Polytechnic School - Department of Civil, Chemical and Environmental Engineering (DICCA)
Master's degree in Environmental Engineering

Class LM-35 Environmental and territorial engineering
DEGREE REGULATION
General part

Description of the Master's degree course

Art. 1 Premise and area of competence

This Regulation, in accordance with the Statute and the University Degree Regulation (general part and special part), discipline the organisational aspects of the teaching activity of the Master's degree Course in Environmental Engineering, as well as any other subject devolved to it by other legislative and regulatory sources.
The Degree Regulation of the Master's degree Course in Environmental Engineering is resolved, pursuant to article 18, paragraphs 3 and 4 of the University Degree Regulation, general part, by the Degree Programme Board (DPB) of Environmental Engineering to the majority of the members and submitted for the approval of the Board of the DICCA Department, after consultation with the Polytechnic School, with the prior favourable opinion of the Joint Committee of the School.
The resolutions of the DPB can also be taken in telematic mode according to the above-mentioned regulations and, in particular, of Article 14 "meetings with telematic mode" of the current General Regulation of the University (in force since 19/12/2018).

Art. 2 Admission requirements and procedures for verifying individual preparation

Admission to the Master's degree course in Environmental Engineering (class LM-35) is subject to the possession of specific curriculum requirements and adequate personal preparation.

Curricular requirements:
In particular, possession of a three-year degree, obtained in Italy, in the following classes: L-7 Civil and Environmental Engineering, L-9 Industrial Engineering or previous legal systems considered equivalent, or alternatively, possession of another qualification obtained abroad and recognised as suitable guarantees direct admission to this LM-35 ;

Alternatively, possession of specific numbers of ECTS obtained in sets of disciplinary-scientific sectors (SSD), characterising the fundamental learning areas.
In particular, holders of three-year, specialist or master's degrees as per Ministerial Decree 509/1999 or Ministerial Decree 270/2004, obtained at an Italian University, or holders of a five-year degree (prior to Ministerial Decree 509/1999), obtained at an Italian University, or alternatively holders of qualifications acquired abroad and recognised as suitable, who have passed at least 36 ECTS of the SSDs in the mathematics, physics and chemistry area and at least 12 ECTS of the following characterising SSDs, are admitted: ICAR01, ICAR02, ICAR03, ICAR07, ICAR08, ICAR09, ING-IND24, ING-IND25.

In the event that the candidate does not meet the required curricular requirements, the DPB will indicate the curricular additions in terms of university credits or specific teaching units which must necessarily be acquired before a new application is submitted.
Furthermore, a good knowledge of the English language is required, understood as the ability to use the English language fluently, in written and oral form, with reference also to disciplinary lexicons (level B2).

Adequacy of personal preparation
In order to be admitted to the Master's Degree Course in Environmental, students who meet the curriculum requirements must take a test, conducted in the form of a public interview, aimed at ascertaining the candidate's general preparation. Knowledge of fundamental notions of engineering and the subjects characterizing the degree class is assessed.
The adequacy of personal preparation is automatically verified for those who have obtained a Bachelor's degree, Italian or foreign, or a qualification judged equivalent according to what has been indicated about the assessment of curricular requirements, with a final grade of at least 9/10 of the maximum grade provided for by their degree or who have obtained a final grade corresponding at least to the "A" classification of the ECTS system.
For those who do not have a B2 level or higher certification or attestation, the good knowledge of English, understood as the ability to use English fluently, in written and oral form, with reference also to disciplinary lexicons, is verified through an interview.
The result of the test shall only include the words "passed", "not passed".

Art. 3 Training activities

The list of teaching units and other possible training activities, in the cohort 2020-21, is given in the appropriate annex (Annex 1) which constitutes an integral part of this regulation. A responsible professor is identified for each teaching unit. A professor is responsible for teaching whoever is in charge of teaching according to the law, i.e. the one to whom the relative Department Board has attributed the responsibility itself when assigning teaching tasks to professors.
The language used to provide training activities (lessons, exercises, workshops) shall be English.

Art. 4 Enrolment in individual training activities

In accordance with Article 6 of the University Regulations for students, in order enrol in individual training activities you must have a qualification which allows access to the university.

Art. 5 Curricula

The Master’s degree Course in Environmental Engineering is structured in curricula: Blue Engineering and Green Engineering.
The student, after a first year in which the skills considered to be the basis for the degree are provided, will find two suggested paths to deepen some aspects of environmental engineering. In particular, a more marine/atmospheric environment oriented path and a path more linked to the territory as a catchment area, industrial and urban environment.

Art. 6 Total time commitment

The definition of the hourly fraction dedicated to lessons or equivalent teaching activities is established, for each teaching unit, by the DPB and specified in the special part of the regulation. In

any case the following intervals of variability of the correspondence classroom/ECTS hours are assumed: 8 ÷ 12 hours of lesson or assisted teaching activity.
The definition of the assumed total time commitment, reserved for personal study or other training activities of an individual type, is laid down, for each teaching unit, in the annex (Annex 1) to this regulation.
The director of DICCA Department and the coordinator of the DPB shall be responsible for verifying compliance with the above requirements, including for the publication of course programmes.

Art. 7 Study plans and prerequisites

Students can enroll full-time or part-time; for the two types of student there are different rights and duties.
The student chooses the type of registration simultaneously with the presentation of the study plan.
The full-time student carries out his training activity considering the study plan prepared by the Master's degree course, which is distinguished by years of the course programme and published in the Degree Programme Table. The study plan formulated by the student must contain an indication of the training activities, with the relative credits that he intends to achieve, provided by the official study plan for this teaching period, up to a maximum of 65 credits provided in each year.
The part-time student is required to submit an individual study plan specifying the number of credits he intends to enter.
In the absence of the completion of the study plan by the due date, a standard plan will be uploaded ex officio, except in cases where it is planned to complete an individual study plan (e.g. change of course of study, previous part-time individual study plan).
The enrolment of full-time and part-time students is regulated by the University Regulations for students considering the operational provisions resolved by the Central government bodies and indicated in the Student Guide (published annually on the University's website).
The educational path of the student was organised according with criteria of propaedeuticity. Therefore, the study plan is strongly recommended in coherence with the educational path.
The DPB may, by express and reasoned resolution, authorise students who have demonstrated particularly high academic performance in the previous academic year to include in their study plan more than 65 credits, but in any case, not more than 75.
"Particularly high performance" means that the student has passed all the exams of his/her study plan by the month of September.
The study plan, which has a shorter duration than the normal one, is approved by the Degree Programme Board.
The method and deadline for the presentation of the study plan are established annually by the Polytechnic School and reported in the Degree Programme Table – Engineering Area.

Art. 8 Attendance and methods of carrying out teaching activities

The teaching units may take the form of: (a) lectures, including distance learning by telematic means; (b) practical exercises; (c) laboratory exercises; (d) thematic seminars.
The articulated profile and the demanding nature of the lessons taught as part of the course of study make the attendance to the training activities strongly recommended for an adequate understanding of the topics and therefore for a good success in the exams.
The schedule of classes is divided into semesters. As a rule, the semester is divided into at least 12 weeks of lesson plus at least 4 weeks overall for verification tests and profit exams.
The period for profit exams ends with the beginning of the lessons of the following semester.

The lesson schedule for the entire academic year is published on the Course of Study's website before the start of the lessons of the academic year. The schedule of classes guarantees the possibility of attendance based on the years of the course programme provided for by the current Degree Programme Table. For practical reasons, the compatibility of the timetable for all formally possible optional teaching choices is not guaranteed. Students must then formulate their study plan taking into account the time of the lessons.

Art. 9 Examinations and other profit exams

Profit exams can be carried out in written, oral, or written and oral, according to the methods indicated in the teaching sheets published on the website of the Master's degree course.

On request, specific learning verification arrangements may be provided which take into account the needs of disabled students and students with specific learning disorders (D. S. A.), in accordance with art. 29 paragraph 4 of the University Degree Regulation.

In the case of teaching units structured in modules with several professors, they participate collegially in the overall evaluation of the student's profit which cannot, however, be split into separate evaluations on the individual modules.

The calendar of profit exams is established by September 30th for the following academic year and is published on the website of the Degree Course. The calendar of any intermediate verification tests is established by the DPB and communicated to the students at the beginning of each teaching cycle.

Examinations are held in periods of interruption of classes. Examinations may be planned during the period of the classes only for students who, in the current academic year, have not included training activities in their study plan.

All profit examinations of training activities must be passed by the student at least twenty days before the expected date for taking the graduation exam.

The result of the examination, with the vote obtained, is verbalized in accordance with art. 29 of the University Degree Regulation.

The profit examination Committees are appointed by the course coordinator and consist of at least 3 members, two of whom are full members, one of whom is the professor responsible for teaching. If the percentage of success for teaching is less than 30% consecutively for two academic years, the Committee will be extended to at least 5 professors and the report must certify the effective presence of at least 3 members. They may be members of the Committee who are experts in the subject identified by the Course Board on the basis of criteria that ensure the possession of scientific, didactic or professional requisites; these requisites may be presumed to be possessed by retired university professors. The Committees are chaired by the professor responsible for teaching and a deputy must be identified for each one.

Art. 10 Recognition of credits

The Degree Programme Board decides on the approval of applications for change or transfer from another degree course of the university or other universities in accordance with the rules provided for in the University Degree Regulation, art. 21. It also decides the recognition, as training credits, for a maximum number of 12 ECTS, of professional knowledge and skills certified in accordance with the current legislation.

The evaluation of applications for change will take into account the didactic specificities and the actuality of the educational content of the individual exams taken, reserving to establish from time to time any forms of verification and supplementary exams.

Within the framework of the national and regional legislation on alternance education/work, it is possible for the course of study to provide, for selected students, learning paths that also take into account work experience carried out at companies under contract.

Art. 11 Mobility, studies abroad, international exchanges

The DPB strongly encourages internationalisation activities, in particular student participation in mobility and international exchange programmes. For this purpose, it shall ensure, in accordance with the rules in force, the recognition of the training credits obtained within these programmes and shall organise the training activities as appropriate in such a way as to make these activities easier and effective.

The DPB recognizes enrolled students, who have regularly completed a period of study abroad, the exams taken off-site and the achievement of the related credits with which the student intends to replace the exams of his own study plan.

For the purposes of the recognition of these examinations, the student at the time of the compilation of the plan of training activities, he intends to follow at the University abroad, must produce suitable documentation proving the equivalence of content between the teaching unit abroad and the teaching unit that intends to replace taught in the Master's degree Course in Environmental Engineering. Equivalence shall be evaluated by the DPB.

The conversion of votes will take place according to criteria approved by the DPB, in accordance with the European ECTS system.

For periods of study dedicated to the preparation of the final test, the number of credits recognised, relating to this case, is put in relation to the length of the period spent abroad.

Art. 12 Procedures for the final examination

The final examination consists in the discussion of a written thesis, aimed at ascertaining the candidate's technical-scientific and professional preparation.

For the purposes of obtaining a Master's Degree, the final examination consists of the writing of a thesis (theoretical, experimental or applicative), elaborated by the student in an original way under the guidance of one or more supervisors, on subjects defined as relevant to a discipline for which the candidate has passed the exam; the thesis must in any case be coherent with the arguments discussed during the Master's degree.

The supervisors must include at least one professor from the Polytechnic School and/or the reference or associate Department.

The thesis is carried out in English; the candidate may be asked by the DPB through the supervisor to write a summary in Italian.

In case of use of another EU language, the authorization of the DPB, the translation of the title and the writing of an extensive summary in Italian are required.

If the thesis is written in Italian, the student must prepare an extensive summary in English, which highlights the characteristics, aims and results achieved.

The thesis must reveal the student's ability to deal with research and/or application issues. The thesis must consist of a project and/or the development of an application that proposes innovative solutions with respect to the state of the art.

The thesis must also reveal:

- adequate preparation in the disciplines characterising the Master's Degree;
- correct use of sources and bibliography;
- systematic and argumentative skills;
- clarity in the exposition;

- design and experimental skills;
- critical skills.

The commitment required of the student for the preparation of the final test is commensurate with the number of credits assigned to the examination itself.
The Committee for the final examination is composed of at least five members including the Committee president and is appointed by the Director of the DICCA Department.
The procedure for the final examination consists of the oral presentation of the thesis by the student to the Final Examination Committee, followed by a discussion of any questions raised by the members of the Committee.
The evaluation of the final examination by the Committee takes place, in the event of passing the final exam, by assigning an increase, varying from 0 to 6 (maximum established by the Polytechnic School in agreement with the Departments and reported in the Degree Programme Table) to the weighted average of the marks obtained in the exams relating to training activities that require a final vote, taking as weight the number of credits associated with the individual training activity.
Among the aspects that contribute to the definition of the grade awarded to the final examination, the Committee will have to take particular account of:

✓ quality, completeness and originality of the work;

✓ presentation of the thesis;

✓ any period spent abroad for the preparation of the thesis or a substantial part of it;

✓ duration of the candidate's studies.

Art. 13 Guidance services and tutoring

The Polytechnic School, in agreement with the DICCA Department, organizes and manages a tutoring service for the welcome and support of students, in order to prevent dispersion and delay in studies and to promote a profitable active participation in university life in all its forms.

Art. 14 Verification of obsolescence of credits

University training credits (ECTS) acquired within the framework of the degree course can be subject to obsolescence verification after 6 years. If the DPB recognizes the obsolescence of even a single part of the relative educational content, the DPB itself establishes the supplementary tests that must be taken by the student, defining the topics, the methods of verification, the composition of the Examination Committee.
Once the required tests have been passed, the DPB validates the credits acquired with a resolution. If the related training activity provides for a vote, it may be varied from the one previously obtained, on a proposal from the Examination Committee which carried out the verification.

Art. 15 Degree Programme Table

The DICCA Department, after consulting the Polytechnic School, approves and publishes annually the Degree Programme Table of the Master's degree course. In the Degree Programme Table are indicated the main provisions of the didactic system and the didactic regulation of the Master's degree course, to which additional information may be added.
The Degree Programme Table of the Master's degree course contains the list of the teaching units activated for the academic year in question. The sheets of the individual teaching units are published on the website of the degree course.

Annex 1 to the Degree Regulation of the Master's degree Course in Engineering for Building Retrofitting
List of training activities and related training objectives

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
BLUE AND GREEN ENGINEERING	**1**	**104376**	**MATHEMATICAL METHOTS FOR ENGINEERING**	5	MAT/07	RELATED OR SUPPLEMENTARY LEARNING ACTIVITY	Related or supplementary learning activity	English	The course aims to provide a study of the most common partial differential equations (PDE) and their solution techniques through an analysis of various applications. The emphasis is devoted to second order PDE and the understanding of the specific analytical techniques for solving elliptic, parabolic and hyperbolic cases. The course also provides the tools to solve problems in various applications with numerical methods implemented through the use of Matlab.	50	75

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
BLUE AND GREEN ENGINEERING	**1**	**98064**	**NUMERICAL CARTOGRAPHY AND GIS**	5	ICAR/06	CORE LEARNING ACTIVITY	Environmental and Land Planning Engineering	English	The course provides the necessary tools for the management and analysis of the various spatial data available today relating to the terrestrial, marine and aerial environment, including the most recent and high-resolution ones such as LiDAR Digital Terrain Models and satellite images. Several applications supporting the management of the environment will be addressed through GIS (Geographic Information System) software.	50	75
BLUE AND GREEN ENGINEERING	**1**	**98158**	**HYDROLOGY AND WATERSHED MANAGEMENT**	10	**ICAR/02**	**CORE LEARNING ACTIVITY**	**Environmental and Land Planning Engineering**			0	0
		97232	HYDROLOGY	5				English	Provide the knowledge of advanced hydrologic modelling focusing on the frequency	50	75

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
									analysis of extreme events (storm and flood), distributed and semi-distributed hydrological models and event-based modelling		
		98069	WATERSHED MANAGEMENT	5				English	To provide interpretative and predictive tools for the analysis, design and management of ideas, projects and systems in the field of water resources at the watershed scale	50	75
BLUE AND BLUE ENGINEERING	**1**	**98159**	**ENVIRONMENTAL FLUID MECHANICS**	10	**ICAR/01**	**CORE LEARNING ACTIVITY**	**Environmental and Land Planning Engineering**			0	0
		97233	ADVANCED FLUID MECHANICS	5				English	Presents the fundamental principles and laws that govern the motion of fluids. Simple practical problems are formulated and solved and the foundation to tackle more complex problems are laid	50	75

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
		97234	ENVIRONMENTAL FLUID MECHANICS	5				English	Provides the basic knowledge of the transport processes and dispersion of pollutants in natural systems (rivers, lakes, estuaries and lagoons, coastal areas and the sea)	50	75
BLUE AND GREEN ENGINEERING	**1**	**98160**	**ENVIRONMENTAL CHEMISTRY AND PROCESSES**	10		MIXED				0	0
		97236	CHEMISTRY OF ENVIRONMENTAL TECHNOLOGIES	5	CHIM/07	RELATED OR SUPPLEMENTARY LEARNING ACTIVITY	Related or supplementary learning activity	English	Learn to describe, discuss and compare structure and properties of inorganic and organic chemicals (including polymers and biomolecules) involved in environmental and technological processes, with particular attention to atmospheric and water chemistry and pollution. Students will acquire skills and methods to deal with problems related to	50	75

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
									the chemicals reactivity and interactions.		
		98066	FUNDAMENTALS OF ENVIRONMENTAL PROCESSES	5	ING-IND/24	CORE LEARNING ACTIVITY	Environmental and Land Planning Engineering	English	The course provides the basic knowledge on mass transfer processes of reacting chemicals and multicomponent phase equilibria useful for modelling environmental compartments and environmental interfaces. Applications are related to health risk assessment and environmental contamination.	50	75

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
BLUE AND GREEN ENGINEERING	**1**	**98161**	**SUSTAINABILITY AND APPLIED ECOLOGY**	10		**MIXED**				0	0
		98070	APPLIED ECOLOGY	5	BIO/07	CORE LEARNING ACTIVITY	Environmental and Land Planning Engineering	English	Provide fundamental knowledge on the methods for the evaluation of environmental issues due to human impacts on the biosphere, with specific regard to pollution and resource consumption.	50	75
		98071	LIFE CYCLE ASSESSMENT AND ECODESIGN	5	ING-IND/26	RELATED OR SUPPLEMENTARY LEARNING ACTIVITY	Related or supplementary learning activity	English	Learn about sustainability, life cycle thinking and life cycle assessment as a tool to evaluate potential impacts along the life-cycle of a product for ecodesign purpose.	50	75
BLUE AND GREEN ENGINEERING	**1**	**98257**	**INDUSTRIAL PROCESSES AND PRODUCTS**	10		CORE LEARNING ACTIVITY	Environmental and Land Planning Engineering			0	0

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
		98237	ENVIRONMENTAL IMPACT OF INDUSTRIAL PROCESSES AND PRODUCTS	5	ING-IND/27			English	To provide an in-depth knowledge of the main industrial processes, with particular reference to environmental and sustainability issues related to these processes and their products.	50	75
		98247	CLEAN ENERGY PRODUCTION	5	ING-IND/24			English	The course will be organised in sections devoted to different renewable energy production systems (e.g. photovoltaic and wind systems, fuel cells, wave energy, biomass thermochemical conversion, mini-hydro, ..).	50	75
GREEN ENGINEERING	**2**	**97235**	**ENVIRONMENTAL GEOTECHNICS**	10	**ICAR/07**	**CORE LEARNING ACTIVITY**	Environmental and Land Planning Engineering			100	150

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
		104334	SLOPE STABILITY	5				English	The purpose of the course is to provide students with theoretical and practical knowledge on the identification, characterization and analysis of landslide phenomena. The course focuses on the stability analyses of natural and artificial slopes, which are necessary to design mitigation countermeasures as well as for stabilizing landslides and preventing/reducing slope displacements.	50	75
		104335	GROUND ENGINEERING	5				English	1)To introduce the various hydro-geological processes and the relevant analytical methods for engineering analysis; 2)To overview the main applications of groundwater flow principles as relevant to geotechnical engineers;		

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
									3)To introduce the fundamental aspects of capillarity in soils.		
GREEN ENGINEERING	**2**	**98165**	**FLUVIAL AND TIDAL MORPHODYNAMICS**	10	**ICAR/01**	**CORE LEARNING ACTIVITY**	**Environmental and Land Planning Engineering**			0	0
		97239	TIDAL AND ECO-MORPHODYNAMICS	5				English	Students will be instructed on the general processes involved in the morphodynamics and eco-morphodynamics of tidal environments, gaining useful skills to research and consultancy purposes.	50	75

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
		98156	FLUVIAL HYDRAULICS AND MORPHODYNAMICS	5				English	The course provides competences on how the morphology of rivers and tidal estuaries is shaped by the action of steady and unsteady free-surface flows, with an eye to the mutual interactions between the flow, the morphology and the ecosystem.	50	75
GREEN ENGINEERING	**2**	**98259**	**INDUSTRIAL ECOLOGY**	5		MIXED				0	0
	2	97238	WASTE UTILIZATION AND SOIL REMEDIATION	5	ICAR/03	CORE LEARNING ACTIVITY	Environmental and Land Planning Engineering	English	The course offers a broad discussion of the issues of pollution, remediation and purification in the soil, based on the principles of the risk analysis. Beside the management of the contaminated sites, the solid waste treatment is also discusssed by analysing several case studies	50	75

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
									of incenerition, composting plants and landfills.		
	2	98250	BIOCHEMISTRY AND ENVIRONMENTAL BIOTECHNOLOGY	5	CHIM/11	RELATED OR SUPPLEMENTARY LEARNING ACTIVITY	Related or supplementary learning activity	English	Basic concepts of biochemistry and microbiology, main metabolic routes and applications of environmental concern	50	75
BLUE ENGINEERING	**2**	**98162**	**COASTAL PROCESSES AND ENGINEERING**	10		**CORE LEARNING ACTIVITY**	**Environmental and Land Planning Engineering**			0	0
		97237	COASTAL STRUCTURES AND SHORE PROTECTION	5	ICAR/02			English	Principles of coastal structures planning and design and shore protection management	50	75
		98074	COASTAL HYDRO- AND MORPHO-DYNAMICS	5	ICAR/01			English	The course is aimed at introducing the student to the hydrodynamics and morphodynamics of the coastal region	50	75

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
BLUE ENGINEERING	**2**	**98258**	**MARINE BIODIVERSITY MANAGEMENT AND EMISSION TREATMENT PLANTS**	10		**CORE LEARNING ACTIVITY**	**Environmental and Land Planning Engineering**			0	0
BLUE ENGINEERING	2	98248	MARINE BIODIVERSITY MANAGEMENT	5	BIO/07			English	The course aims at building knowledge on the fundamentals of marine ecology and management of marine biodiversity, with specific focus on biodiversity assessment, ecological indexes evaluation, biodiversity maintenance and restoration and marine resources.	50	75
BLUE ENGINEERING	2	98249	ENVIRONMENTAL SAFETY TECHNIQUES AND PLANTS	5	ING-IND/25			English	To provide students a solid knowledge on process and occupational safety problems of industrial plants, to introduce evaluation tools and	50	75

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
									fundamental design approaches to minimize and prevent risk for man, environment and assets.		
BLUE ENGINEERING	**2**	**98163**	**MIXING PROCESSES IN GEOPHYSICAL FLOWS**	**10**	**ING-IND/06**	**RELATED OR SUPPLEMENTARY LEARNING ACTIVITY**	Related or supplementary learning activity			0	0
		98075	GEOPHYSICAL FLUID DYNAMICS				Related or supplementary learning activity	English	To provide the basics of geophysical fluid dynamics: ruling equations and peculiar dynamical phenomena induced by apparent forces, i.e., centrifugal and Coriolis forces.	50	75
		98077	MIXING PROCESSES IN AIR AND SEA				Related or supplementary learning activity	English	To provide an overview of existing dispersion models (atmosphere and sea)	50	75
BLUE AND GREEN ENGINEERING	**2**	**98068**	**EU AND TRANSNATIONAL ENVIRONMENTAL LAW**	5	IUS/14	RELATED OR SUPPLEMENTARY LEARNING ACTIVITY	Related or supplementary learning activity	English	Provide critical analysis of principles, rules and current trends and concerns of European Union and international environmental law	50	75

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
BLUE AND GREEN ENGINEERING	**2**	**98245**	**EMOTIONAL AND SOCIAL COMPETENCES FOR ENGINEERING PROFESSIONALS**	2		OTHER ACTIVITY	Other Useful Knowledge for the Introduction into the Workplace	English	The main objective of the course is to provide the fundamental knowledge to succeed in business,technical skills being equal: the capacity to successfully handle emotions and professional challenges under pressure through the development of emotional intelligence, sustained focus, constructive relationships and productive collaborations.	20	30
BLUE AND GREEN ENGINEERING	**2**	**90498**	**MACHINE LEARNING**	5	INF/01	ELECTIVE LEARNING ACTIVITY	Student's elective learning activity	English	Students will understand and learn how to use key machine learning algorithms.	0	0
BLUE AND GREEN ENGINEERING	**2**	**98239**	**HARBOUR ENGINEERING**	5	ICAR/02	ELECTIVE LEARNING ACTIVITY	Student's elective learning activity	English	Fundamentals of Port Planning and Design taking into account maritime operations and land	50	75

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
									requirements for terminals and inland transportation		
BLUE AND GREEN ENGINEERING	**2**	**98242**	**MITIGATION AND ADAPTATION TO CLIMATE CHANGE**	5	ICAR/03	ELECTIVE LEARNING ACTIVITY	Student's elective learning activity	English	The course provides competence about climate change and Greenhouse gases emissions (GHG), through the application of the Kyoto Protocol and the EU Emission Trading System.	50	75
BLUE AND GREEN ENGINEERING	**2**	**56880**	**SUSTAINABLE PLANNING**	5	ICAR/20	ELECTIVE LEARNING ACTIVITY	Student's elective learning activity	English	The course aims at providing a vast and up-to-date knowledge on the main policies, laws and tools for sustainable planning. It examines in depth the most important spatial issues at the local and international level and analyses the European and Italian landscape in relation to: urban safety and security,	0	0

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
									natural/anthropic risk prevention, smart and sustainable mobility, waterfront renewal, waste management, eco-responsible tourism, energy planning.		
BLUE AND GREEN ENGINEERING	2	**98117**	**RESILIENCE OF THE BUILT ENVIRONMENT**	5	ICAR/09	ELECTIVE LEARNING ACTIVITY	Student's elective learning activity	English	Seismic risk analysis of the built environment in relation to natural events: hazard, exposure and vulnerability. Probabilistic seismic hazard assessment: occurrence of earthquakes, mitigation laws. Taxonomy and classification of the exposed assets. Vulnerability models: observational (macroseismic method), mechanical based (analytical or numerical) and hybrid methods. Evaluation of fragility curves from nonlinear	0	0

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
									dynamic analyzes (IDA, MSA and cloud method). Probabilistic framework for the calculation of risk. Analysis of economic consequences and losses (direct and indirect damage). The resilience of the built environment and the society: robustness and recovery time. Risk assessment, prevention and management of the seismic emergency in the case of monumental building: LV1 models, vulnerability and damage survey forms.		
BLUE AND GREEN ENGINEERING	2	**98155**	**FLOOD PROTECTION AND RIVER RESTORATION**	5	ICAR/02	ELECTIVE LEARNING ACTIVITY	Student's elective learning activity	English	To provide students with the principles of river restoration and the capability of designing erosion/deposition control works in streams and rivers with special focus on	50	75

Curriculum	Year	Code	Teaching unit	ECTS	SSD	Type	Area	Language	Training Objectives	Hours for assisted teaching activity	Hours for personal study
									flood protection issues.		
BLUE AND GREEN ENGINEERING	**2**	**98244**	**TRAINEESHIP**	3		OTHER ACTIVITY	Training and Orientation Traineeships	English	To develop a self-employment work to deepen theoretical or applicative problems or project development in the framework of a company/institution internship.	0	75
BLUE AND GREEN ENGINEERING	**2**	**98246**	**FINAL THESIS**	10		FINAL EXAMINATION	For the final examination	English	The final thesis consists in the development of a specific project that asses the scientific, technical and professional skills gained by the student at the end of his studies.	0	250