ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

DEGREE PROGRAMME REGULATIONS

LM – 75 SCIENCE AND TECHNOLOGIES FOR ENVIRONMENTAL SUSTAINABILITY

Ravenna Campus

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Unless otherwise specified, for brevity, where the masculine form is used in these regulations, it is intended to refer inclusively to all individuals operating within the community.

ART. 1 ADMISSION REQUIREMENTS

To successfully attend the Master's Degree Program in Science and Technologies for Environmental Sustainability, it is necessary to have acquired adequate university-level knowledge in mathematics, physics, chemistry, biology, ecology, and earth sciences, in particular:

- Basic knowledge of mathematics in the fields of mathematical analysis and linear algebra;
- Basic knowledge of statistics and computer science;
- Basic knowledge of physics in the fields of mechanics, thermodynamics, and electromagnetism;
- Basic knowledge of general and organic chemistry;
- Basic knowledge in the field of cellular biology, zoology, botany, and ecology;
- Basic knowledge of earth sciences in the fields of geology and the description of the Earth's surface.

To be admitted to the Master's Degree Program in Science and Technologies for Environmental Sustainability, applicants must hold a Bachelor's Degree or a three-year university diploma, or another equivalent qualification obtained abroad.

Furthermore, applicants must meet specific curricular requirements and pass an assessment of their personal preparation.

a. Required Knowledge for admission

- **Curricular Requirements**

Curricular requirements are considered fulfilled according to one of the two methods indicated below:

1. Having obtained a first-cycle degree in one of the following classes:
    - Ex D.M. 270/04: L-32 Science and Technologies for the Environment and Nature;
    - Corresponding qualifications under previous regulations, as well as other equivalent qualifications obtained abroad.
2. Holding a degree belonging to a different class from those indicated and having acquired at least 60 university credits (CFU) in the following macro-scientific disciplinary sectors: MAT, INF, FIS, CHIM, BIO, GEO, AGR, ICAR, ING-IND, SECS-S, VET.

- **Assessment of personal competences and skills**

Admission to the Master's Degree Program is subject to passing an assessment of personal competences and skills, which will be carried out according to the methods defined in the admission procedures section.

For the international curriculum taught in English, an entry-level English language proficiency of at least B2 is required. English language proficiency is verified through the submission of appropriate certification and/or the completion of an exam (in-person or remote).

b. Admission procedure

The assessment of personal competences and skills is carried out by a dedicated Committee and aims to evaluate the university-level competencies in mathematics, physics, chemistry, biology, ecology, and earth sciences acquired by the candidate during previous academic studies.

In particular, the candidate's personal preparation is evaluated through the analysis of their curriculum and a possible interview or written test (in-person or remote), assigning a total score of up to 100 points, of which:

- 0 to 40 points for the final graduation mark or weighted average if still completing the degree;
- 0 to 60 points for the possession of the indicated competencies, evaluated based on the acquisition, during the previous academic career, of CFUs in the following macro-scientific disciplinary sectors: MAT, INF, FIS, CHIM, BIO, GEO.

Personal preparation is considered adequate if the candidate obtains at least 60 points.

The detailed procedures, criteria, and admission calendar are approved by the Degree Program Council and published on the University portal.

ART. 2 RULES FOR MOBILITY BETWEEN CURRICULA OF THE DEGREE PROGRAM

The degree program is divided into curricula. Transfer between the two curricula is not permitted.

ART. 3 INDIVIDUAL STUDY PLANS

The possibility of submitting individual study plans is foreseen, with the procedures, criteria, and deadlines announced through the University Portal. Individual study plans, approved by the Degree Program Board, must in any case comply with the degree programme teaching regulations.

If the study plan includes the choice of educational activities activated in limited-access degree programs, admission to these must first be approved by the Council of the restricted-access degree program, based on criteria previously identified by them.

ART. 4 IMPLEMENTATION OF LEARNING ACTIVITIES AND TYPES OF TEACHING ACTIVITIES

The attached didactic plan indicates the methods of implementing each educational activity and its breakdown into hours of frontal teaching, practical exercises, or internships, as well as the type of teaching methods. Any further information on this matter will be published annually on the University Portal.

ART. 5 ATTENDANCE AND COURSE UNIT PREREQUISITES

Mandatory attendance for didactic activities is indicated in the attached didactic plan, as are any prerequisites for individual educational activities.

The methods and verification of mandatory attendance, where foreseen, are established annually by the Degree Program during the presentation of the didactic planning and communicated to students before the start of lessons through the University Portal.

ART. 6 PART-TIME STUDENT STATUS

The student can choose to enroll as a part-time student that allows to complete the course of study in a longer or shorter period than the normal duration (2 years for the Second Cycle degree programmes) according to the procedures laid down in the University Teaching Regulation. The teaching activities foreseen by the course of study, in case of necessary disablement, can be replaced, to guarantee the quality and sustainability of the educational offer.

ART. 7 ASSESSMENT OF LEARNING ACTIVITES

The attached didactic plan specifies the cases in which educational activities conclude with an exam graded out of thirty or with a pass/fail judgment. The methods of conducting the assessments (oral, written, or practical form, or any combination thereof) are established annually by the Degree Program during the presentation of the didactic planning and communicated to students before the start of lessons through the University Portal.

ART. 8 ELECTIVE LEARNING ACTIVITIES

Students may select one or more learning activities autonomously from among those offered by the University of Bologna and available through the online procedure for the study plan submission.

If students intend to sit exams concerning an activity that is not included among those available through the online procedure, they should apply to the Degree Programme Board in the terms laid down annually and published on the University website. The Board will assess the coherence of the choice with the student's study programme.

ART. 9 CRITERIA FOR THE RECOGNITION OF CREDITS ACQUIRED IN DEGREE PROGRAMMES IN THE SAME CLASS

The recognition of credits acquired in previous university studies is determined, upon student request, by the Degree Program Board. Acquired university credits (CFU) are recognized for no less than half and up to the total credits of the same scientific-disciplinary sector foreseen by the didactic regulations of the degree program. If, after recognitions based on the rules of these regulations, unused credits remain, the Degree Program Council may recognize them by evaluating the specific case based on didactic and cultural affinities.

ART. 10 CRITERIA FOR RECOGNITION OF CREDITS ACQUIRED IN DEGREE PROGRAMS OF DIFFERENT CLASSES, AT TELEMATIC UNIVERSITIES, AND AT FOREIGN UNIVERSITIES

The recognition of credits acquired in previous university studies is determined, upon student request, by the Degree Program Board. Acquired university credits (CFU) are recognized by the Degree Program Board based on the following criteria:

- Analysis of the program completed;
- Evaluation of the congruence of the scientific-disciplinary sectors and the content of the educational activities in which the student earned credits with the specific educational objectives of the degree program and the individual educational activities to be recognized, always pursuing the goal of student mobility.

Recognition is granted up to the total university credits (CFU) foreseen by the attached didactic plan. If, after recognitions based on the rules of these regulations, unused credits remain, the Degree Program Board may recognize them by evaluating the specific case based on didactic and cultural affinities.

ART. 11 CRITERIA FOR THE RECOGNITION OF EXTRA-UNIVERSITY COMPETENCIES AND SKILLS

Competencies acquired outside the University may be recognized in cases provided for by current legislation. The request for recognition will be evaluated by the Degree Program Board, taking into account the maximum number of recognizable credits set in the teaching regulations of the program. Recognition may occur if the activity is deemed consistent with the specific educational objectives of the degree program.

ART. 12 CURRICULAR INTERNSHIP

The Degree Program provides, upon student request, the possibility of undertaking a curricular internship in preparation for the final examination according to the procedures established by the general University Internship Regulations and international mobility programs.

ART. 13 FINAL EXAMINATION

- **Characteristics of the Final Examination**

The final examination for obtaining the Master's Degree consists of the writing and public discussion of a thesis written and developed originally by the student on a topic consistent with the objectives of the degree program, under the guidance of a supervisor.

The graduate's ability to work independently and to clearly and comprehensively present and discuss the results of an original research project, of an experimental or theoretical nature, on a specific topic is verified.

- **Modalities of the final examination**

The final examination consists of verifying the graduate's ability to work independently and to clearly and comprehensively present and discuss the results of an original research project, of an experimental or theoretical nature, on a specific topic.

The thesis can be written in Italian or English.

The thesis title must be submitted at least six months before the discussion and must be approved by the Degree Program Board.

The preparation of the thesis is carried out under the supervision of a supervisor who is a professor at the University of Bologna and is discussed in an adversarial manner with a counter-supervisor chosen from among the members of the Degree Program Board.

The didactic plan provides for the preparation of the final examination in Italy or abroad, or alternatively, an internship for the thesis in Italy or abroad.

The thesis defense takes place with the support of a PowerPoint presentation for a duration of 30 minutes. Scoring: 9 points can be assigned: 4 at the discretion of the Supervisor, 3 at the discretion of the Counter-supervisor, and 2 at the discretion of the Examination Committee.

A student who has participated in 14 'Thursday seminars' organized and certified by the degree program is entitled to 1 additional point on the final grade of the degree examination.

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The Joint Faculty-Student Committee has expressed a favorable opinion on the consistency of the credits assigned to the individual educational activities and the specific planned educational objectives foreseen in the didactic plan, pursuant to Article 12, paragraph 3 of Ministerial Decree 270/04 and subsequent amendments.

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La Commissione Paritetica docenti-studenti ha espresso parere favorevole sulla coerenza dei crediti assegnati alle singole attività formative e gli specifici obiettivi formativi programmati previsti nel piano didattico, ai sensi dell'articolo 12 comma 3 del DM 270/04 e ss.mm.ii.

Anno Accademico **2025/2026**
Classe **LM-75 R-SCIENZE E TECNOLOGIE PER L'AMBIENTE E IL TERRITORIO**
Corso **6794-SCIENZE E TECNOLOGIE PER LA SOSTENIBILITÀ AMBIENTALE**

Curriculum: CURRICULUM: WATER AND COASTAL MANAGEMENT (968)

Primo Anno di Corso

Gruppo: Compulsory academic activities

TAF: **Ambito:**

Cfu min: **Cfu max:**
Note:

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.
6794 000 000 B2192 - 0 - CHEMISTRY OF MARINE AND COASTAL ENVIRONMENTS	CON	CHIM/01		6	40/0/12/0	No	Voto
Ambito: 051 - Discipline chimiche			B				
Obiettivi: At the end of the course, the student will acquire the basic knowledge of the chemistry of the sea, the chemical composition of the oceans and the factors that govern it. The student will be able to describe the distribution of the elements/chemicals in the marine environment as a function of the chemical reactivity and interaction with the main physical and biological processes.							
Obiettivi inglese: At the end of the course, the student will acquire the basic knowledge of the chemistry of the sea, the chemical composition of the oceans and the factors that govern it. The student will be able to describe the distribution of the elements/chemicals in the marine environment as a function of the chemical reactivity and interaction with the main physical and biological processes.							
6794 000 000 99152 - 0 - COASTAL GEOMORPHOLOGY AND REMOTE SENSING	CON	GEO/04		6	32/20/0/0	No	Voto
Ambito: 402 - Discipline di scienze della Terra			B				
Obiettivi: Moving from basic concepts on coastal landforms and depositional environments, students will develop an understanding of the main evolution processes of coastal systems. Conceptual models and field observations will be used to present the main coastal systems functions, including those provided by coastal wetlands as for example primary productivity and carbon sequestration. Students will acquire an operational knowledge of various measuring and monitoring technologies, with particular emphasis on satellite remote-sensing tools. Applications to real case studies will be presented and discussed in detail through hands-on projects.							
Obiettivi inglese: Moving from basic concepts on coastal landforms and depositional environments, students will develop an understanding of the main evolution processes of coastal systems. Conceptual models and field observations will be used to present the main coastal systems functions, including those provided by coastal wetlands as for example primary productivity and carbon sequestration. Students will acquire an operational knowledge of various measuring and monitoring technologies, with particular emphasis on satellite remote-sensing tools. Applications to real case studies will be presented and discussed in detail through hands-on projects.							

6794 000 000 99148 - 0 - ECOLOGY OF COASTAL ENVIRONMENTS	CON	BIO/07	6	48/0/0/0	No	Voto

Ambito: 069 - Discipline ecologiche B

Obiettivi: Students will gain an overall understanding of the state of the coastal ecosystems, how they are affected by local and global anthropogenic disturbances and what are the ecological methods for their monitoring, management, and conservation. At the end of the course, students will know the main marine coastal ecosystems, their associated communities, and the functions of these systems. They will learn to implement bioassessment methods and the integrated approaches to monitor these ecosystems. Finally, they will gain knowledge on the principles of conservation biology, on threats to marine biodiversity, and the ecological approaches to conserve it.

Obiettivi inglese: Students will gain an overall understanding of the state of the coastal ecosystems, how they are affected by local and global anthropogenic disturbances and what are the ecological methods for their monitoring, management, and conservation. At the end of the course, students will know the main marine coastal ecosystems, their associated communities, and the functions of these systems. They will learn to implement bioassessment methods and the integrated approaches to monitor these ecosystems. Finally, they will gain knowledge on the principles of conservation biology, on threats to marine biodiversity, and the ecological approaches to conserve it.

6794 000 000 99146 - 0 - GEOGRAPHIC INFORMATION SYSTEMS	CON	AGR/14	6	24/30/0/0	No	Voto

Ambito: 2019 - Attività formative affini o integrative C

Obiettivi: At the end of the course students will have an overview of the different disciplines involved in the study and representation of the territory and the environment, and of the multidisciplinary systemic approach necessary to select the appropriate tools and techniques to acquire, analyze, record and share spatial data with continuity in digital format, in order to carry out a spatial survey. In addition, students will have the knowledge necessary to read, interpret, and evaluate both basic and thematic cartographies in order to use them in various professional circumstances as a tool for effective communication of environmental information.

Obiettivi inglese: At the end of the course students will have an overview of the different disciplines involved in the study and representation of the territory and the environment, and of the multidisciplinary systemic approach necessary to select the appropriate tools and techniques to acquire, analyze, record and share spatial data with continuity in digital format, in order to carry out a spatial survey. In addition, students will have the knowledge necessary to read, interpret, and evaluate both basic and thematic cartographies in order to use them in various professional circumstances as a tool for effective communication of environmental information.

6794 000 000 88166 - 0 - HYDROCOMPLEXITY OF THE COASTAL ZONE	CON	GEO/05	6	32/20/0/0	No	Voto

Ambito: 402 - Discipline di scienze della Terra B

Obiettivi: At the end of this course the student will achieve a quantitative understanding of the components of the hydrological cycle and how these components are measured (or calculated) and influence each other with special emphasis to coastal zone settings. By working on a specific project, the student will learn the physical processes, problems, management challenges, adaptation strategies, and feedback mechanisms important for water resources use in the coastal zone. Other topics include: the relationships among water resources and climate change, extreme events and flood hazards, human activities, such as gas and water extraction, land subsidence, loss of freshwater, land reclamation, drainage and salt-water intrusion, urbanization and loss of groundwater recharge, quarrying and mining activities. Moreover, the student will be introduced to the principles of density-dependent groundwater modelling for coastal aquifer.

Obiettivi inglese: At the end of this course the student will achieve a quantitative understanding of the components of the hydrological cycle and how these components are measured (or calculated) and influence each other with special emphasis to coastal zone settings. By working on a specific project, the student will learn the physical processes, problems, management challenges, adaptation strategies, and feedback mechanisms important for water resources use in the coastal zone. Other topics include: the relationships among water resources and climate change, extreme events and flood hazards, human activities, such as gas and water extraction, land subsidence, loss of freshwater, land reclamation, drainage and salt-water intrusion, urbanization and loss of groundwater recharge, quarrying and mining activities. Moreover, the student will be introduced to the principles of density-dependent groundwater modelling for coastal aquifer.

6794 000 000 88165 - 0 - INTEGRATED COASTAL ZONE MANAGEMENT	CON	GEO/05	6	40/0/12/0	No	Voto

Ambito: 402 - Discipline di scienze della Terra B

Obiettivi: The course aims to enhance and consolidate the level of knowledge of planning and decision making with reference to water and coastal management, with an emphasis on principles and tools in ICZM. The main connectivity and interactions between physical-geometric, natural and socio-economic data to manage the coastal areas will be discussed. At the end of the course, the student will learn the main aspects of coastal zone, be able to identify threats on coastal resources associated with human activities and understand planning and decision making with reference to water and coastal management. The student will be introduced to the application of decision-support tools that aid in the evaluation and assessment of water and coastal systems and can be used to guide decision-making efforts from process to strategic level.

Obiettivi inglese: The course aims to enhance and consolidate the level of knowledge of planning and decision making with reference to water and coastal management, with an emphasis on principles and tools in ICZM. The main connectivity and interactions between physical-geometric, natural and socio-economic data to manage the coastal areas will be discussed. At the end of the course, the student will learn the main aspects of coastal zone, be able to identify threats on coastal resources associated with human activities and understand planning and decision making with reference to water and coastal management. The student will be introduced to the application of decision-support tools that aid in the evaluation and assessment of water and coastal systems and can be used to guide decision-making efforts from process to strategic level.

6794 000 000 99150 - 0 - INTEGRATED FIELD AND LABORATORY COURSE	CON		6	0/0/72/0	No	Giudizio

Ambito: 1147 - Altre conoscenze utili per l'inserimento nel mondo del lavoro F

Obiettivi: The fieldwork, performed at the end of the first year, is a truly interdisciplinary experience for students, who will take advantage of a direct interaction with professors from different fields as well as responsibles in charge of coastal management and preservation. The experience will foster (1) an understanding of the main natural and anthropogenic drivers of the evolution of coastal environments, including both biotic and abiotic components; (2) the ability to analyze resource and management problems in coastal areas; (3) a conceptual understanding of preservation and restoration solutions. Attendance is mandatory. Absence from the fieldwork will be granted only in the event of medical or family emergencies, which must be documented and communicated to the organizers. At the end of the experience, readings on topics related to the fieldwork will be assigned and students will be divided into groups. A critique report on the management activities observed during the fieldwork will be required from each group and a final general discussion will be performed in class.

Obiettivi inglese: The fieldwork, performed at the end of the first year, is a truly interdisciplinary experience for students, who will take advantage of a direct interaction with professors from different fields as well as responsibles in charge of coastal management and preservation. The experience will foster (1) an understanding of the main natural and anthropogenic drivers of the evolution of coastal environments, including both biotic and abiotic components; (2) the ability to analyze resource and management problems in coastal areas; (3) a conceptual understanding of preservation and restoration solutions. Attendance is mandatory. Absence from the fieldwork will be granted only in the event of medical or family emergencies, which must be documented and communicated to the organizers. At the end of the experience, readings on topics related to the fieldwork will be assigned and students will be divided into groups. A critique report on the management activities observed during the fieldwork will be required from each group and a final general discussion will be performed in class.

6794 000 000 99147 - 0 - ISOTOPES AS TRACERS OF THE SEA	CON	FIS/07	6	32/10/12/0	No	Voto

Ambito: 2232 - Discipline agrarie, matematiche, fisiche e informatiche B

Obiettivi: The course focuses on the diagnostic value of natural and anthropogenic isotopes as tracers of sea processes and cycling of carbon. At the end of the course, the student will have an overall understanding on the application of various isotopic techniques to determine the sources, pathways, dynamics and fate of carbon, as well as pollutants and particles that enter the sea from land and atmosphere.

Obiettivi inglese: The course focuses on the diagnostic value of natural and anthropogenic isotopes as tracers of sea processes and cycling of carbon. At the end of the course, the student will have an overall understanding on the application of various isotopic techniques to determine the sources, pathways, dynamics and fate of carbon, as well as pollutants and particles that enter the sea from land and atmosphere.

6794 000 000 99149 - 0 - MODELLING AND ASSESSING CLIMATE-RELATED OCEAN AND COASTAL HAZARDS AND RISKS	CON	GEO/12	6	32/10/12/0	No	Voto

Ambito: 2019 - Attività formative affini o integrative C

Obiettivi: The aim of this course is providing the students with a general knowledge of climate-related hazards along our coasts, and techniques for modelling and assessing the associated risk.
The topic will be discussed both from a dynamic and phenomenological point of view, and laboratory sessions will introduce the students to practical tools for climate risk assessment along our coasts.

Obiettivi inglese: The aim of this course is providing the students with a general knowledge of climate-related hazards along our coasts, and techniques for modelling and assessing the associated risk.
The topic will be discussed both from a dynamic and phenomenological point of view, and laboratory sessions will introduce the students to practical tools for climate risk assessment along our coasts.

6794 000 000 88164 - 0 - PHYSIOLOGY APPLIED TO THE ENVIRONMENT: POLLUTANT IMPACTS ON HUMAN HEALTH AND ECOSYSTEM	CON	BIO/09	6	40/0/12/0	No	Voto

Ambito: 1033 - Discipline biologiche B

Obiettivi: The interaction between stress factors from the marine environment with animal/human physiology will be the core of the teaching course. Potential impacts of pollutants will be considered, mainly addressing emerging pollutants and new conditions generated by global change. The students will learn about: main contaminants and source of discharge; impacts on animal physiology and threats to human health; principles of environmental quality assessment using biological methods (biomarkers); knowledge on integrated monitoring plans applied at the national and international levels.

Obiettivi inglese: The interaction between stress factors from the marine environment with animal/human physiology will be the core of the teaching course. Potential impacts of pollutants will be considered, mainly addressing emerging pollutants and new conditions generated by global change. The students will learn about: main contaminants and source of discharge; impacts on animal physiology and threats to human health; principles of environmental quality assessment using biological methods (biomarkers); knowledge on integrated monitoring plans applied at the national and international levels.

Secondo Anno di Corso

Gruppo: 1) Compulsory academic activities

TAF: Ambito:

Cfu min: Cfu max:
Note:

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.

6794 000 000 78487 - 0 - BIOREMEDIATION AND EXPLOITATION OF MARINE BIORESOURCES	CON	ICAR/03	6	48/0/0/0	No	Voto

Ambito: 2298 - Discipline giuridiche, economiche, ingegneristiche, gestionali e valutative B

Obiettivi: The course will provide students with the knowledge of biochemistry, microbiology and bioprocessing required for the sustainable remediation of impacted marine ecosystems (surface and subsurface water and sediments) and the industrial exploitation of marine biodiversity and bioresources.

Obiettivi inglese: The course will provide students with the knowledge of biochemistry, microbiology and bioprocessing required for the sustainable remediation of impacted marine ecosystems (surface and subsurface water and sediments) and the industrial exploitation of marine biodiversity and bioresources.

6794 000 000 94533 - 0 - FINAL EXAMINATION (18 CFU)	CON		18	0/0/0/0	No	

Ambito: 1018 - Per la prova finale E

Obiettivi: At the end of the activity, the student is able to produce an original scientific paper, including general scientific and ethical issues. The student is familiar with the scientific method as a working tool; is familiar with searching for information; is able to work by objectives; is able to make a scientific presentation.

Obiettivi inglese: At the end of the activity, the student is able to produce an original scientific paper, including general scientific and ethical issues. The student is familiar with the scientific method as a working tool; is familiar with searching for information; is able to work by objectives; is able to make a scientific presentation.

6794 000 000 99154 - 0 - SEDIMENT CHARACTERIZATION AND MANAGEMENT IN COASTAL AREAS	CON	GEO/08	6	32/20/0/0	No	Voto

Ambito: 2019 - Attività formative affini o integrative C

Obiettivi: At the end of the course the student will have and overview of the basic compositional features of marine sediments and the factors controlling their chemical composition. The students will be familiar with techniques for their sampling and analysis according either to research purposes and normative activities. Focus will be paid to drdged sediments concerning their characterization, evaluation and management with attention to quality criteria and possible reuse.

Obiettivi inglese: At the end of the course the student will have and overview of the basic compositional features of marine sediments and the factors controlling their chemical composition. The students will be familiar with techniques for their sampling and analysis according either to research purposes and normative activities. Focus will be paid to drdged sediments concerning their characterization, evaluation and management with attention to quality criteria and possible reuse.

Gruppo: 2) Final examination and thesis preparation activities

TAF: E Ambito: 1018 - Per la prova finale

Cfu min: 18 Cfu max: 18

Note: Choose among one of the following options:

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.
6794 000 000 94535 - 0 - INTERNSHIP ABROAD FOR THE PREPARATION OF THE FINAL EXAMINATION (18 CFU)	CON			18	0/0/450/0	No	Giudizio

Ambito: 1018 - Per la prova finale E

Obiettivi: This internship is carried out abroad. With this internship activity, the student gathers data and engages in activities related to the preparation of the final examination. They develop skills in judgment and evaluation, acquiring knowledge in the use and management of specific software or scientific tools connected to the subject selected for the final examination.

Obiettivi inglese: This internship is carried out abroad. With this internship activity, the student gathers data and engages in activities related to the preparation of the final examination. They develop skills in judgment and evaluation, acquiring knowledge in the use and management of specific software or scientific tools connected to the subject selected for the final examination.

6794 000 000 94536 - 0 - INTERNSHIP FOR THE PREPARATION OF THE FINAL EXAMINATION (18 CFU)	CON		18	0/0/450/0	No	Giudizio

Ambito: 1018 - Per la prova finale E

Obiettivi: With this internship activity, the student gathers data and engages in activities related to the preparation of the final examination. They develop skills in judgment and evaluation, acquiring knowledge in the use and management of specific software or scientific tools connected to the subject selected for the final examination.

Obiettivi inglese: With this internship activity, the student gathers data and engages in activities related to the preparation of the final examination. They develop skills in judgment and evaluation, acquiring knowledge in the use and management of specific software or scientific tools connected to the subject selected for the final examination.

6794 000 000 87955 - 0 - PREPARATION FOR THE FINAL EXAMINATION (18 CFU)	CON	18	0/0/450/0	No	Giudizio

Ambito: 1018 - Per la prova finale E

Obiettivi: Through this activity the student acquires skills, methodologies and data for the preparation of the final examination at an Italian research organisation. He/she develops skills of judgement and evaluation and acquires knowledge in the use and management of the specific software or hardware tools required for the research work that is the subject of the final examination.

Obiettivi inglese: Through this activity the student acquires skills, methodologies and data for the preparation of the final examination at an Italian research organisation. He/she develops skills of judgement and evaluation and acquires knowledge in the use and management of the specific software or hardware tools required for the research work that is the subject of the final examination.

6794 000 000 94534 - 0 - PREPARATION FOR THE FINAL EXAMINATION ABROAD (18 CFU)	CON	18	0/0/450/0	No	Giudizio

Ambito: 1018 - Per la prova finale E

Obiettivi: In this casethe final examination preparation is carried out abroad. During this period the student gains essential skills to independently plan and execute an original investigation related to the objectives of the Master's degree. This includes both the conceptualization and practical implementation of experiments in the chosen field.

Obiettivi inglese: In this casethe final examination preparation is carried out abroad. During this period the student gains essential skills to independently plan and execute an original investigation related to the objectives of the Master's degree. This includes both the conceptualization and practical implementation of experiments in the chosen field.

Gruppo: 3) Elective academic activities - regolamento

TAF: D Ambito: 1008 - A scelta dello studente

Cfu min: 12 Cfu max: 12

Note:

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.

Anno Accademico **2025/2026**
Classe **LM-75 R-SCIENZE E TECNOLOGIE PER L'AMBIENTE E IL TERRITORIO**
Corso **6794-SCIENZE E TECNOLOGIE PER LA SOSTENIBILITÀ AMBIENTALE**

Curriculum: ANALISI E GESTIONE DELL'AMBIENTE (C99)

Primo Anno di Corso

Gruppo: 1) Attività formative obbligatorie

TAF: **Ambito:**

Cfu min: **Cfu max:**
Note:

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.
6794 000 000 37358 - 0 - ANALISI CHIMICA DELLA QUALITA' AMBIENTALE	CON	CHIM/01	B	6	40/0/12/0	No	Voto
Ambito: 051 - Discipline chimiche							
Obiettivi: Al termine del corso, lo studente possiede una conoscenza sulle misurazioni chimiche necessarie per valutare la qualità dell'ambiente. E' in grado di comprendere ed applicare le metodologie per il monitoraggio chimico degli inquinanti nei vari comparti ambientali, i criteri per valutare l'affidabilità dei dati di concentrazione e gli strumenti per interpretarli in relazione alla composizione chimica delle matrici (aria, acqua, suolo), alle fonti della contaminazione ed ai possibili effetti sull'ambiente.							
6794 000 000 37361 - 0 - FISIOLOGIA APPLICATA ALL'AMBIENTE	CON	BIO/09	B	6	40/0/12/0	No	Voto
Ambito: 1033 - Discipline biologiche							
Obiettivi: Al termine del corso, lo studente possiede conoscenze sull'interazione organismo-ambiente e conoscenze teorico-pratiche necessarie a misurare e prevedere gli effetti delle attività antropiche sugli organismi viventi a livello molecolare, cellulare e di individuo. Su queste basi, è in grado di applicare indicatori di qualità ambientale, ed utilizzare i dati ambientali ed epidemiologici nell'ambito della valutazione del rischio.							
CLIR 000 000 26337 - 6 - IDONEITA' LINGUA INGLESE B - 2	E-L		F	6	0/0/0/0	No	Giudizio
Ambito: 1007 - Ulteriori conoscenze linguistiche							

6794 000 000 37364 - 0 - IDROLOGIA AMBIENTALE	CON	GEO/03	6	32/10/12/0	No	Voto

Ambito: 402 - Discipline di scienze della Terra B

Obiettivi: Fornire gli elementi di base per comprendere le interazioni fra idrosfera e ambiente, l'idrodinamica fluviale, il flusso delle acque sotterranee, la dispersione degli inquinanti, l'idro-geochimica e la gestione delle acque nell'ambito della legislazione vigente a livello europeo (Water Framework Directive). Oltre che tramite lezioni frontali, la formazione sarà raggiunta tramite l'utilizzo di modelli analitici e numerici sviluppati al computer e con prove in campagna.

6794 000 000 55012 - 0 - LEGISLAZIONE AMBIENTALE	CON	IUS/10	6	48/0/0/0	No	Voto

Ambito: 2298 - Discipline giuridiche, economiche, ingegneristiche, gestionali e valutative B

Obiettivi: Al termine del corso, lo studente possiede conoscenze approndite sulle principali tematiche del diritto ambientale, in particolare sulla tutela dell'aria, delle acque, gestione dei rifiuti e bonifica dei siti contaminati. Conosce inoltre la disciplina dei principali sistemi di certificazione in materia ambientale. Lo studente è in grado di risolvere le problematiche giuridiche ambientali relative alle diverse forme di inquinamenti.

6794 000 000 37362 - 0 - METODI ECOLOGICI PER L'ANALISI E LA GESTIONE DELL'AMBIENTE	CON	BIO/07	6	40/0/12/0	No	Voto

Ambito: 069 - Discipline ecologiche B

Obiettivi: Al termine del corso, lo studente possiede conoscenze teoriche e pratiche necessarie a misurare e prevedere gli effetti delle attività antropiche su popolazioni, comunità ed ecosistemi e a sintetizzare le informazioni secondo modalità utili ai fini della gestione dell'ambiente.
E' in grado di: applicare metodi di monitoraggio e indicatori di qualità dell'ambiente basati su caratteristiche strutturali e funzionali di popolazioni, comunità, ecosistemi; valutare l'ecotossicità delle sostanze; integrare informazioni di diversa natura, nel quadro di approcci "weight of evidence"; effettuare valutazioni di rischio ecologico, sia predittive che retrospettive, con particolare riguardo all'analisi degli effetti ecologici dei contaminanti e di altri agenti di stress; discriminare la variabilità naturale dall'alterazione antropica e valutare l'impatto delle attività umane sui sistemi ecolgici, applicando opportuni disegni di campionamento.

6794 000 000 B5181 - 0 - MODELLI E ANALISI PER LA GESTIONE AMBIENTALE	CON	FIS/07	6	24/20/12/0	No	Voto

Ambito: 2232 - Discipline agrarie, matematiche, fisiche e informatiche B

Obiettivi: Al termine del corso lo studente è in grado di rappresentare un sistema e possiede le basi per modellare la dinamica delle relazioni che intercorrono tra gli elementi di un sistema. Lo studente conosce i fondamenti dell'economia dell'ambiente e le categorie di politiche ambientali per la gestione dell'ambiente.

Obiettivi inglese: At the end of the course, the student will be able to represent a system and have a basic knowledge of how to model the dynamics of the relationships between the elements of a system. Students will be familiar with the basics of environmental economics and the environmental policy categories of environmental management.

6794 000 000 B5177 - 0 - REMOTE SENSING E GIS APPLICATI ALLO STUDIO DI AMBIENTE E TERRITORIO	CON	GEO/04	6	32/20/0/0	No	Voto

Ambito: 402 - Discipline di scienze della Terra B

Obiettivi: All'nizio del corso si studieranno i fondamenti della geomatica e le basi teoriche relative alle caratteristiche e al funzionamento dei Sistemi Informativi Geografici (GIS – Geographic Information Systems). Accanto alle conoscenze in ambito GIS, lo studente acquisirà le basi teoriche di Remote Sensing sufficienti per utilizzare dati provenienti da diverse piattaforme satellitari. Le competenze teoriche acquisite durante le lezioni frontali saranno accompagnate da esercitazioni pratiche con i software open-source e open-access più utilizzati nell'ambito delle geoscienze (QGIS, SNAP, SAGA, ecc.). Le esercitazioni saranno mirate alla comprensione di casi-studio reali applicati al monitorggio del territorio e allo studio dell'ambiente, con esercizi via via più complessi che includeranno l'utilizzo simultaneo di dati cartografici e telerilevati (vettoriali e raster). Al termine del corso lo studente sarà in grado di utilizzare i fondamentali strumenti di georeferenziazione e restituzione cartografica, di ricercare, scaricare e processare dati satellitari di vario genere, ed infine produrre la cartografia tematica di interesse (es. uso del suolo).

Obiettivi inglese: At the beginning of the course, the fundamentals of geomatics and the theoretical basics of the characteristics and functioning of Geographic Information Systems (GIS) will be studied. Alongside GIS knowledge, the student will acquire the theoretical foundations of Remote Sensing sufficient to master the use of data from various satellite platforms. The theoretical skills acquired during lectures will be complemented by practical exercises with the most used open-source and open-access software in geosciences (QGIS, SNAP, SAGA, etc.). The exercises will be aimed at understanding real case studies applied to the management of the territory and the study of the environment, with progressively more complex tasks that will include the simultaneous use of cartographic and remotely sensed data (vector and raster). By the end of the course, the student will be able to use fundamental georeferencing and cartographic restitution tools, search for, download, and process various types of satellite data, and ultimately produce thematic maps of interest (e.g., land use).

6794 000 000 99107 - 0 - SCIENZA DEI DATI PER L'AMBIENTE	CON	CHIM/02	6	32/0/24/0	No	Voto

Ambito: 051 - Discipline chimiche B

Obiettivi: Conoscere e sapere applicare principali metodi di analisi e di modellazione di dati monovariati, bivariati e multivariati.

Obiettivi inglese: Knowledge of the main topics of analysis and modelling of univariate, bivariate and multivariate data.

6794 000 000 B5179 - 0 - VALUTAZIONE DELL'IMPATTO AMBIENTALE	CON	FIS/07	6	32/10/12/0	No	Voto

Ambito: 2232 - Discipline agrarie, matematiche, fisiche e informatiche B

Obiettivi: Al termine del corso, lo studente possiede elementi conoscitivi sulle diverse procedure valutative(Valutazione di Impatto Ambientale, Valutazione Ambientale Strategica, Valutazione di Incidenza), e sugli strumenti per l'identificazione e la valutazione degli impatti ambientali indotti dalle realizzazione di piani e progetti. E' in grado di comprendere, interpretare in modo critico ed impostare autonomamente un rapporto di impatto ambientale.

Secondo Anno di Corso

Gruppo: 1) Attività formative obbligatorie

TAF: Ambito:

Cfu min: Cfu max:
Note:

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.
6794 000 000 58305 - 0 - LABORATORIO INTERDISCIPLINARE	CON			6	8/0/60/0	No	Giudizio

Ambito: 1147 - Altre conoscenze utili per l'inserimento nel mondo del lavoro F

Obiettivi: Al termine dell'attività, lo studente è in grado di affrontare una specifica problematica ambientale con un approccio sperimentale multidisciplinare ed integrato utilizzando tecniche di analisi chimiche, fisiche, ecologiche, biologiche e geologiche e fornendo una rappresentazione territoriale dei dati ottenuti sia individualmente che in gruppo.

6794 000 000 70020 - 0 - PROVA FINALE (15 CFU)	CON		15	0/0/0/0	No	

Ambito: 1018 - Per la prova finale E

Obiettivi: Al termine dell'attività, lo studente è in grado di produrre un elaborato scientifico originale, anche in relazione a questioni generali scientifiche ed etiche. Conosce il metodo scientifico come strumento di lavoro; ha familiarità con la ricerca delle informazioni anche in lingua inglese, è capace di lavorare per obiettivi, è in grado di effettuare una presentazione scientifica.

Gruppo: 2) Attività formative affini e integrative

TAF: C Ambito: 2019 - Attività formative affini o integrative

Cfu min: 12 Cfu max: 12
Note: Scegli 12 CFU fra gli insegnamenti proposti.

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.

6794 000 000 99169 - 0 - ANALISI DEL CICLO DI VITA E CHIMICA SOSTENIBILE (C.I.) 6 Voto

Modulo integrato: 99166 - PRINCIPI, METODOLOGIA E APPLICAZIONI DEL LIFE CYCLE ASSESSMENT CON FIS/07 3 16/0/12/0 No

Ambito: 2019 - Attività formative affini o integrative C

Obiettivi: Al termine del corso lo studente ha appreso il concetto di Life Cycle Thinking, i suoi principi e la metodologia del Life Cycle Assessment (LCA). Conosce, inoltre, i principali strumenti di valutazione della sostenibilità che applicano l'approccio del ciclo di vita (Carbon Footprint, Product Environmental Footprint, Environmental Product Declaration, ecc.). E' in grado di impostare uno studio di LCA e di applicarlo per l'ottenimento di un'etichettatura ecologica.

Obiettivi inglese: At the end of the course the student has learned the concept of Life Cycle Thinking, its principles and the methodology of Life Cycle Assessment (LCA). The student will also know main sustainability assessment tools for life cycle approach (Carbon Footprint, Product Environmental Footprint, Environmental Product Declaration, etc.) and will be able to set up an LCA study and apply it to obtain an ecological label.

Modulo integrato: 99167 - SOSTENIBILITÀ DEI PROCESSI CHIMICI CON CHIM/06 3 24/0/0/0 No

Ambito: 2019 - Attività formative affini o integrative C

Obiettivi: Al termine del corso, lo studente conosce e sa utilizzare i principi e gli strumenti della chimica sostenibile, alcuni fondamentali aspetti normativi(REACH), i principi e gli esempi di progettazione di materiali, sostanze e processi alternativi, con riferimento anche alle fonti di materie prime ed energia.

Obiettivi inglese: At the end of the course, the student knows and can apply the principles and tools of sustainable chemistry, some fundamental regulatory aspects (REACH), the principles and examples of designing alternative materials, substances and processes, with reference also to the starting materials and energy demand.

6794 000 000 66090 - 0 - CARATTERIZZAZIONE GEOCHIMICA DI MATERIALI CONTAMINATI CON GEO/08 6 32/20/0/0 No Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: Al termine del corso, lo studente conosce:
- le caratteristiche principali di materiali contaminati di varia natura (acque luride, sedimenti dragati, residui minerari);
- i metodi e le tecniche per la loro caratterizzazione e per la valutazione del loro impatto sull'ambiente;
- alcune delle principali tecniche di bonifica dei siti contaminati.

6794 000 000 58465 - 0 - ECOLOGIA DEL PAESAGGIO CON BIO/03 6 32/20/0/0 No Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: Attraverso i fondamenti e i presupposti teorici dell'ecologia del paesaggio, lo studente al termine del corso è in grado di: comprendere il ruolo centrale della componente vegetale nel paesaggio; utilizzare un approccio ecologico nell'analisi del paesaggio in un contesto multiscalare multitemporale; acquisire tecniche e metodi di analisi da applicare nel campo della gestione, conservazione e monitoraggio di paesaggi e habitat in uno scenario di cambiamenti globali.

Obiettivi inglese: Through principles and methods of landscape ecology, the student at the end of the course will be able to: understand the central role of the plant component in the landscape; use an ecological approach in landscape analysis within a multi-scalar and multi-temporal framework; use the landscape ecology methods for the management, conservation and monitoring of landscapes and habitats in a scenario of global changes.

6794 000 000 28121 - 0 - GEOFISICA DEI RISCHI AMBIENTALI CON GEO/10 6 32/0/24/0 No Voto

Ambito: 2019 - Attività formative affini o integrative C

Obiettivi: Al termine del corso, lo studente possiede le conoscenze geofisiche necessarie per valutare i rischi ambientali di origine naturale ed antropica. E' in grado di utilizzare gli strumenti geofisici e le stime di pericolosità disponibili per mitigarne gli effetti. Conosce l'applicazione dei metodi di indagine geofisica ai problemi ambientali, la prospezione sismica e geoelettrica e l'acquisizione ed interpretazione dei dati ottenuti con georadar.

6794 000 000 37378 - 0 - PEDOLOGIA E GESTIONE DEL SUOLO	CON	AGR/14	6	32/10/12/0	No	Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: Al termine del corso, lo studente conosce il valore del suolo quale risorsa non rinnovabile. Conosce i fattori che ne condizionano la genesi e lo sviluppo. E' in grado di:
- utilizzare gli strumenti ed i metodi per impostare un rilevamento pedologico e per realizzare le principali analisi chimico fisiche;
- classificare i suoli, interpretare ed utilizzare le informazioni per valutare la qualità dei suoli, in relazione alle diverse destinazioni d'uso, ed alle pressioni a cui può essere soggetto.

6794 000 000 B5252 - 0 - TEORIA ED APPLICAZIONI DEI MODELLI DI TRASPORTO E DISPERSIONE DEGLI INQUINANTI IN ATMOSFERA	CON	CHIM/02	6	32/20/0/0	No	Voto

Ambito: 1144 - Attivita' formative affini o integrative C

Obiettivi: Al termine del corso, lo studente ha conoscenza dei principi fondamentali per effettuare bilanci di materia e di energia coinvolti nei processi di trasporto, delle nozioni fondamentali di fisica dei bassi strati dell'atmosfera e dei meccanismi di dispersione degli inquinanti nella bassa atmosfera. E' in grado di utilizzare i modelli più diffusi di simulazione delle concentrazioni in aria e delle deposizione al suolo degli inquinanti e di confrontare i risultati con i valori di riferimento della qualità dell'aria.

Obiettivi inglese: This course provides the student with a basic knowledge of the fundamental principles necessary for calculating mass and energy balances involved in transport processes, basic notions of the physics of the lower atmosphere and the dispersion and deposition mechanisms of pollutants. This will enable the student to use the most widespread simulation models for atmospheric concentrations and ground deposition of pollutants and to compare the results with air quality reference values.

Gruppo: 3) Attività formative a scelta - regolamento

TAF: D Ambito: 1008 - A scelta dello studente

Cfu min: 12 Cfu max: 12

Note:

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.

Gruppo: 4) Attività formative relative alla prova finale

TAF: E Ambito: 1018 - Per la prova finale

Cfu min: 15 Cfu max: 15

Note: Scegli una delle opzioni proposte.

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.
6794 000 000 44304 - 0 - PREPARAZIONE PROVA FINALE	CON			15	0/0/375/0	No	Giudizio

Ambito: 1018 - Per la prova finale E

Obiettivi: Lo studente con questa attività acquisisce presso un ente di ricerca italiano le competenze, le metodologie e i dati per la preparazione della preparazione della prova finale. Sviluppa capacità di giudizio e valutazione e acquisisce conoscenze nell'utilizzo e gestione degli strumenti software o hardware specifici necessari per il lavoro di ricerca oggetto della prova finale.

Obiettivi inglese: Through this activity the student acquires skills, methodologies and data for the preparation of the final examination at an Italian research organisation. He/she develops skills of judgement and evaluation and acquires knowledge in the use and management of the specific software or hardware tools required for the research work that is the subject of the final examination.

6794 000 000 81355 - 2 - PREPARAZIONE PROVA FINALE ALL'ESTERO	CON		15	0/0/375/0	No	Giudizio

Ambito: 1018 - Per la prova finale E

Obiettivi: Obiettivi: Nella preparazione della prova finale lo studente ha acquisito le capacità necessarie per affrontare in autonomia la pianificazione e la realizzazione sperimentale di una indagine originale su tematiche connesse con gli obiettivi della Laurea Magistrale.

Obiettivi inglese: In this casethe final examination preparation is carried out abroad. During this period the student gains essential skills to independently plan and execute an original investigation related to the objectives of the Master's degree. This includes both the conceptualization and practical implementation of experiments in the chosen field.

Note: Note: Se scegli quest'attività intendi partecipare ad un bando per la mobilità internazionale d'Ateneo (es.: Bando Tesi Estero, Erasmus+, etc.) L'individuazione dell'ente ospitante e la definizione delle attività sono da concordare col relatore di tesi.

6794 000 000 70441 - 0 - TIROCINIO IN PREPARAZIONE DELLA PROVA FINALE	CON	15	0/0/375/0	No	Giudizio

Ambito: 1018 - Per la prova finale E

Obiettivi: Obiettivi: Lo studente con questa attività di tirocinio acquisisce dati e svolge attività connesse alla preparazione della prova finale. Sviluppa capacità di giudizio e valutazione e acquisisce conoscenze nell'utilizzo e gestione degli strumenti software o hardware specifici connessi al lavoro oggetto della prova finale.

Obiettivi inglese: With this internship activity, the student gathers data and engages in activities related to the preparation of the final examination. They develop skills in judgment and evaluation, acquiring knowledge in the use and management of specific software or scientific tools connected to the subject selected for the final examination.

Note: Se scegli quest'attività intendi attivare un tirocinio presentando richiesta tramite SOL - Tirocini (per saperne di più vai sul sito web del tuo CdS > homepage > studiare > tirocinio prova finale).

6794 000 000 81354 - 0 - TIROCINIO IN PREPARAZIONE DELLA PROVA FINALE ALL'ESTERO	CON	15	0/0/375/0	No	Giudizio

Ambito: 1018 - Per la prova finale E

Obiettivi: Obiettivi:Lo studente con questa attività di tirocinio all'estero acquisisce dati e svolge attività connesse alla preparazione della prova finale. Sviluppa capacità di giudizio e valutazione e acquisisce conoscenze nell'utilizzo e gestione degli strumenti software o hardware specifici connessi al lavoro oggetto della prova finale.

Obiettivi inglese: This internship is carried out abroad. With this internship activity, the student gathers data and engages in activities related to the preparation of the final examination. They develop skills in judgment and evaluation, acquiring knowledge in the use and management of specific software or scientific tools connected to the subject selected for the final examination.

Note: Se scegli quest'attività intendi partecipare a un bando per la mobilità internazionale (es.: Erasmus+ Mobilità Tirocinio) o attivare un tirocinio presentando richiesta tramite SOL - Tirocini (per saperne di più vai sul sito web del tuo CdS > homepage > studiare > tirocinio prova finale).

Legenda:

CFU: crediti formativi universitari
TAF: tipologia attività formativa (A-di base; B-caratterizzanti; C-affini o integrative; F-ulteriori attività formative; D-a scelta autonoma dello studente; S- stages e tirocini presso imprese, enti pubblici o privati, ordini professionali; E-per la prova finale)
SSD: settore scientifico disciplinare
F/E/L/N: indica le ore Frontali/Esercitazioni/Laboratori/Ore di esercitazione e/o laboratorio tenute da non docenti
Freq.: segnala l'esistenza di un obbligo di frequenza
Ver.: indica la modalità di verifica del profitto finale
TIP.: indica la tipologia delle forme didattiche. Queste possono essere CON: convenzionali, E-L: in e-learning, MIX: miste, C/E: convenzionali e/o e-learning. Il corso di studio può definire annualmente una delle modalità.