(b) The implications of extinction-(c) Earth's past mass extinction events - (d) The current mass extinction event - (e) Generalizations we can draw from past extinction events.  ***Conservation of marine biodiversity***  Value of Marine Biodiversity; Why is important? Ecosystem function and services; The shifting baseline concept; What is an endangered species; The IUCN red list; CITES; Conservation strategies (MPAs)  **4- Global Threats for Global Biodiversity and Anthropogenic Impacts**  ***Threats to Marine Biodiversity***  Human effects on Marine Environment; Pollution (toxic metals, pesticides, herbicides); the problem of the Plastic; Biological Invasion; Nutrients and Eutrophication; Global Environmental Change and the Ocean.  ***The Hidden Diversity of the Coral Reef***  The Holobiont (members and habitats); The coral probiotic Hypothesis; The Hologenome theory of evolution; The coral Symbiome; Impact of Environmental stress on the coral Symbiome  ***The coral diseases***  Terminology and definitions; History and actual distribution; Koch’s postulates; Skeleton Eroding Band, Brown Band Disease, White Syndrome, Ulcerative White Spot, Black Band Disease, Tumors; Divers of coral disease outbreaks; Vectors and Reservoirs; Management issue and Actions  **5- Marine Fisheries and Biodiversity**  ***Fisheries and food from the Sea***  What is a fishery; Stock - a key concept; Fishing techniques and their effects (Longline fishery, Purse seine, Trawls, Gill nets); Magnitude and Impacts  ***Marine Fisheries and Biodiversity – Overfishing***  Definitions; Vulnerable resource species; The case: Terranova Grand banks; The impact of the overfishing; The case of Tuna fisheries; The waste; The food fraud; Illegality: shark finning, flag of convenience, IUU definitions  ***Marine* *Fisheries and Biodiversity – Fishing Management***  Aged-based population; Closures and quotas- quotas and Individual transferable quotas; Mariculture; MPAs;  The roles of consumers.  **Syllabus Course part II: Marine Ecology**  **1 - Processes in Marine Ecosystem**  ***Ecological and Evolutionary Principles of Marine Biology***  Ecological interactions; Interactions on the scale of individuals; The population level; The community level: structure and interspecies interactions; The ecosystem level  ***The Chemical and Physical Environment***  Measures of physiological performance; Temperature; Salinity; Oxygen; Light  ***Reproduction, Dispersal, and Migration***  Ecological and evolutionary factors in sex; Reproduction, demography, and life cycles; Migration; Larval dispersal at different scales  ***Primary Production Process and Critical Factors in Plankton Abundance***  Photosynthetic marine organisms; Light and photosynthesis; Patchiness of the plankton; The seasonal pattern of plankton abundance; Water column parameters and the spring diatom increase; Nutrients required by phytoplankton; Rate of nutrient uptake; Harmful algal blooms; Phytoplankton succession and the paradox of phytoplankton coexistence; Global trend of primary production; Measuring primary productivity; Zooplankton grazing in the sea  ***Food Webs and Microbial Ecology – The Decomposition Process***  Food chains and food webs; Decomposition process; Key organisms in the oceanic microbial food webs; Microbial food webs dynamics; The seasonal cycle of production and consumption  **2 - Systems in Marine Ecosystem**  ***Seaweeds and Kelp Forests***  Morphology; Production and life cycle; Classification; Factors affecting growth; Kelp forests  ***Seagrass Meadows***  Morphology; Adaptations to marine life; Distribution, taxonomy and evolution; Factors affecting growth; Succession; Seagrass Ecology and Functions; Seagrass grazing; Decline of seagrasses and restoration  ***Mangrove Forests***  Classification; Zonation; Adaptations and reproduction; Associated organisms; Functions and services; Impacts on mangrove forests  ***Coral Reefs***  Coral polyp; Symbiosis with zooxanthellae and calcification; Coral growth and reproduction; Factors limiting the growth; Distribution of coral reefs; Coral reef development and types; Zonation; Biological interactions in coral reef ecosystem; Bioerosion and corallivory  ***The Water Column: Marine Vertebrates and Other Nekton***  Cephalopods; Fish; Mammals; Marine birds and reptiles Prerequisites None. Teaching form - Lessons: 4 + 4 credits  - Tutorials: 2 + 2 credits Textbook and teaching resource - Lesson slides (power point presentations)  - Marine Biology: Function, Biodiversity, Ecology (3°edition). Jeffrey S. Levinton, Oxford University Press  - Marine Ecology: Processes, Systems, and Impacts (2° edition). Michel J. Kaiser et al., Oxford University Press  ‑ Scientific Papers Semester First semester. Assessment method Oral examination (18-30/30) Office hours Monday 08:30-10:30 (Biodiversity)  [Monday 10.30-12.30 (Marine Ecology)](http://elearning.unimib.it/course/view.php?id=16869" \o "Enter)  [Lab. 2030 (U3) – 0264483433](http://elearning.unimib.it/course/view.php?id=16869" \o "Enter)  [Office R032 (U9) – 0264483308](http://elearning.unimib.it/course/view.php?id=16869" \o "Enter) More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **PHYSICS OF THE SEA** | **F7502Q005** | **6** | **1** |
| **Lecturer:  Prof.ssa Claudia Pasquero** | | | |
| Aims Provide basic knowledge of the physics of the oceans. Show the usefulness of mathematical and physical models for the description and the understanding of geophysical fluid dynamics. Provide basic knowledge of oceanographic data formats and processing and visualization tools (netcdf files, Matlab scripts). Contents In the first part of the course fundamental physical properties of the ocean will be introduced. The second part will be basic geophysical fluid dynamics, with the discussion of solutions to approximations relevant for the description of the ocean circulation. Observational data analysis through the Matlab program will be performed in the laboratory. Detailed program *Ocean Physics:*Light and sound propagation. Temperature and salinity. Equation of state. Stratification. Tracer distribution. Heat fluxes. Water masses. T-S diagrams.  *Oceanic Dynamics:* Navier-Stokes equation. Mass conservation. Hydrostatic approximation. Geostrophic. Thermal wind equation. Vorticiity. Boundary layer. Large scale circulation and winds. Subtropical and subpolar gyres. Western boundary currents. Gravity waves. Rossby and Kelvin waves. Turbulent fluxes.  *Ocean data analysis:* Introduction to ocean databases, use of netcdf files through the software program Matlab, introduction to spatio-temporal data analysis, visualization of ocean maps. Prerequisites None. Teaching form Frontal lecture.  Computer lab. Textbook and teaching resource - Stewart, “Introduction to Physical Oceanography”, freely available on line.  - Marshall and Plumb “Atmosphere, Ocean, and Climate Dynamics”, Academic Press (2008)  - Vallis “Atmospheric and Oceanic Fluid Dynamics”, Cambridge UNiv. Press (2006) Semester First semester. Assessment method Oral exam.  Computing project. Office hours Contact the instructor. More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **INTERNATIONAL LAW OF THE SEA AND MARINE ENVIRONMENT PROTECTION** | **F7502Q006** | **6** | **1** |
| **Lecturers:  Prof. Tullio Scovazzi, Dott.ssa Ilaria Tani** | | | |
| Aims The aim is to provide students who have a scientific background with some basic knowledge of the international legal regime that presently applies to marine spaces, with particular emphasis on the protection of the marine environment. Contents The legal regime of the seas at the world basis, as resulting from the 1982 United Nations Convention on the Law of the Sea.  A regional system for the protection of the marine environment, as resulting from the 1976-1995 Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean. Detailed program 1. The international legal dimension of the sea under the United Nations Convention on the Law of the Sea (Montego, 1982):  - internal maritime waters;  - territorial sea;  - exclusive economic zone;  - high seas;  - seabed beyond national jurisdiction as common heritage of mankind.  2. Maritime boundaries.  3. The protection of the marine environment (ecosystems and species):  - pollution from ships;  - pollution from land-based sources;  - pollution from dumping;  - pollution from mineral exploitation activities on the seabed;  - the establishmebnt of marine protected areas.  4. Regional co-operation in the Mediterranean Sea:  - the Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and its Protocols;  - the Agreement on the Conservation of Cetaceans of the Mediterranean Sea, the Black Sea and the Contiguous Atlantic Area;  - the General Fisheries Commission for the Mediterranean. Prerequisites None. Teaching methods Oral classes with active involvement of the studens who are requested to analize and comment the relevant legal instruments. Textbooks and Reading Materials A number of papers and the relevant legal texts are collected in a syllabus that is distributed to the students. Semester First semester. Assessment method Oral exam. Office hours By appointment. More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **MARINE INVERTEBRATE ZOOLOGY** | **F7502Q011** | **6** | **1** |
| **Lecturers:  Dott.ssa Francesca Benzoni, Dott. Andrea Galimberti** | | | |
| Aims This course examines a wide panel of topics related to marine invertebrates and their symbiotic, environmental, and functional roles and interactions. The aim of the course is to provide concepts and applications in a context of modern zoology. Apart from classic systematics and base concepts for each invertebrate phylum, the course program covers many applicative issues related to these animals, ranging from bioprospecting activities to management and control of invasive species and cryptic ones. Contents Zoology deals with the study of animals (in this specific cours, the invertebrate ones). There could be many ways to treat such a wide topic. In this course, the systematics aspects are reduced to the very essential aspects, while more detailed information will be provided concerning the structure, biodiversity and interactions typical of each invertebrate phylum. Bioprospecting and conservation issues will be also discussed. Detailed program INTRODUCTION TO MARINE INVERTEBRATE ZOOLOGY [A. GALIMBERTI]  - Importance of zoology  - Basic concepts (bauplan, evolution, diversity and interactions)  MARINE INVERTEBRATE PHYLA: SYSTEMATICS AND PRINCIPAL CHARACTERISTICS [A. GALIMBERTI]  - Protozoa  - Parazoa (Porifera and Placozoa)  - Eumetazoa and Radiata  - Platyhelminthes and Nemertea  - Rotifera and Nematoda  - Mollusca  - Annelida  - Arthropoda  - Lophophorata  - Echinodermata  A FOCUS ON CNIDARIANS [F. BENZONI]  SYMBIOSES BETWEEN MARINE INVERTEBRATES AND UNICELLULAR ALGAE [F. BENZONI]  MARINE INVERTEBRATES AND BIOCONSTRUCTION [F. BENZONI]  MARINE INVERTEBRATES AS PESTS AND INVASIVE SPECIES (CONTROL AND MANAGEMENT ISSUES) [F. BENZONI]  THE HIDDEN BIODIVERSITY OF MARINE INVERTEBRATES [F. BENZONI]  SYMBIOSES INVOLVING MARINE INVERTEBRATES AND BACTERIA [A. GALIMBERTI]  - Intracellular symbioses (base concepts)  - Nutritional symbioses  - Bioluminescent symbioses  APPLICATIVE ZOOLOGY: E-DNA AND MOLECULAR-BASED ADVANCES IN THE STUDY MARINE COMMUNITIES [A. GALIMBERTI] Prerequisites None. Teaching form Frontal lessons. Textbook and teaching resource PDF lessons, videos, and supporting scientific papers provided on the e-learning platforms. Semester Second semester. Assessment method Oral examination at the end of the course. There are no intermediate tests. The exam starts with the discussion of a recent research paper dealing with the topics presented in the course and will continue by discussing the other arguments of the course. Office hours Upon request by email to the teachers. More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **MARINE VERTEBRATE ZOOLOGY** | **F7502Q012** | **6** | **1** |
| **Lecturers:  Dott. Alessandro De Maddalena, Dott.ssa Elena Agnese Valsecchi** | | | |
| Aims The course aims to allow students to:  1) recognize and be able to classify the major groups of marine vertebrates in the wild;  2) learn specialized terminology and basic concepts of the zoology of these groups of organisms;  3) understand selected external and internal structures which allow adaptation to the aquatic environment;  4) learn about methodologies of study of these classes of organisms in the wild and measures taken for their conservation. Contents The course covers marine vertebrates’ systematics, evolutionary history, anatomy, physiology, behavior, conservation and research. Detailed program This course is an introduction to the biology of marine vertebrates. It is structured in two modules, the first dealing with fish sea birds (run by Dr De Maddalena) and the second (run by Dr Valsecchi) regarding marine mammals and marine reptiles. Both sections cover a sampling of various taxonomic groups, their evolutionary relationships and biology including anatomy and physiology, adaptation to the aquatic environment (for marine mammals and marine reptiles), behavior, ecology and conservation. Prerequisites Basic biology notions. Teaching form 42 hours (21 + 21) frontal lessons. Textbook and teaching resource Source material can be found in the following books:  - "Sharks of Maldives" by De Maddalena A, Editoriale Magenes  - "FishBase", Froese R and Pauly D, www.fishbase.org  - "The Diversity of Fishes. Biology, Evolution and Ecology" by Helfman G.S., Collette B.B., Facey D.E., and Bowen B.W., Wiley-Blackwell Publishing  - “Marine Mammals Evolutionary Biology” by Berta A and Sumich JL, Academic Press  - “Biology of Marine Mammals” by Reynolds JE and Rommel SA, Melbourne University Press  - “Marine Mammals of the World. Systematics” Semester Second semester: March to May 2018. Assessment method Oral and written exam.  It will be carried out first the oral exam (normally 10 questions, 5 for each section: Marine Mammals and Reptiles, Fish and Marine Birds). The written test will be followed, on the same day, by few question from both Prof, Valsecchi and Prof. De Maddalena. Office hours Mondays from 11.00am till noon. More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **GEOBIOLOGY** | **F7502Q013** | **6** | **1** |
| **Lecturers:  Prof.ssa Daniela Basso** | | | |
| Aims To provide the main concepts for understanding the interactions and the coevolution of biosphere, hydrosphere and geosphere.  To acquire the conceptual and operative knowledge for the study and interpretation of the modern marine environments and their reconstruction in the geological record, including the recent past.  Module II: Microfacies; the Pelagic Environment.  Knowledge of the microfossil groups which are useful to define a paleoenvironmental and biostratigraphic framework from different oceanographic settings. Taxonomic bases for the identification of the main planktonic species. Application of microfossil assemblage for paleoecological reconstructions. Environmental Micropaleontology. Taphonomy. Contents Coevolution of geosphere and biosphere, principles of biomineralization, biogenic carbonates, bioconstruction and habitat engineers, sediments and benthos, benthic zonation, introductory biogeochemistry and proxy data in natural archives, past and ongoing global changes. Detailed program Lessons: The benthos in the geologic history. Extinctions and major events in the Earth history. The appearance of organic calcification and the biomineralization. Photosynthesis and chemosynthesis. Ocean chemistry and biomineralization. The evolution of biogenic builders in the Phanerozoic. The modern bioconstruction: structures, biological associations, ecological factors of control and distribution. Habitat engineers. Diagnosis, significance and distribution of the major benthic associations and related sediments. Benthic zonation in the present-day oceans as key to understand the geological record. The benthos in the geomorphology and evolution of carbonate platforms. Biocoenoses, communities, associations and interpretation of fossil assemblages on the basis of the biostratinomic processes. The chemical environment at the water-sediment interface. Identification and interpretation of the most important ichnofacies. Biogeochemical proxies and natural archives. The ongoing global change and the geobiological feed-back.  Laboratory: Geobiological analyses of carbonate sediments and fossil–bearing material and their interpretation. Prerequisites Paleontology, Geobiology. Teaching form Lessons: 5 credits  Tutorials: 1 credit Textbook and teaching resource The lectures and some suggested readings will be provided by the teacher.  Useful books: Fundamentals of Geobiology, Knoll et al (Eds) ISBN 978-1-4051-8752-7. Semester First semester. Assessment method Written and Oral examination  Written: 20 questions to be briefly answered in 90 minutes.  Each answer is given a mark. No answer counts 0. Final mark is the mean.  The first question, exclusively for the students of Geological Sciences who select this course, is aimed at assessing their knowledge of the main subdivision of the geological time. A negative result for this first question corresponds to immediate rejection.  Oral: questions about the written results.  The final mark is composed by the written+oral marks plus up to 1 point for the practicals.  Marks are given as n/30. Minimum positive value is 18/30. Office hours To make an appointment, please contact me by mail: daniela.basso@unimib.it More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **BIOFACIES** | **F7502Q014** | **6** | **1** |
| **Lecturers:  Prof.ssa Daniela Maria Basso, Prof.ssa Elisa Malinverno** | | | |
| Aims Module I: Benthic facies and applied marine paleoecology  To provide technical skills to plan, analyse and interpret the results of the paleontological and paleoecological investigation. To provide the rationale and the methods for the use of palaeoecology in the reconstruction of recent environmental changes in transitional and marine coastal areas, on the basis of the interplay between natural change and history of the anthropogenic impact. Ability to identify and interpret some common macrobenthic facies, and taphofacies. Ability to manage the commonest multivariate methods of statistical analyses for the interpretation of benthic associations.  Module II: Microfacies; the Pelagic Environment  Knowledge of the microfossil groups which are useful to define a paleoenvironmental and biostratigraphic framework from different oceanographic settings. Taxonomic bases for the identification of the main planktonic species. Application of microfossil assemblage for paleoecological reconstructions. Environmental Micropaleontology. Taphonomy. Contents Module I: Benthic facies and applied marine paleoecology  Identifying biofacies as a tool for paleoenvironmental definition. Applications and examples. Introduction to applied marine paleoecology: rationale, sampling strategies, case histories. Multivariate statistics applied to paleoecological analysis. Observations, laboratory analyses and techniques.  Module II: Microfacies; the Pelagic Environment  Recognition of biofacies for the definition of the pelagic paleoenvironment in different oceanographic settings. Bases of plankton taxonomy. Taphonomy. Applications and examples from present-day and past environments. Detailed program Module I: Benthic facies and applied marine paleoecology  Lessons: Sampling strategies and techniques for the study of marine and transitional benthic associations, death and fossil assemblages. Taphonomic processes and their effects on macrobenthos. Applied marine paleoecology: rationale, case histories. Multivariate statistics for benthic paleoecology.  Laboratory: Identification of key species within the main macrobenthic groups (mollusks, brachiopods, corals, calcareous algae, bryozoans). Quantification of the sedimentary contribution of the components of the benthic association. Macrobenthic facies analysis and identification of the paleoenvironment. Laboratory techniques and analyses for the study of marine and transitional benthic associations, death and fossil assemblages. Observations of the effects of the biostratinomic processes on shelled macrobenthos. Preparation, elaboration, and interpretation of multivariate paleobiological data.  Module II: Microfacies; the Pelagic Environment  Lessons: Microfossils and oceanic (paleo)environments. Taxonomic bases for the identification of the main plankton groups. Plankton paleoecology and biogeography. Biofacies in the pelagic environment: sedimentary environment and diagenesis. Bases for the definition of a biostratigraphic framework for pelagic sedimentary successions. Examples from the present-day environment and from the geological record.  Laboratory: Identification, through binocular and polarized light microscope, of key species within the main microfossil groups (calcareous nannofossils, diatoms, silicoflagellates, foraminifera). The laboratory classes will be devoted to: a) the recognition of biofacies and the identification of paleoenvironments (coastal zone, continental shelf, continental slope, abyssal plain) in different settings (mid-ocean oligotrophic gyre, upwelling zones, areas with strong continental input, polar zones); b) the identification of biozones through the recognition of biostratigraphic markers for selected time frames. Prerequisites Paleontology, Geobiology. Teaching form Lesson  Laboratories Textbook and teaching resource Slides and scientific papers provided by the Lecturers. Semester Second semester. Assessment method Written and oral examination, grading in /30. Office hours Monday and Thursday 9:00 AM - 12.00 A.M. More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **POLITICAL GEOGRAPHY AND GEOPOLITICS OF THE SEA** | **F7502Q015** | **6** | **1** |
| **Lecturers:  Prof.ssa Elena Dell'Agnese, Prof. Marco Grasso** | | | |
| Aims Understanding of the main questions raised by studying oceanic and transnational spaces in a critical geopolitics perspective.  An advanced ability to critically analyze and interrogate scholarship and discourse framing the oceans, and the geopolitical dynamics underway to conquer sea-power.  An understanding of the major challenges (acidification, oil and gas drilling, overfishing, and, in the long term, deep-sea mining, bioprospecting, and geo-engineering) posed by the deep seabed.  An engagement with the challenges of inter-disciplinary study and research. Contents After a short introduction to the most recent theoretical approaches to political geography and critical geopolitics, the course focuses first on the historical representation of the ocean as a "political and social space" and on how the sea can be framed by international geopolitical discourse, in relation to the processes of territorialisation, geo-power and extra-territoriality of marine spaces. The second part relates to the geopolitics of the deep see and in particular it focuses on the definition, value, ownership, access, health and future state of the resource-rich and highly contested sub-surface ocean. Detailed program **Part I - Political geography of the sea (Elena dell’Agnese)**  The political geography of the sea: a classical approach (maritime boundaries and Law of the Sea, transport and trade, strategy and warfare)  A (critical) political geo-graphy of the sea? thinking about the sea / representing the sea / exploiting the “geopolitical features” of the sea  Geo-graphy and the power of representation /Dividing (and naming) the ocean sea: the East Sea/ Sea of Japan issue  The territorialisation of the sea /Territorial claims and islands disputes: the Dokdo-Takeshima issue  Geographical definitions and island disputes: the Sankeku-Diaoyu issue/ climate change and vanishing islands/reefs: Okininotori: a shima, or a reef’?  A classical approach to the geopolitics of the sea/ the myth of sea power: A.T. Mahan theoretical positions / China as a maritime power and the South China Sea competition (Spratly, Paracel and more)  Sea power, sea nodes and islands as U.S. bases: The Hawai’i and Pearl Harbor, Midway and Wake, Guam  Sea power, sea nodes and islands as overseas U.S. bases/ bases of empire and lily pads: Guantanamo, Micronesia and Marshall Islands, Okinawa, Diego Garcia  LSMPAs (Large Scale Maritime Protected Areas): conservation or geopolitics?  Extra-territoriality 1: Pirates as enemies of all nations The golden age of piracy and the “pirate commonwealth” against the “world political map”, pirates of today, popular geopolitics of “pirates”  Extra-territoriality 3: Seasteading: “How Floating Nations Will Restore the Environment, Enrich the Poor, Cure the Sick, and Liberate Humanity from Politicians” (maybe)  Extra-territoriality 2: Cruising ships: Cruise tourism as an example of globalization? (History and Development, Crews, Employment, exploitation)  **Part II – Geopolitics of deep oceans (Marco Grasso)**  The tragedy of the commons  Harvesting the Commons: the Oceanic frontier and the devolution of the seas  Deep oceans: potential and problems  The deep seabed governance: the United Nations Convention on the Law of Sea (UNCLOS) and the International Seabed Authority (ISA)  The deep seabed governance  The deep seabed governance: the mining regime  Claiming the commons: Sovereignty and the deep seabed  Claiming the commons: the Arctic deep seabed  Protecting the commons  Climate change and the future of the deep oceans Prerequisites An adequate grasp of the perspectives of the relevant social sciences (geography, politics, economics, law, and sociology).  Capacity of working according to multidisciplinary and interdisciplinary perspectives. Teaching form Lectures (class teaching). Textbook and teaching resource **Part I - Political geography of the sea (Elena dell’Agnese)**  1. Political geography, geopolitics, critical geopolitics.  - The political geography of the sea: a classical approach (maritime boundaries and Law of the Sea, transport and trade, strategy and warfare)  - Glassner M.I., The new political geography of the sea, Political Geography Quarterly, 1986, pp. 6-8  - A (critical) political geo-graphy of the sea? (thinking about the sea / representing the sea / exploiting the “geopolitical features” of the sea)  - Steinberg, P.E. (1999) Navigating to Multiple Horizons: Toward a Geography of Ocean-Space, The Professional Geographer, 51, 3, pp. 366-375  2. Geo-graphy and the power of representation: The geo-graphy of the ocean sea  - Dividing (and naming) the ocean sea  - Steinberg, P.E. (1999), Lines of divison, lines of connection: Stewardship in the world ocean,  Geographical Review 89, 2, pp. 254-264  - The East sea/ Sea of Japan case study  - Chi Sang-Hyun, One feature, two names and many issues: The political geographies of naming the sea between Korea and Japan, eastsea1994.org/data/bbsData/14912842071.pdf  3. The “political geography of the sea”: the territorialisation of the sea  - Territorial claims and islands disputes (Dokdo-Takeshima)  - Suk Kyoon Kim (2008), Understanding Maritime Disputes in Northeast Asia: Issues and Nature, Int'l J. Marine & Coastal L., pp. 213-247  4. Geographical definitions and island disputes (Sankeku-Diaoyu)  - McCormack G. (2013), Much Ado over Small Islands: The Sino-Japanese Confrontation over Senkaku/Diaoyu, The Asia-Pacific Journal, 11, 21, pp. 1-20  - Climate change and vanishing islands/reefs (Okininotori: a shima, or a reef’?)  - Yamamoto L., Esteban M. (2010), Vanishing Island States and sovereignty, Ocean & Coastal Management 53, pp. 1–9  5. A classical approach to the geopolitics of the sea: the myth of sea power (A.T. Mahan)  - Sumida J. (1999): Alfred Thayer Mahan, geopolitician, Journal of Strategic Studies, 22, 2-3, 39-62  - China as a maritime power and the South China Sea competition  - Nohara J.J. (2017) Sea power as a dominant paradigm: the rise of China’s new strategic identity, Journal of Contemporary East Asia Studies, 6, 2, pp. 210-232  6. Sea power, sea nodes and islands as U.S. bases  - The Hawai’i and Pearl Harbor, Midway and Wake, Guam  - Vine D., (2015) Base Nation: How U.S. Military Bases Abroad Harm America and the World, Metropolitan Books, New York, Introduction, Capp. 1 and 2  7. Sea power, sea nodes and islands as overseas U.S. bases: bases of empire and lily pads  - Guantanamo, Micronesia and Marshall Islands, Okinawa, Diego Garcia  - Vine D., (2015) Base Nation: How U.S. Military Bases Abroad Harm America and the World, Metropolitan Books, New York, Cap 3.  8. LSMPAs (Large Scale Maritime Protected Areas): conservation or geopolitics?  - Sand P.H. (2012), ‘Marine protected areas’ off UK overseas territories: comparing the South Orkneys Shelf and the Chagos Archipelago, The Geographical Journal, 178, 3, pp. 201–207  - Leenhardt P., Cazalet B., Salvat B., Claudet J., Feral F. (2013). The rise of large-scale marine protected areas: Conservation or geopolitics? Ocean & Coastal Management, 85, pp. 112-118  9. Extra-territoriality 1: Pirates as enemies of all nations The golden age of piracy and the “pirate commonwealth” against the “world political map”, pirates of today, popular geopolitics of “pirates”  - Featherstone D. (2005) Atlantic networks, antagonisms and the formation of subaltern political identities, Social & Cultural Geography, 6, 3, pp. 387-404  - Hastings J.V., (2008), Geographies of state failure and sophistication in maritime piracy hijackings, Political Geography 28, pp. 213–223  10. Extra-territoriality 2: Cruising ships: Cruise tourism as an example of globalization? (History and Development, Crews, Employment, exploitation)  - Hall C.M., (2001), Trends in ocean and coastal tourism: the end of the last frontier? Ocean & Coastal Management, 44, pp. 601-618  11. Extra-territoriality 3: Seasteading: “How Floating Nations Will Restore the Environment, Enrich the Poor, Cure the Sick, and Liberate Humanity from Politicians” (maybe)  - Steinberg P.E., (2009) Sovereignty, Territory, and the Mapping of Mobility: A View from the Outside, Annals of the Association of American Geographers, 99:3, 467-495,  - Steinberg P.E., Nyman E., Caraccioli M.J. (2012), Atlas Swam: Freedom, Capital, and Floating Sovereignties in the Seasteading Vision, Antipode, 44, 4, pp. 1532–1550  **Part II – Geopolitics of deep oceans (Marco Grasso)**  - Hannigan, J. (2016). The Geopolitics of Deep Oceans. Cambridge, UK: Polity Press  - Scientific articles and policy briefs pointed indicated below. They are all accessible from within the campus; for accessing them from outside the campus see here:  https://www.biblio.unimib.it/it/risorse/accesso-alle-risorse-remoto  The tragedy of the commons  - Hardin, G. (1968). The tragedy of the commons. Science, 162(3859), 1243-1248.  - Breitburg, D., Levin, L. A., Oschlies, A., Grégoire, M., Chavez, F. P., Conley, D. J., ... & Jacinto, G. S. (2018). Declining oxygen in the global ocean and coastal waters. Science, 359(6371).  - See also, The Atlantic, ‘A Foreboding Similarity in Today’s Oceans and a 94-Million-Year-Old Catastrophe’,  https://www.theatlantic.com/science/archive/2018/01/suffocating-oceans/550415/]  Harvesting the Commons: the Oceanic frontier and the devolution of the seas  - Hanningan (2016): Introduction and Chapter 1  - Van Dover, C. L. (2011). Tighten regulations on deep-sea mining. Nature, 470(7332), 31-33.  - Sielen, A. B. (2013). The devolution of the seas: the consequences of oceanic destruction. Foreign Affairs, 92(6), 124-132.  - Diaz, R. J., and Rosenberg, R. (2008). Spreading dead zones and consequences for marine ecosystems. Science, 321(5891), 926-929.  Deep oceans: potential and problems  - Thurber, A. R., Sweetman, A. K., Narayanaswamy, B. E., Jones, D. O. B., Ingels, J., & Hansman, R. L. (2014). Ecosystem function and services provided by the deep sea. Biogeosciences, 11(14), 3941-3963.  -·Armstrong, C. W., Foley, N. S., Tinch, R., & van den Hove, S. (2012). Services from the deep: Steps towards valuation of deep sea goods and services. Ecosystem Services, 2, 2-13.  - Mengerink, K. J., Van Dover, C. L., Ardron, J., Baker, M., Escobar-Briones, E., Gjerde, K., ... & Sutton, T. (2014). A call for deep-ocean stewardship. Science, 344(6185), 696-698.  The deep seabed governance: the United Nations Convention on the Law of Sea (UNCLOS) and the International Seabed Authority (ISA)  -·Hanningan (2016): Chapter 2  -·Wolfrum, R. (2008). Legitimacy of international law and the exercise of administrative functions: the Example of the International Seabed Authority, the International Maritime Organization (IMO) and International Fisheries Organizations. German Law Journal, 8, 2039-2060. ONLY SECTION C, pp. 20145-2054.  The deep seabed governance  -·Kim, B. M. (2014). Governance of the global commons: the deep seabed, the Antarctic, outer space. KIEP World Economy, 4(29).  -·Guntrip, E. (2003). The Common Heritage of Mankind: an adequate regime for managing the deep seabed. Melb. J. Int'l L., 4, 376.  The deep seabed governance: the mining regime  -·Jaeckel, A., Gjerde, K. M., and Ardron, J. A. (2017). Conserving the common heritage of humankind–Options for the deep-seabed mining regime. Marine Policy, 78, 150-157.  -·Boetius, A., & Haeckel, M. (2018). Mind the seafloor. Science, 359(6371), 34-36.  Claiming the commons: Sovereignty and the deep seabed  -·Hanningan (2016): Chapter 3  - Werner, W., & Aalberts, T. (2016). Mastering the globe: Law, sovereignty and the commons of mankind. In The Politics of Globality since 1945 (pp. 89-105). Routledge (Available at: http://www.academia.edu/download/38711813/Globality\_-\_Mastering\_the\_Globe\_-\_Aalberts\_Werner\_final.pdf)  Claiming the commons: the Arctic deep seabed  -·Borgerson, S. (2013). The coming Arctic boom: as the ice melts, the region heats up. Foreign Affairs, 92, 76.  -·Berkman, P. A., & Young, O. R. (2009). Governance and environmental change in the Arctic Ocean. Science, 324(5925), 339-340.  -·Rothwell, D. R. (2013, April). The Law of the Sea and Arctic Governance. In ASIL Annual Meeting Proceedings, 107, pp. 272-275. American Society for International Law.  Protecting the commons  -·Hanningan (2016): Chapter 4  -·The Economists, ‘The tragedy of the high seas’,  https://www.economist.com/news/leaders/21596942-new-management-needed-planets-most-important-common-resource-tragedy-high  Climate change and the future of the deep oceans  -·Hanningan (2016): Chapter 5  -·McGee, J., Brent, K., & Burns, W. (2018). Geoengineering the oceans: an emerging frontier in international climate change governance. Australian Journal of Maritime & Ocean Affairs, 10(1), 67-80. Semester Second semester. Assessment method Parte I - Political geography of the sea (Elena dell'Agnese)  2,000-2,500 word topical paper on an issue analyzed during the course and selected by the instructor.  Part II – Geopolitics of deep oceans (Marco Grasso)  2,000-2,500 word topical paper on an issue analyzed during the course and selected by the instructor. Office hours Elena dell'Agnese  Thursday 10,30-12,30  Room 358/U7 third floor  Marco Grasso  Thursday 15:30  - 17:00  Room 333/U7 - Third floor More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **HUMAN GEOGRAPHY OF SMALL ISLAND SYSTEMS** | **F7502Q016** | **6** | **1** |
| **Lecturer:  Dott. Stefano Malatesta** | | | |
| Aims Mainly referring to the general framework of the Island Studies, the course aims to provide a set of tools useful to the analysis of socio-spatial dynamics within island systems. Furthermore the course aims to provide tools and interpretative models useful to understand how, at local scale, human communities (privately, socially and politically) cope with socio-environmental changes, crises, conflicts and transitions by producing a set of resilient practices, knowledge and adjustments Contents Geography of Archipelagos and Island States; Human Geography of Islands; Human Ecology of Island Systems; Environmental challenges in Small Island States; Trans-scalar Spatial Analysis of Island Systems; Environmental Policies of Small Island States, Islands as Ecotones, Archipelago and Aquapelagos Detailed program The course will be structured in two parts:  I. The first part of the course will be dedicated to the study of the human geography of islands and archipelagic states. Students will apply, even by adopting a critical perspective, a set of patterns and paradigms (such as isolation, vulnerability, distribution, concentration, center-periphery relationship and spatial dispersion), in order to understand the role of spatial features in shaping socio-environmental processes Furthermore reading these socio-environmental processes by adopting a trans-scalar perspective helps students and researchers to stress the complexity of the human ecology of islands, coastal areas and archipelagic systems.  II. The second part of the course will be dedicated to the reading, at local scale, of the set of social, political and spatial measures and adjustments that human communities adopt to deal with the environmental challenges affecting island systems.  Lessons:   * Island Studies: an introduction * Some interpretative categories * Human ecology: an introduction * The geography of islands and island states * The human ecology of islands * Small Island States: some environmental issues * Small islands: geography * Small islands: human geography * Small islands: sustainability * Small islands: resilience and social response to change * Human Geography of the Maldives * Environmental changes and challenges of the Maldivian Islands  Prerequisites None. Teaching form Classes will be provided by lessons, discussions of scientific papers, analysis of national and international reports, and reading of environmental assessments.  Students will be asked to work directly on a set of case studies, focusing on the geographical relevance of the environmental changes affecting small island systems in local, regional and supra-regional contexts.  The human geography of the Maldives will represent a reference for the understating of the interactions among human and environmental systems in small island states and archipelagos. Textbook and teaching resource References:   * A selection of essays from: Baldacchino G., Niles D. (eds), 2011, Island Futures. Conservation and Development Across the Asia-Pacific Region, Springer, London * Depraetere C., 2008, The Challenge of Nissiology (part 1), Island Studies Journal, Vol.3, No. 1, pp. 3-16 * Depraetere C., 2008, The Challenge of Nissiology (part 2), Island Studies Journal, Vol.3, No. 1, pp. 17-36 * Hay P., 2006, A Phenomenology of Islands, Island Studies Journal, Vol. 1, No. 1, 2006, pp. 19-42 * Jędrusik M., 2014, The elusive sustainable development of small tropical islands, Miscellanea Geographica. Regional Studies on Development, 18, 3, 26-30 * Malatesta et al., 2015, The right place. Solid waste management in the Republic of Maldives: between infrastructural measures and local practices, Miscellanea Geographica. Regional Studies on Development, 19, 2, pp. 25-32 * Royle, 1989, A Human Geography of Islands, Geography, 74, 2, 106-116 * Stratford et al., 2011, Envisioning the Archipelago, Island Studies Journal, Vol.6, No. 2, pp. 113-130   Additional essays and case studies could be provided during the lessons. Semester Second semester. Assessment method Oral exam. Office hours Monday 11,00-13,00, u6-4147, IV Floor More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **APPLIED GEOMORPHOLOGY AND HABITAT** | **F7502Q021** | **6** | **1** |
| **Lecturers:  Dott. ssa Alessandra Savini, Prof.ssa Daniela Basso** | | | |
| Aims To provide knowledge on traditional and new advanced techniques used to characterise, map and model the distribution and extent of marine benthic habitats. To provide students with the necessary knowledge and practical experience to develop marine habitat maps; to identify and classify, when relevant, the main types of bioconstruction; to recognize the dominant habitat engineers and their relationship with the abiotic components, within an ecosystem approach. Contents This course deals with the geomorphological and geobiological characterization of benthic habitats, with an emphasis on marine benthic bioconstructions of the temperate Mediterranean Sea and the shallow water tropical reef environments. It focuses on field and remote observations of characteristic habitats and their multi-scale relationships with the associated abiotic components. Environmental issues, related to the role of habitat mapping and monitoring in marine ecosystem management, are explained and discussed using case histories.  Laboratory activities will offer the students the opportunity to use traditional and new advanced methods and techniques for mapping and modelling the distribution of marine benthic habitats. Detailed program Introduction to biogeomorphology: interplay between organisms and geomorphology in submerged environments. Mediterranean marine bioconstructions: from the shallow shelf to the bathyal zone. Examples of bioconstructions from tropical reef environments.  Applied submarine geomorphology for ecosystem based management: the role of habitat mapping.  Habitat mapping, characterization and classification. The use of surrogates in habitat mapping practice. Habitat suitability models. Habitat mapping and ecosystem-based management.  Tutorials: Habitat mapping and habitat characterization techniques. Prerequisites Introduction to Marine Physical Geography, Geobiology, Invertebrate zoology (base level) or systematic and general Palaeontology. Teaching form - Lessons: 2 + 3 credits  - Tutorials: 1 credits Textbook and teaching resource - Seafloor Geomorphology as benthic habitat. 2011. Ed. by P.T.Harris and E.K. Baker. Elsevier.  - A selection of scientific journal articles will be provided by the teachers. Semester Second semester. Assessment method - Written and Oral examination  Marks are given as n/30. Minimum positive value is 18/30. Office hours To make an appointment, please contact the teachers by e-mail:  alessandra.savini@unimib.it  daniela.basso@unimib.it More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **MARINE ENVIRONMENTAL MICROBIOLOGY** | **F7502Q035** | **6** | **1** |
| **Lecturer:  Prof. Andrea Franzetti** | | | |
| Aims Expertise in applied microbiology of marine environments.  Skills in molecular and traditional analyses for characterization of microbial communities.  Skills in analysis of data from microbial community characterization by bioinformatic tools. Contents  1. Microbial metabolisms and diversity in marine environments: diversity of bacteria and archea in marine environments, metabolic diversity of microbes in marine environments. 2. Roles of microbes in ocean processes. 3. Techniques for the characterization of microbial communities in marine environments. 4. Microbial marine habitats. 5. Microbial aspects of environmental issues in marine environments.  Detailed program 1. Microbial metabolisms and diversity in marine environments: diversity of bacteria and archea in marine environments, metabolic diversity of microbes in marine environments  - Microbial molecular phylogeny  - Phototrophy  - Microbial respiration  - Main microorganisms in marine environmet  2. Roles of microbes in ocean processes:  - Carbon cycle  - Sulfur cycle  - Iron cycle  3. Techniques for the characterization of microbial communities in marine environments  - Phylogenetic markers  - Libraries of gene 16S rRNA  - Metagenomics  - Microscope analyses  4. Microbial marne habitats  - Coastal environmets  - Open ocean  - Cold seeps  - Hydrothermal vents  5. Microbial aspects of environmental issues in marine environments:  - Aerobic and anaerobic biodegradation of aliphatic and aromatic hydrocarbons  - Biological treatments of contaminated sediments Prerequisites Basic knowledge of microbiology Teaching form Lessons, Seminars: 5 credits  Bioinformatic laboratory: 1 credit Textbook and teaching resource 1. “Marine Microbiology: ecology and applications” (2011), 2nd edition di Colin Munn. GS, New York  2. “Bioremediation and Natural Attenuation” (2006) di P. J. J. Alvarez, W. A. Illman. Ed Wiley $ Sons, New Jersey  3. “Brock - Biology of Microorganisms” (2007) di M. T. Madigan, J. M. Martinko Brock. Ed. CEA Milano.  4. “Molecular Microbial Ecology”. Ed. A.M. Osborn, C. J. Smith (2005) Taylor & Francis Group – New York NY  Scientific articles provided by the teacher Semester First semester. Assessment method Oral exam and report on laboratory activities. Office hours Monday 9.00 - 10.00. More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

Syllabus Subjects

**2nd YEAR**

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **COASTAL AND MARINE HAZARD RESILIENCE** | **F7502Q007** | **6** | **2** |
| **Lecturer:  Prof.ssa Marcella Schmidt Muller Di Friedberg** | | | |
| Aims The aim of the curse is to increase understanding about how to best deal hazards associated with coastal and marine environments and to provide knowledge on the complexity of the human response to risk, exploring the cultural dimension of disaster. Contents Definitions and uses of the terms hazard, risk, and disaster. Vulnerability and resilience.  Hazards, Risks and disasters in marine and coastal areas.  Culture, knowledge and worldviews related to hazard.  Cultural dimension of Disaster Risk Reduction (DRD).  Tsunami Dynamics and sea level rise: adaptation, mitigation, and resilience.  Governance, communication and participation. Detailed program The curse examines the development of the meaning, uses and applications of the terms hazard, risk and resilience in marine and coastal areas and explores the cultural dimension of disaster.  The significance of “culture” must be understood and incorporated into any attempt to deal with natural disaster, shifting from the emphasis on the physical nature of hazards (tsunami, storm surges, inundations, sea level rise) to exploring the root causes of human and social vulnerability to hazards and the resilience and social response of people in front of disasters.  Students will be engaged in lessons, discussions of scientific papers, and analysis of national and international reports, oral presentations and reading of environmental assessments, field work.  In the curse, the case study of the Maldives will be presented, focusing on the resilience-based responses to hazards and risk of a multiple set of actors (women, children, elderly people, local communities, international agencies, political institutions) and human activities (tourism, agriculture, infrastructures). Prerequisites None. Teaching form Lessons: 6 credits Textbook and teaching resource A selection of essays from:  Fred Krüger, Greg Bankoff, Terry Cannon, Benedikt Orlowski, and E. Lisa F. Schipper (Eds.) Cultures and Disasters: Understanding Cultural Framings in Disaster Risk Reduction. Abingdon and New York: Routledge, 2015.  A list of additional articles and documents will be distributed during the course. Semester Second semester. Assessment method Examination type: Written and oral examination.  Mark range: 18-30/30. Office hours Appointment via email  marcella.schmidt@unimib.it More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **COASTAL AND MARINE BOTANY** | **F7502Q017** | **6** | **2** |
| **Lecturers:  Prof.ssa Pilar Diaz Tapia, Prof.ssa Sandra Citterio** | | | |
| Aims - Understanding the diversity of species and structures of marine plants and their role in marine ecosystems.  - Introducing the techniques for the study of diversity, systematics and evolution of marine plants.  - Acquiring skills for identifying marine plants.  - Providing basic concepts about the applications of marine plants. Contents This subject will focus on plants of marine environments, particularly on macroalgae, seagrasses and mangroves and with a special emphasis on the Mediterranean and tropical regions. The introduction will deal with what are marine plants. The first part of the course will focus on systematics, including the topics diversity, structure, evolution and biology. The second part will focus on the distribution and characteristics of the main biomes formed by marine plants. Also, the problematic of the invasive and introduced marine plants will be covered. The third part will deal with the commercial uses of marine plants and their cultivation. Detailed program INTRODUCTION TO MARINE BOTANY  - Marine plants and the tree of life  - The habitat of marine plants  SYSTEMATICS OF MARINE PLANTS  - Rhodophyta  - Ulvophyceae  - Phaeophyceae  - Tracheophyta  MARINE PLANTS BIOMES  - Rocky shores: from turfs to kelp forests  - Estuaries  - Mangroves  - Seagrasses  - Invasive and introduced marine plants  USES OF MARINE PLANTS  - Phycocolloids  - Seaweeds as food  - Other uses: biofuel, fertilizers, pharmacy, bioindicators  - Introduction to seaweeds cultivation and integrated multi-trophic aquaculture Prerequisites None. Teaching form - Lessons: 5 credits  - Tutorials: 1 credits Textbook and teaching resource Slides  Textbooks and References:  - “Marine Botany”, by Dawes C.J., John Wiley & Sons, Inc.  - “Seaweed Ecology and Physiology”, by Hurd et al., Cambridge  - “Global Seagrass Research Methods”, by Short & Coles, Elsevier  - “Alghe e Fanerogame del Mediterráneo”, by Rodríguez-Prieto et al., Il Castello (edizione italiana)  - “Algaebase”, Guiry & Guiry, www.algaebase.org Semester First semester. Assessment method Written and Oral examination. Office hours on request. More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **MANAGEMENT OF AQUATIC RESOURCES: FISHERIES** | **F7502Q018** | **6** | **2** |
| **Lecturer:  Prof. Rodolfo Enrique Del Rio-Rodríguez** | | | |
| Aims The present course examines key aspects and critical issues of marine aquaculture, as part of the primary production activity (aquaculture) with the largest growth rate among other food production techniques worldwide. Aquaculture nowadays supply fifty percent of fish products consumed in the world. The big challenge that aquaculture is facing concerns with sustaining and ever increasing demand circumscribed by environmental sustainability Therefore, the course aims to provides and overall knowledge of marine aquaculture, its potential in food security and the negative aspects/mitigations measures of the subject. Contents Currents status of Aquaculture, Key aspects for the development of aquaculture, Aquaculture Systems, Aquaculture and the Environment Detailed program 1. CURRENT STATUS OF AQUACULTURE  a. Definition of Aquaculture  b. A bit of History  c. Aquaculture in the world  d. Marine Aquaculture  e. Perspectives  2. KEY ASPECTS FOR THE DEVELOPMENT OF MARICULTURE  a. Environment  b. Nutrition  c. Health  d. Site Selection  e. Best Management Practices  f. Legal Aspects to Observe  3. AQUACULTURE SYSTEMS  a. Extensive, semi-intensive, intensive and super-intensive  b. Ponds, tanks, cages, raceways  c. Culture of selected marine species  i. Sea Bream  ii. Scallops, Oysters  iii. Sea cucumbers  iv. Support cultures (algae, micro-invertebrates)  d. Especial issue: Biofloc aquaculture  4. AQUACULTURE AND THE ENVIRONMENT  a. The Ugly side of aquaculture and their remedies  i. Nutrient discharge vs regulations  ii. Antibiotics and other chemicals vs vaccination  iii. Fish meal vs soya and cell wall proteins  iv. Disease vs prevention and biosecurity  v. Genetic Impact on wild populations vs containment  b. Animal welfare  c. Especial issue: The Integrated Multitrophic Aquaculture model Prerequisites None. Teaching form Lectures. Textbook and teaching resource  * Slides and support of these books: * Aquaculture, Resource use and the environment (2015), Boyd & McNevin, Wiley-Blackwell, First Edition * Echinoderm aquaculture (2015), Brown & Eddy, Wiley-Blackwell, First Edition * Fish Disease: Diagnosis and Treatment (2010), Noga, E. J., Wiley-Blackwell, Second Edition.  Semester First semester. Assessment method Exam is subdivided in 2 parts: written and oral. Office hours By appointment. More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **MARINE MOLECULAR BIOLOGY** | **F7502Q019** | **6** | **2** |
| **Lecturer:  Prof.** **Pereira Boeger Walter Antonio, Dott. Ivan Orlandi** | | | |
| Aims This course introduces the basic aspects of the molecular and cellular biology of marine organisms. Topics include the methodology and applications of molecular biology as a means of examining ecosystem-wide biological processes. At completion of the course, the students should be able to define specific biological problems with corresponding molecular markers, to design compatible experimental procedures and to define the necessary analytical protocols. Contents Principles and applications of molecular biology tools (genomics, transcriptomics and proteomics) for the study of marine ecology. Detailed program **Introduction**   * Organization and structure of genomes. * Principles of molecular evolution of genes. * Relationship between gene regulation and biological functions. * Phylogenetic relationships among marine organisms   **Section 1: Molecular tools for marine biology and ecology**   * Marine ecological genomics: * Genome sequencing methods: dideoxy procedure, primer walking, pyrosequencing, use of reversible chain terminators, sequencing by ligation, large-scale DNA sequencing methods: shot-gunning strategy for sequencing genomes, cyclic array * sequencing whole genome of key organisms, genome comparison for phylogeny, genomic analysis of natural communities, genomic analysis of communities (genome ecology), * Polymerase Chain Reaction (PCR): principles and application in marine ecology * Species identification by barcoding. * Transcriptomic: * Quantitative real-time polymerase chain reaction (QPCR): principles and probes; * Absolute and quantitative analyses * RNase protection-based assays * CDNA subtractive hybridization(SSH) * DNA arrays: cDNA and oligonucleotide arrays * Comparative approaches to cellular functions based on molecular analyses. * Proteomic: * Preparation of protein samples from bacteria, plants and animal tissues. * SDS PAGE and protein detection by Western analysis. * 2D gel electrophoresis: 2D protein patterns, mass spectrometry and comparative analyses.   **Section 2: Application of molecular markers in marine biology and ecology**   * Introduction: * Types of molecular markers and their applicability – a matter of scale * Basic concepts in evolution – why molecular data markers? * Specific concepts on genetics * Markers and the individual * Barcode of life revisited- a tool to understand biology * Parentage, relatedness * Markers and population * Basic principles of population genetics * Phylogeography * Markers and species * Speciation * Phylogeny * Biogeography * Markers and communities * Metagenomics * Invasive species * Conservation genetics in the marine environment  Prerequisites Undergraduate genetics and ecology. Teaching form Lessons and field activities. Textbook and teaching resource The students can use "Gene Cloning and DNA Analysis: An Introduction" T.A. Brown 7th Edition as general textbook. The teaching material used for the lessons is available on the e-learning platform. Semester The course will take place in the first semester according to a timetable that will be published. Assessment method Examination type: Oral examination.  Students will perform a presentation focused on a research paper based on Molecular Biology approach and they will discuss about the principles and applications of technologies introduced in this course.  Mark range: 18-30/30. Office hours The teacher will receive by appointment.  Monday - Friday 9.00-17.00 More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **PALEOCEANOGRAPHY AND PALEOCLIMATOLOGY** *(activate 2018/2019)* | **F7502Q020** | **6** | **2** |
| **Lecturer:  Prof.ssa Elisa Malinverno** | | | |
| Aims Understanding the natural variability in the climate system; knowledge of climatic variations and their causes at different time scales; study of proxies in different archives; knowledge of the main oceanographic processes in the present and in the past. Contents Bases of Paleoclimatology and Paleoceanography: climate system, chronology, proxies. Climatic variability and climate variations: timescales of changes. Paleoceanographic variations, as reconstructed through proxy data. Detailed program Lessons:  The climate system: components, inter-relations, annual and inter-annual variability.  Climatic variations: time scales and control mechanisms at the global scale; the anthropogenic impact.  Chronology: main dating methods in paleoclimatology and paleoceanography. 14C as a dating method and paleoclimatic paleoceanographic proxy.  Climatic evolution in the geologic past: greenhouse and icehouse states at geological scale; climate variations and Milankovitch cycles; millennial, centennial and decadal-scale variability in the recent past.  Paleoclimatic proxies: examples and applications in the marine, ice and terrestrial record.  Paleoceanographic applications; climate and sea level; paleocirculation and paleoproductivity; global and Mediterranean (sapropel) anoxic events; salinity crisis; ocean acidification in the present-day and in the paleo-record.  Tutorials:  Case studies: processing and interpretation of paleoclimatic and paleoceanographic data. Analysis and discussion on paleoclimatic and paleoceanographic reconstructions from the recent scientific literature. Prerequisites None. Teaching form - Lessons: 5 credits  - Tutorials: 1 credits Textbook and teaching resource Bradley – Quaternary Paleoclimatology  Slides provided by the Lecturer and scientific papers. Semester Second semester. Assessment method Oral examination: 2 questions to assess the knowledge on proxies and the mechanisms and time scales of changes; 1 question related to the changes occurred within one specific time frame, among those shown in class and in the slides, drawing a graph. Office hours Monday and Thursday: 9:00 AM - 12:00 AM More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **WAVES AND TURBULENCE** | **F7502Q022** | **6** | **2** |
| **Lecturer:  Prof.ssa Claudia Pasquero** | | | |
| Aims Provide advanced knowledge of the unbalanced dynamics of the oceans, of ocean mixing and transport. Show the interconnections between ocean dynamics and marine ecosystems. Contents This course is an introduction to the dynamics of ocean mixing and transport. The focus is on aspects of the small scale processes that feed back onto large scale dynamics. Topics include: ocean energetics, diapycnal mixing, internal waves, mesoscale eddies, eddy diffusivities in turbulent flows, isotropic and geostrophic turbulence, vorticity and potential vorticity dynamics, energy and enstrophy transfer across scales. Detailed program Surface waves, internal waves, tsunamis, tides. Shallow water systems. Effects of rotation: inertial waves, Kelvin waves, Rossby waves. Barotropic and baroclinic instabilities. Mesoscale eddies and submesoscale dynamics. Wave-mean flow interactions. Isotropic turbulence. Quasi-geostrophic turbulence. Turbulent diffusion and eddy transport. Ocean mixing. Turbulent effects on the marine ecosystem. Prerequisites Physics of the Sea. Teaching form Frontal lecture. Textbook and teaching resource  * Vallis “Atmospheric and Oceanic Fluid Dynamics”, 2nd edition, Cambridge UNiv. Press (2017) * Salmon, “Lectures in Geophysical Fluid Dynamics”, Oxford U. Press (1998) * Thorpe, “The Turbulent Ocean”, Cambridge U. Press (2005)  Semester Second semester. Assessment method Oral examination. Presentation of a scientific paper. Office hours Contact the instructor More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **COASTAL RISKS AND DYNAMICS** | **F7502Q023** | **6** | **2** |
| **Lecturer:  Prof. Diego Vicinanza** | | | |
| Aims The need to have one appropriate knowledge on these topics is crucial for the national territory when the European directives are to be implemented on Maritime Spatial Planning and Maritime Spatial Planning detail on Integrated Coastal Zone Management (integrated management of the coastline). The relevance of these topics in the Master's Degree in Marine Sciences results particularly obvious and only in the national context the maritime cluster currently contributes 2.6% to the formation of the National GDP and the presence in Lombardy of numerous design companies and construction of maritime works of various nature, consulting companies and design justifies the need to provide graduates in Marine Sciences experienced in the marine sector. At international level, the presence of the Marhe Center, highlight the needs to complete Marine Sciences students skills with knowledge of coastal dynamics and coastal protection, especially in an area that is heavily at risk in the present climate change scenarios. Contents The course is intended to provide basic knowledge of coastal processes for the proper management of the coastline from a physical point of view. The knowledge on maritime hydraulics (wave genesis, wave transformations, coastal currents), sediment transport and beaches morphodynamic will be deepened. Coastal risk elements will be presented, with particular regard to coastal erosion and possible defense approaches. The main techniques for studying and monitoring the coastal system will be examined. The part of the Coastal Risk Course aims to provide the student with advanced knowledge in the study and forecast of the impact of catastrophic events on the coastline. The training obtained can be applied for Civil Protection purposes and to minimize impacts on coastline. Detailed program The first part of the course is dedicated to the introduction and general treatment of the following topics (lesson 1 to 6):  Overview of Maritime Hydraulics. Wave climate, wave transformation, forecast of short and long-term sea conditions.  In the second part (lesson from 7 to 10), topics such as:  Coastal dynamics: genesis of coastal currents, set-up and set-down, longitudinal and transversal currents, solid transport.  Coastal Hydraulic Risk  Evaluation of Environmental Impact and Strategic Planning  Defense work against erosion, adherent defenses, defenses detached from the coast (groins and breakwaters), submerged breakwaters, beach nourishment.  A final lesson on Marine Renewable Energy focus on future perspectives on marine science. Prerequisites None. Teaching form Teaching is divided into modules consisting of 21 two-hour lectures. Textbook and teaching resource The videos and the pdf of the lessons are provided. Semester First semester. Assessment method The exam will consist of an interview that will focus on the topics covered during the course. The evaluation will be carried out on the basis of the student's answers, which will demonstrate the knowledge of the topics covered during the course. Office hours Friday from 2 to 3 pm. More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **FOOD LAW AND POLICY** | **F7502Q024** | **6** | **2** |
| **Lecturer:  Prof.ssa Livia Pomodoro** | | | |
| Aims The course is guided by the ambition to addresses impediments to systemic change in the food system by creating productive connections between students and members of the scholarly community, nongovernmental organizations, and professionals from the field. It aims to enable students as future researchers to become more aware of important developments among agricultural and fishery producers and facilitate exchange of knowledge and information between future scientists and social movements. Expected academic outcome of the course is the provision of a general overview of the ways in which food-related knowledge, both traditional and innovative, is informed, defined and regulated in today datacentric society.  Additionally, the course aims at answering some crucial development questions: What is the potential of fisheries in ensuring global food security? What are the legal instruments needed? What is the role of legal framework in managing the uncertain risks arising from novel food products? Which new forms of collaboration between experts, industry and citizens are characterizing the day present food domain? Contents The course focuses upon the laws at all levels of government and the policies that govern the structure and content of the international food regulatory system. Detailed program Students have an opportunity to explore different levels of food policy and laws/regulations and their impact on various sectors including economy, environment and equity through discussion on a range of food issues, case study examples, international food standards/agreements and to learn the methods of their interpretation. The major topics include the international aspect of food law, policy considerations and food law regulatory governance, food safety, food labelling and certifications, the implementation and enforcement of food laws/regulation, food justice, food ethics, international food standards and the role of global institutions in food governance. All these topics are coupled and matched with the importance of marine science and fisheries for the global food security and specific goals of the UN Agenda 2030 and other relevant international development strategies. The course tries to improve the understanding of issues socially, and economically sustainable for alleviating hunger, obesity, and create networks of people, organizations, and content to push for food system change. Prerequisites Since this course is not a mandatory one and it does not have any specific prerequisites. However, students willing to attend it should have basic knowledge on natural resources interactions, their importance and position within international development agendas. However, any specific knowledge on legal topics is not mandatory. Additionally, working language of the course is English and required level of knowledge is B2 according to the Common European Framework of Reference for Languages. Teaching form The module encompassed lectures, class discussions, presentations supported by examples. Students were required to attend the course and to actively take part in the discussions. A teaching strategy involved combination of different instructional activities implemented to help students accomplish the learning goals of the class expressed at the beginning of the course. One of the course objectives was for students to be able to identify the key theoretical positions in a topic area, discuss them critically, and apply them to particular issues. Textbook and teaching resource References:  http://www.milanfoodlaw.org/?page\_id=751&lang=en  http://www.un.org/millenniumgoals/  http://www.un.org/depts/los/convention\_agreements/texts/unclos/unclos\_e.pdf  http://www.fao.org/fishery/en  https://ec.europa.eu/maritimeaffairs/policy/blue\_growth\_en  www.msc.org/?set\_language=en  http://www.friendofthesea.org/IT/  http://actionguide.info/m/orgs/319/  https://ec.europa.eu/fisheries/home\_en Semester Winter Semester (October 2017 – February 2018). Assessment method Written exam made of multiple choice and open questions. In the academic year 2017/2018 exams were held on 24th of January and on 14th of February 2018, but the schedule can be defined according to the students’ preferences. Office hours This course does not have specific ordinary office hours. Individual and group emails are used as the main instruments of communication with professors. Flexibility of the course enables meeting with students according to their needs and requests. More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **COASTAL AND MARITIME TOURISM** | **F7502Q025** | **6** | **2** |
| **Lecturers:  Dott.ssa Chiara Giubilaro, Dott.ssa Valeria Pecorelli** | | | |
| Aims This course aims at critically examining tourism activities and industry in coastal regions and marine spaces, focusing on social, economic and cultural impacts of tourism development in these specific contexts. Various types of tourism -such as ecotourism- in coastal and marine locations will be presented and discussed based on a number of selected case studies (e.g: Venice, the Black Sea; the Caribbean islands; The Red Sea; The Maldives). Moreover, the course will provide critical insights to explore the relationship between tourism economies and performances, socio-spatial practices and environmental issues, and finally it will explore coastal and marine tourism policies, strategies and guidelines as promoted by EU and other institutional agencies. Contents  * Geographies of Coastal and Marine Tourism (definitions, facts and figures) * Marine Tourist Destinations and main Trends * Cultural Geographies of Marine Tourist Destinations * European Strategies for Coastal and Maritime Tourism, EU and UNWTO reports analysis * Sustainable Tourism and Blue Economy * Environmental Impacts and Policies of Marine Tourism * Political Ecologies of Marine Tourism  Detailed program The course will be organized in 3 modules, 21 lessons:  - The first module will initially provide general key concepts, facts and figures on tourism debates and issues. Attention will be focused on cultural, social and political meaning tourism activities produce in coastal and marine areas. By examining a range of case studies drawn from across the world, this module aims to provide conceptual tools, frameworks and categories to understand how coastal and marine tourist destinations are strongly affected by several factors, such as cultural struggles, social transformations and environmental changes.  - The second module will explore discourses presented in selected reports by Eu and UNWTO in order to discuss strategies for coastal and maritime tourism from an institutional perspective. Moreover, attention will be paid to the relation between sustainable tourism and blue economy through scientific articles and case studies that will be discussed among the participants.  - The third module will explore the environmental area of CMT from a political ecology perspective. Scientific papers and selected case studies will be discussed among the participants. Prerequisites None. Teaching form - Lessons: 6 credits Textbook and teaching resource  * Orams, M. (1999). Marine Tourism: Development, impacts and management. London and New York: Routledge. * Hall, C. M. (2001). Trends in ocean and coastal tourism: the end of the last frontier? Ocean & Coastal Management, 44(9–10), 601–618. * Sheller, M., & Urry, J. (2004). Tourism Mobilities: Places to Play, Places in Play. London and New York: Routledge. * Garrod, B., & Gossling, S. (Eds.). (2008). New Frontiers in Marine Tourism. New Frontiers in Marine Tourism. Oxford: Elsevier. * Orams, M., & Lück, M. (2012). Marine systems and tourism. In A. Holden & D. Fennell (A C. Di), The Routledge Handbook of Tourism and the Environment (pagg. 170–182). London and New York: Routledge.   Please note that additional essays and reports may be provided during lectures. Semester First semester. Assessment method Written and oral examination. Office hours Tuesday, 14-16. More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **COMMUNICATION SKILLS AND INTERPERSONAL RELATION MANAGEMENT** | **F7502Q027** | **6** | **2** |
| **Lecturer:  Prof.ssa Maria Grazia Strepparava** | | | |
| Aims Students will acquire the basic knowledge to develop expertise in teamwork and group dynamic, leadership, negotiation, communication in difficult situation; by several practical experiences they will increase self awareness of their own behaviours, attitudes and reactions, increasing their efficacy in teamwork, leadership, negotiation, conflict management, difficult or emergency situation. Contents The course will provide the basic knowledge of communication skills (dyadic and group) and a general overview of the most important psychological mechanisms involved in interpersonal relationship; students will learn these basic principles also by practical experiences and exercises (group activities, role-play, case simulation) and will learn some emotions and behaviors regulation strategies. Detailed program Group and teamwork: group definition, structure, type, roles and group structure, moreno sociogram; principles of group dynamics, social control mechanisms, sensemaking, cohesiveness, group interaction; stages of team growth and group development; team work principles. leadership, Blanchard model.  Communication: models of communication, principles and strategy, pragmatics of communication, conversational analysis, variables in communication, setting, communication techniques for collecting information (active listening, open and close questions, probing questions, cues and concerns) and for giving information (communication guidelines); non verbal communication.  Interaction: basic principles of negotiation and conflict resolution; the interpersonal motivational system model; personality and individual differences.  Emotion: model of emotions, emotion regulation principles, DBT skills in emotion regulation strategies, mindfulness.  Disaster psychology, psychological first aid, resilience, burnout. Prerequisites None. Teaching form Frontal lessons, supervised group activities, role-play, case simulation, book reading, selected movies discussion, individual work. Textbook and teaching resource A selection of scientific journal articles will be provided by the teachers; slides provided by the teacher. Semester Second semester. Assessment method Written (a report on selected topics) and Oral examination (discussion of the written report).  Marks are given as n/30, averaging the two parts.  Minimum positive value is 18/30 Office hours To make an appointment, please contact the teachers by e-mail: mariagrazia.strepparava@unimib.it  Office: U38, villa Serena (Monza), room number 5-24, V floorTuesday, 14-16. More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

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| **Course** | **Course Code** | **Course Credits** | **Course Year** |
| **MARINE APPLIED GEOLOGY** *(activate 2018/2019)* | **F7502Q029** | **6** | **2** |
| **Lecturer:  Prof.** **Prof. Cesare Corselli** | | | |
| Aims Provide knowledge on the human uses of marine and coastal environment infrastructures and the best practices for a sustainable use of marine resources with particular attention to biodiversity and preservation of the marine landscape. Contents This course will provide basic knowledge about the use of marine and coastal areas by the human activity, also with particular attention to the impact of human infrastructures on the marine ecosystem. Detailed program *Natural resources in the ocens*  Oil and natural gas, minerals, sediments and rocks.  *The technologies in onshore and offshore environments*  Exploration vs. exploitation.  *The coastal zone*  Use and protection in a climate changing environment  *The open ocean*  Technology exploitations and impacts. Prerequisites Physics of the Sea; Introduction to Marine Physical Geography; Law of the Sea. Teaching form Lecturers. Textbook and teaching resource References:  - E. Seibold, W.H. Berger -The Sea Floor:An Introduction to Marine Geology. Springer (e-book);  - APAT – Atlante delle opere di sistemazione costiera. Manuali e Linee Guida;  - Journal of Coastal Research, v.20;  - Erosion littorale en Mediterranée occidentale: dynamique, diagnostic et remèdes. CIESM Workshop Series 18  A selection of scientific journal articles will be provided by the teacher. Semester First semester. Assessment method Written and Oral examination  Mark range: 18-30/30 Office hours To make an appointment, please contact the teachers by e-mail: mariagrazia.strepparava@unimib.it  Office: U38, villa Serena (Monza), room number 5-24, V floorTuesday, 14-16. More Information More information can be found on the website e-learning: [didattica.unimib.it/F7502Q](http://www.didattica.unimib.it/F7502Q) | | | |

Useful information for student

Dates and details on the admission test of the degree course

The interview and the computer-based test (multiple choice questionnaire) will take place:

**FIRST WINDOW**

(for bachelor graduation or career assessment obtained by 22 December 2017)

**25th September 2017, 10.30 am**local time **OR 9th October 2017, 10.30 am** local time

For applications submitted between 14th of July to 15th of September 2017

**SECOND WINDOW**

(for bachelor graduation or career assessment obtained by 28 February 2018)

**25 Jennuary 2018 – 10.30** **a.m.**  
For applications submitted between 8 to 19 January 2018

Depending on the variable cultural background of the applicants, judged on the basis of their career, the computer-based test will consist of a multiple choice questionnaire aimed at the self-assessment of the knowledge of basic concepts in the biological, chemical, geological and geographical fields.

The computer-based test can be performed either online (on distance, for foreign applicants) or at a UNIMIB lab. The venue will be communicated by the Commission.

Periods of didactics activities

**First semester** classes will be held during the period **30 October 2017 – 31 January 2018** for the first year, except teachings borrowed which may provide for the start of classes. For second-year students the classes will start on **2 October 2018**.

**Second semester** classes will be held during the period from **5 March to 29 June 2018**

Website of the Course

Department: [www.disat.unimib.it](http://www.disat.unimib.it)

General information of the course in E-learning: [didattica.unimib.it/F7502Q](http://didattica.unimib.it/F7502Q)

Documents:

* Course Regulation
* Planned Courses
* Student Guides

Didactic:

* Open Days
* Admission to the Master Programme
* Courses
* Timetable
* Exams
* Language Courses
* Study Plan
* Practical Training (Stage)
* Final Examination

International:

* Erasmus and International Mobility

Faculty Committees

Offices for useful information for students

***Online Student Registry - University of Milan - Bicocca***

Online Registry (Segreterie OnLine): the digital platform of the University of Milan - Bicocca which provides services for students, lecturers and companies.

**Students**

Services are available for registered users. [Registration](http://s3w.si.unimib.it/esse3/Anagrafica/Registrazione.do) can be carried out at any time ad is free.

Users already possessing credentials (user name and password) gain access to services following [login](http://s3w.si.unimib.it/esse3/auth/Logon.do).

**Lecturers**   
It is not necessary to register. You may log in with your university credentials (*@unimib.it*).

Services for teachers (online verbalization), are available following [login](http://s3w.si.unimib.it/esse3/auth/Logon.do).

**Companies**

In order to use services for companies (e.g. stage or apprenticeship organization), it is necessary to receive accreditation. A user name and password will be given for access to the system.

To receive accreditation it is necessary to carry out [Accreditation request](http://s3w.si.unimib.it/esse3/tirocini/RichiestaAccredito.do) by inserting the VAT no. and/or tax code of the company, whilst not modifying the information relative to the company headquarters and filling in only the information relative to job position and work location.

If you already possess access credentials, you may gain access to services following [login](http://s3w.si.unimib.it/esse3/auth/Logon.do).

**Public administration and public services managers**

Companies registered for the consultation service about student academic careers may gain access following [login.](http://s3w.si.unimib.it/esse3/auth/Logon.do)

* Informations about pratical training (**stage)** contatct: [stage@unimib.it](mailto:stage@unimib.it)
* Information about [delivery](https://dictionary.cambridge.org/it/dizionario/inglese-italiano/delivery) [of](https://dictionary.cambridge.org/it/dizionario/inglese-italiano/of) [the](https://dictionary.cambridge.org/it/dizionario/inglese-italiano/the) [graduation](https://dictionary.cambridge.org/it/dizionario/inglese-italiano/graduation) [degree](https://dictionary.cambridge.org/it/dizionario/inglese-italiano/degree) [original](https://dictionary.cambridge.org/it/dizionario/inglese-italiano/original) contact: [ufficio.diplomi@unimib.it](mailto:ufficio.diplomi@unimib.it))
* [information](https://dictionary.cambridge.org/it/dizionario/inglese-italiano/information) [about](https://dictionary.cambridge.org/it/dizionario/inglese-italiano/about) [tuition](https://dictionary.cambridge.org/it/dizionario/inglese-italiano/tuition) [and](https://dictionary.cambridge.org/it/dizionario/inglese-italiano/and) fees, scholarships, exemptions, credits, refunds, declarations ISEEU [contact](https://dictionary.cambridge.org/it/dizionario/inglese-italiano/contact): [segr.studenti.tasse@unimib.it](mailto:segr.studenti.tasse@unimib.it))
* information about curriculum, examinations, registration, degree graduation contact: [segr.studenti.scienze@unimib.it](mailto:segr.studenti.scienze@unimib.it))

University Libraries

Website: <https://www.unimib.it/servizi/service-desk/biblioteca>

E-mail: biblioteca@unimib.it

The University libraries are located at the following locations with its opening hours:

**Central Libray**

Address: piazza dell'Ateneo Nuovo, 1 - 20126 Milano; edificio U6, 2nd floor  
Timetable: 9.00-21.45 Monday to Friday; Saturday 9.00-13.45

**Sciences** [**Library**](https://dictionary.cambridge.org/it/dizionario/inglese-italiano/library)

Address: piazza della Scienza, 3 - 20126 Milano; edificio U2, 1st fIoor  
Timetable: 9.00-18.30 Monday to Friday

**Medicine** [**Library**](https://dictionary.cambridge.org/it/dizionario/inglese-italiano/library)

Address: via Cadore, 48 - 20900 Monza; edificio U8, ground floor  
Timetable: 9.00-19.30 Monday to Thursday; Friday 9.00-18.30

**Pole of Digital Library**

Address: via Martinelli, 23 - 20092 Cinisello Balsamo; edificio U46 - Villa di Breme Forno, 2nd floor  
Timetable: 9.00-17.00 Monday to Friday  
Calendar of [Villa Forno](https://www.biblio.unimib.it/it/node/331): <https://www.biblio.unimib.it/it/node/331>