



PLANNING AND ORGANIZATION DOCUMENT OF TRAINING AND RESEARCH ACTIVITIES

Name of the doctorate:

PhD Programme in Marine Science Technology and Management

Department of reference

DISAT - Department of Environmental and Earth Sciences

Cycle

40°

Schedule of planned training activities (D.PHD.2.1)

The PhD programme in Marine Science, Technology and Management trains professionals and researchers for leadership roles in marine science innovation, both in Italy and abroad. The training of PhD students is based on the acquisition of skills in marine sciences, the use of innovative technologies and economic, legal, social and team-working management tools. The course, which extends over the entire duration of the PhD, includes the development of an experimental project under the guidance of two supervisors. The doctorate also aims to provide industry with professionals capable of improving competitiveness at national and international level. Since 2000, the scientific community has renewed interest in the oceans, enhancing its educational aspect: the programme contributes to the debate on ocean literacy, promoting an in-depth understanding of the mutual influence between the ocean and humanity. The scientific skills acquired will enable PhD students to engage in academic research and management of marine protected areas (MPAs) and other conservation measures (OECMs). Main doctoral topics: Marine biodiversity; marine ecology and biology; seascape ecology; ocean processes and global change; international law of the sea; sustainable use of marine resources; peaceful resolution of maritime disputes; integrated coastal zone management; ocean technology; polar law; marine biogeochemical cycles; dynamics and restoration of coastal ecosystems; computational modeling; political, cultural and social geography of the sea; ocean literacy and ocean citizenship; coastal and maritime tourism; environmental vulnerabilities and conflicts; marine renewable energies; ocean physics; chemical oceanography; new materials; Blue Economy. The Doctorate in Marine Science Technology and Management (MTM) is a doctorate consortium with the Italian Institute of Technology, since the 40th Cycle sees the involvement of the Naples Zoological Station Anton Dorn and the University of Messina. The training offered by the MTM doctoral programme focuses on the acquisition of skills in the marine field, always bearing in mind the multidisciplinary context.

For the 40th cycle, the MTM PhD programme has 11 courses, all of which are taught in English. The courses cover various subject areas, as can also be deduced from the disciplinary scientific sectors to which they belong. Particular attention was also given to team building activities and the ability to work in heterogeneous and complex work groups. The subjects taught by the MTM doctorate are listed in Table 1.

Table 1: Teaching courses provided by the PhD in Marine Science, Technology and Management. The SSDs, type of activity, language, number of hours and CFUs are shown.

NAME	SSD	TYPE OF ACTIVITY	LANGUAGE	N. HOURS	CFU
Technical Aspects of the Law of the Sea	IUS/13	Lesson	English	8	1
Coral Health and Disease Assessment	BIO/07	Lesson	English	8	1
Coral Reef Rehabilitation Techniques	BIO/07	Lesson	English	8	1
Maritime Spaces and Globalization: Economic and Environmental Questions	SECS-P/12	Lesson	English	16	2
The Ocean Space: Culture Geography and Environmental Conflicts of the Water Worlds	M-GGR/01	Lesson	English	8	1
New Materials and Technologies Applicable in the Marine Environment	CHIM/05	Lesson	English	8	1
Habitat Mapping for Ecosystem-based Management of the Deep Sea	GEO/04	Lesson	English	8	1
Use of Aerial Drones for Monitoring Coastal and Nearshore Environments: from Acquisition Procedures to Data Processing	GEO/04	Lesson	English	8	1
Psychological and Social Determinants of Pro Environmental Attitudes and Behaviors	M-PSI/08	Lesson	English	8	1
Teamwork and Group Dynamics I	M-PSI/08	Lesson	English	8	1
Teamwork and Group Dynamics II	M-PSI/08	Lesson	English	8	1

In addition to the courses offered by the MTM Doctorate, there are also training activities (interdisciplinary courses) offered by the University's Doctoral School. The PhD School's interdisciplinary courses are designed to provide, among other things: language, communication, technological and IT skills; knowledge of funding systems, dissemination and exploitation of research results; research ethics and business culture; green skills. The interdisciplinary courses on offer are presented to new doctoral students during the Welcome Day, organised every year in November by the Doctoral School. The complete list of interdisciplinary courses is available at the following links:

<https://elearning.unimib.it/course/index.php?categoryid=6324>

<https://www.unimib.it/didattica/offerta-formativa/dottorato-ricerca/carriera/corsi-interdisciplinari/interdisciplinary-courses-class-schedules>

Table 2: Other teaching activities (seminars, laboratory and research activities, interdisciplinary, multidisciplinary and transdisciplinary training) offered by the Doctoral School

n.	Type of activity	Description of the activity (and how to access the infrastructure for national doctorates)
1.	Linguistic further training	The doctoral school organizes courses aimed at developing language and communication skills for publication in English and presentation of research in international contexts. In addition to these, there are specific in-depth courses on some crucial aspects for the training of doctoral students, such as the development of public speaking skills in relation to specialized and non-specialized audiences (Public speaking and effective communication, 1 cfu/8 hrs), thanks to which doctoral students will analyze communication as a multimodal act that integrates verbal and non-verbal systems, acquiring awareness of their own communicative style and learning how to manage stress during oral presentations. It is also possible to access English courses with certification, in agreement with accredited institutes, and free online courses in English and other languages, including Italian for foreigners. For information https://www.unimib.it/didattica/offerta-formativa/dottorato-ricerca/carriera/corsi-interdisciplinari
2.	Computer training	All doctoral students have access to courses that provide IT skills for research. These include courses on the following topics: (i) analysis and use of application tools for consulting computerized databases, data archiving and the use of cloud tools related to academic work, thanks to which doctoral students will be able to acquire elements on general project management techniques, review of personal productivity methods, management of a personal reference library and its updating, acquisition of skills related to specific software tools for setting up personalized productivity environments to support the careers of young researchers (Productivity too/s far (young) researchers, 1 cfu/8 hours); (ii) construction of bibliographies and computer-aided reviews using tools online for bibliographical research, with a focus on the disciplinary tools of the University Library (databases, search engines, open archives), and management of complex bibliographies (Literature review: how to make a good bibliography, 1 cfu/12 hours); (iii) statistical analysis of quantitative data with R and basic skills to plan a scientific study or experiment and analyze its results (Introduction to statistics with R - 3 cfu/24 hours in 2 parts). For information https://www.unimib.it/didattica/offerta-formativa/dottorato-ricerca/carriera/corsi-interdisciplinari
3.	Research and knowledge management of European and international research systems	The doctoral school organises various interdisciplinary and multidisciplinary courses aimed at training basic and advanced, theoretical-practical skills in research management, knowledge of research and funding systems. The offer includes the course 'Introduction to grant writing' (1 cfu/8 hrs), which combines the presentation of the main national and international funding schemes and basic tools for researching calls, such as the EU Funding&Tender portal, with practical activities concerning the writing of project proposals, with particular reference to European ones. For information https://www.unimib.it/didattica/offerta-formativa/dottorato-ricerca/carriera/corsi-interdisciplinari
4.	Fundamental principles of ethics, gender equality and integrity	The doctoral school organizes various courses aimed at presenting and discussing the ethical principles of research. The course 'Introduction to grant writing' (1 cfu/8 hours) will discuss relevant aspects of the excessive competition for research funds and academic positions, the constant growth of publications and the uncritical use of biblio-metric indices in contemporary science. There will also be a course on gender issues explored from different theoretical and methodological perspectives, which aims to provide the skills to understand the principle of equality and non-discrimination and to address some controversial issues such as gender balance in decision-making positions (Reading the world through gendered lens: a methodological reflection, 2 cfu/16 hrs). For information https://www.unimib.it/didattica/offerta-formativa/dottorato-ricerca/carriera/corsi-interdisciplinari
5.	Fundamental principles of ethics, gender equality and integrity	Starting with the 38th cycle, the doctoral school is organizing a training course on Responsible Research Innovation (RRI) addressed to all doctoral students of the different doctoral courses, from the first to the third year, to accompany them during all stages of their research, including the final stages of sharing and impact assessment, so that they can align research and innovation (R&I) processes with the needs of society. The proposal consists of an annual training day ('Hands on RRI Interactive Workshop') on key RRI issues (ethics, integrity, reproducibility, FAIR management of research data) with a macro-disciplinary slant (Human & Life Sciences, Economics, Social/ Sciences, STEM) and specific process dimensions, also based on PhD students' research projects. The RRI activities are complemented by a number of in-depth seminars such as ethical aspects related to artificial intelligence, public engagement and communication of science, and the conscious and transparent use of data. For information https://www.unimib.it/didattica/offerta-formativa/dottorato-ricerca/carriera/corsi-interdisciplinari
6.	Valorisation and dissemination of results, intellectual property and open access to data and research products	The interdisciplinary courses, which are open to all doctoral students, cover various topics related to the dissemination and exploitation of research and the promotion of intellectual property. Training on the dissemination of results includes courses on scientific writing (Writing of scientific papers, 1 cfu/8 hours; Scientific writing in human and social sciences, 2 cfu/16 hours), on the choice of publication venue for research work (Surfing the academic job market: How to publish in high-impact international journals, 1 cfu/8 hours), courses on presenting research results in technical contexts, e.g. industry conferences, and to the general public (Philosophy of Artificial Intelligence and robotics, 1 cfu/12 hours), including social media (Communicating research in the era of social media, 1 cfu/8 hours), and courses on the basic principles of public relations and media relations for academics (Basic principles of public relations and media relations for academics, 1 cfu/12 hours). Training in research valorization includes a course on intellectual property management and the patent system (International or foreign strategies, patent rights, employees and researchers' intellectual property rights, 1 cfu/8 hours). There are also courses on open science, and in particular open access to research products (Open Access publishing: a guide, cfu/8 hours) and the development of responsible research. For information https://www.unimib.it/didattica/offerta-formativa/dottorato-ricerca/carriera/corsi-interdisciplinari
7.	Seminars	Each year, the doctoral school organises various thematic and interdisciplinary discussion paths open to all doctoral students, also with a view to developing new research strands. In particular, several courses on transversal competences for the academic and professional worlds are planned, including team building (The Appropriate Leadership. A sustainable approach to inclusive leadership in diverse contexts, 1 cfu/8 hrs), design thinking (Design thinking and innovation planning, 1 cfu/12 hrs), preparation for entry into the international industrial fabric (Transferable competences and professional transitions, 1 cfu/8 hrs) and a course on enterprise culture and entrepreneurship, with a view to social responsibility and sustainability, in accordance with European and MUR guidelines (Giovani & Impresa, 1 cfu/12 hrs). The offer also includes a philosophical cross-curriculum on research (Scientific method: the fundamental concepts, 1 cfu/8 hours) and critical thinking (Freedom of research and public use of reason: developing critical thinking through four philosophical approaches, 2 cfu/16 hours). For information https://www.unimib.it/didattica/offerta-formativa/dottorato-ricerca/carriera/corsi-interdisciplinari
8.	Seminars	The PhD School offers a package of interdisciplinary, multidisciplinary and trans-disciplinary courses on Green skills: (i) the course "Introduction to multidisciplinary aspects of sustainability" (2 cfu/16 hours) provides a trans-disciplinary introduction to sustainability concepts; (ii) the course "Basics of Biobased Processes and biorefineries" (1 cfu/8 hours) addresses the concepts of biorefineries, sustainable resources and the transition from linear to circular bioeconomy, to understand how bioprocesses can help to combine the principles and outcomes of the 17 SDGs and the Green Deal guidelines; (iii) the course "Realizing the green transition" (1 cfu/8 hours) provides skills to promote the green transition with an increased awareness of the opportunities and challenges related to the process of implementing sustainability in industry and society; (iv) the course "Culture/ aspects of the climate crisis: meanings, denials and desires of environmental relatedness" (1 cfu/8 hrs) analyses the multiple cultural and symbolic aspects of environmental relatedness and the emotional and 'unthinkable' aspects of the climate crisis; (v) the course 'The concept of sustainability through the lens of historical sciences' (1 cfu/8 hrs) illustrates the potential of historical sciences to help shape a sustainable future.

During the PhD, each student must complete at least 100 hours of teaching, obtaining a total of at least 8 University Training Credits (CFU), of which at least 2 CFU of interdisciplinary teaching provided by the University Doctoral School and at least 4 CFU of specific teaching offered by the Doctoral Course itself.

Each doctoral student may take advantage of the specific teaching offered by the SCGA Doctoral Course even in excess of the 8 minimum CFU provided. In addition, doctoral students may attend, also in the years following the first one, seminars, workshops, summer schools and courses provided by other doctoral courses or institutions. These activities, to be certified by a certificate of attendance, integrate the training activity for the portion exceeding the minimum threshold of 11 CFU, and are reported by the doctoral students in their end-of-year report for recognition by the Board of teachers.

Each doctoral student has the opportunity to benefit from the specific didactic offer of the MTM Doctoral Course, even exceeding the 8 minimum CFU required. In addition, doctoral students may participate, also in the years following the first, in seminars, workshops, summer schools and courses offered by other doctorates or institutions. These activities, to be documented with a certificate of attendance, complete the training for the part exceeding the 11 minimum CFU required and must be reported in the doctoral students' end-of-year report for recognition by the Board of teachers.

Period abroad

Each doctoral student must spend at least six months abroad (12 months for dual-title co-tutel routes). Unless there are special requirements, it is advisable to carry out this study period abroad during the second year of the doctoral programme. For study periods abroad of more than 30 consecutive days, the grant amount is increased by 50%. The maximum duration allowed abroad is 12 months (18 months for co-tutela courses with a double degree, recognized in the two countries of the co-tutela agreement). The Board of teachers encourages the development of co-tutela courses. Guidelines for the activation of a co-tutela thesis are available at the link:

<https://www.unimib.it/didattica/offerta-formativa/dottorato-ricerca/carriera/studiare-all'estero>

Finally, periods of in-company research defined within the framework of specific agreements with (co-)financing companies may be envisaged. These additional obligations, where foreseen, are made explicit in the call for interest and in the call for interest published on the departmental website.

Formative moments of exchange/presentation of PhD students' research results (D.PHD.2.2)

The research activities of the doctoral students are presented annually to the College and the other MTM doctoral students through an oral hearing, preceded by the delivery of a written report of their activities to the members of the Board of teachers.

End-of-year oral hearings: The schedule of end-of-year hearings is defined in advance and published on the department's website. For first- and second-year presentations, the presence of at least four auditors for each doctoral student is guaranteed, including the supervisor, the tutor and two other experts in the field, who will provide written feedback on: (i) the clarity and exhaustiveness of the report; (ii) the effectiveness, clarity and completeness of the oral presentation and supporting material (slides); (iii) the coherence and validity of the methodologies applied and the results obtained; (iv) suggestions for future directions. The written feedback is supplemented by additional comments and suggestions from the members of the teaching board present at

the hearing. The presentation, in English, lasts approximately 15 minutes with space for discussion.

Hearings must be held by 18 September in order to allow the Teachers' Board to deliberate on year changes in good time. The names of the subject matter experts and the date of the hearing are communicated by the supervisor to the curriculum manager (and in cc to the Coordinator) by 30 June, together with the Webex link set up by the supervisor to allow as much participation as possible. This is an examination that the Board of teachers assesses in order to decide on the doctoral student's transfer to the following year, also based on input from the supervisors. At the end of the hearing, the supervisor sends the written feedback to the curriculum manager (and in cc to the Coordinator), who forwards it to the doctoral student.

End-of-year reports: Each doctoral student must submit to the Board of teachers a detailed report in English of the teaching and scientific activities carried out during the year, in anticipation of the end-of-year hearings. This report, which supplements the report required by the Doctoral School, is drafted according to the template available on the departmental website and must include: (i) the doctoral student's ORCID; (ii) a summary of the scientific activity carried out as part of the research project; (iii) a list of all the teaching (courses, seminars, etc..) attended during the year and in previous years; (iv) periods spent at institutions abroad; (v) any periods spent at other institutions or companies in Italy; (vi) a list of expenses incurred and reimbursed out of available funds; (vii) any teaching or tutoring activities; (viii) third mission activities with IRIS-BOA links; (ix) the list of scientific publications and abstracts of participation in conferences with IRIS-BOA links.

Every year in October, PhD students exchange and present the results of their research during the SCGA & MTM PhD Day, an event organized by PhD students that includes seminars with international speakers, oral presentations and poster sessions.

Interaction between doctoral students is ensured by annual courses dedicated to Responsible Research and Innovation and events organized by the doctoral students themselves, such as "Visions of the Future: Research, Citizenship and Sustainable Development" <https://www.unimib.it/eventi/visioni-futuro-ricerca-cittadinanza-e-sviluppo-sostenibile>. The Academic Board encourages participation in conferences and workshops as speakers, monitoring the use of funds for this purpose and verifying their inclusion in end-of-year reports and presentations.

Submission of the thesis to external assessors: PhD students must upload their thesis, written in English, online and it will be sent to two different external assessors.

Resources available for doctoral students to attend conferences and/or workshops and/or training schools (D.PHD.2.2 - 2.4)

Starting from the first year of the doctoral programme, in accordance with Ministerial Decree 226/2021, each doctoral student receives a budget for research activities equal to 10% of the doctoral grant (€1,624.30/year for three years). The use of these funds is monitored by the Coordinator and reported annually by each doctoral student through the end-of-year report. This budget is mainly used for training activities, such as participation in conferences, workshops and training schools.

In addition, further financial support is generally provided by supervisors. In fact, the submission of a call for interest for a potential doctoral project implies a commitment by the supervisor, if required by the nature of the project, to financially support the doctoral student's research with his/her own funds, in addition to the budget provided for by DM 226/2021. The nature and availability of these funds are clearly specified in the call for interest, published on the departmental website in conjunction with the call for interest.

This system ensures adequate financial support for the development of advanced skills and participation in relevant training events, thus consolidating the training and professional development of doctoral students.

Financial and structural resources (e.g. research lab) available for doctoral students to carry out their research activities (D.PHD.2.4)

For the conduct of their research, PhD students have dedicated workstations and access to state-of-the-art equipment in the field of marine science. *Students will have access to advanced laboratories both at the*

Department of Environmental and Earth Sciences and at the IIT. In addition, they will have access to the infrastructure of the MaRHE Centre in the Maldives, a research centre for higher education born from the agreement between the University of Milano-Bicocca and the Maldives. The complementary nature of the IIT and Bicocca laboratories will offer students a complete education, providing them with a broad cultural and scientific background. The new collaborative activities with the Zoological Station of Naples and the University of Messina will make it possible to expand the equipment available for PhD students.

The University's Central Library offers doctoral students an extensive library collection covering chemical, geological and environmental science topics. In addition, it provides access to journals specialized in the doctoral fields and to more than 100 databases. PhD students can also make use of clusters for parallel computing and software relevant to the various PhD fields (GIS, modeling, etc.), as well as tools provided by the University such as Matlab, Mathematica and Stata.

DISAT contributes financial support of EUR 300 per year for analyses performed by doctoral students in departmental laboratories. Additional funds for analyses are generally provided by supervisors, who make additional resources available over and above the budget provided for in DM 226/2021. Although the latter is mainly intended for training activities such as congresses, workshops and training schools, it can also be used for the purchase of consumables, services, instrument maintenance, chemical reagents, electronic components, use of computing platforms and for the reimbursement of documented travel expenses related to the doctoral student's thesis activity.

This support system guarantees doctoral students adequate resources for the acquisition of advanced skills and participation in high-level training events, thus fostering a complete and well-funded research and training pathway. The international connotation of the research activity is guaranteed by carrying out part of the activity at universities and research institutes abroad with the involvement of lecturers from foreign universities. To support the period of training and research spent abroad, the grant is increased by 50% for periods spent abroad lasting more than 30 consecutive days. To support co-tutela doctorate courses, which allow periods of training and research abroad for up to a maximum of 18 months, starting from the 40th cycle DISAT contributes to covering any enrollment costs of the doctoral student at the foreign university up to a maximum annual amount of €2,500 for each doctoral student.

PhD students are also actively supported in the application procedures for Erasmus mobility funds.

Activities organized to develop the doctoral student's autonomy in conceiving, designing, implementing and disseminating research and/or innovation programmes (D.PHD.2.3)

In order to ensure adequate support for the development of the doctoral student's autonomy, each mentor follows an average of no more than two doctoral students per year (six in total), with a maximum of three (nine in total). The activities envisaged to develop the doctoral student's autonomy in conceiving, designing, implementing and disseminating research and/or innovation programmes include:

- (i) annual reporting on research, teaching, tutoring, third mission activities and the use of funds, as part of the end-of-year report;
- (ii) the organization of the PhD Day, to exercise the ability to run scientific sessions independently;
- (iii) the period of training and research abroad, which promotes the building of a network of relations with other universities and research organizations, increasing the international and multidisciplinary dimension of the training course and the opportunities for professional insertion in a global context.

Teaching and/or tutoring activities consistent with the research project allowed for each PhD student (D.PHD.2.5)

It is envisaged that doctoral students may carry out supplementary teaching activities, up to a maximum of 40 hours per year, subject to authorization by the Board of teachers. The Board of teachers assesses whether these activities are useful from a training point of view and whether they allow adequate dedication to training and research activities. In addition, doctoral students may carry out tutoring activities, again subject to authorization by the Board of teachers, within the limits of consistency and compatibility with the research activities carried out, and with a maximum annual fee of €2,500. The Board of Lecturers encourages these activities and, in implementation of the University Tutoring Regulations (June 2023), coordinates with the Courses of Study to identify suitable doctoral students to be proposed for tutoring assignments in support of

dissertation pathways.

Co-titles and/or issuance of multiple titles envisaged (D.PHD.2.6)

The SCGA doctoral programme ensures doctoral students periods of mobility consistent with the doctoral research project, in line with the objectives of the University Strategic Plan and the Three-Year Departmental Plan, and activates on average at least one co-tutela agreement aimed at awarding the double title for each doctoral cycle, also in substitution of the Doctor Europeans title. The possibility of co-tutela courses is promoted by the Board of Professors when calls for interest are published. The co-tutela courses are financially supported by DISAT, which contributes to cover any enrollment costs of the doctoral student at the foreign university up to a maximum annual amount of 2500 euros for each doctoral student.

Type of research products expected for each PhD student (D.PHD.2.7)

During their doctoral studies, each doctoral student is required to publish the results of their research in ISI peer-reviewed journals.

At the university level, the intellectual property of individual doctoral candidates is protected. In order to ensure that research products are directly attributable to doctoral candidates themselves and accessible in compliance with intellectual protection mechanisms, doctoral candidates are required to have an ORCID and to upload all products of their research, including scientific articles and abstracts of conference presentations, to IRIS-BOA. The IRIS-BOA codes must also be included in the end-of-year report.

At the end of the doctoral course (36 months), each doctoral student must have submitted at least two manuscripts as first author in ISI journals. To qualify for the final examination, at least one article as first author in an ISI journal must be submitted, accepted or published. Please consider carefully the possibility of publishing in open access, in line with the contracts concluded by the university with the main publishing houses. The budget available to doctoral students, provided for by DM 226/2021, can be used to cover the costs of open access licence for publications as first author concerning research carried out as part of the doctoral programme.