



ALMA MATER STUDIORUM  
UNIVERSITÀ DI BOLOGNA

DEGREE PROGRAMME TEACHING REGULATIONS

LM 75- Environmental and Land Studies  
SCIENCE AND TECHNOLOGIES FOR ENVIRONMENTAL SUSTAINABILITY  
Curriculum - Water Costal Management

**Ravenna Campus**

Courtesy translation in English.  
In case of disputes, **the Italian version is prevalent.**  
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## **Second Cycle Degree/ Two Years Master's Degree in Science And Technologies For Environmental Sustainability**

### **ART. 1 ADMISSION REQUIREMENTS**

In order to to profitably attend the Second-Cycle Degree/Two-Year Master's Degree in Science and Technologies for Environmental Sustainability, students must possess appropriate knowledge of mathematics, physics, chemistry, biology, ecology, earth sciences at university level, and in particular:

- basic knowledge of mathematics in the fields of mathematical analysis and linear algebra
- basic knowledge of physics in the fields of thermodynamics and electromagnetics
- basic knowledge of general chemistry and organic chemistry
- basic knowledge in the field of cell biology, zoology and botany
- basic knowledge of earth sciences in the fields of geology and the description of the earth's surface
- basic knowledge of ecology

Admission to the Second-Cycle Degree/Two-Year Master's Programme requires possession of a Bachelor's degree or A three-year university Diploma, or any other degree obtained abroad, recognised as suitable.

Additionally, candidates must meet the curricular requirements and pass the assessment of personal knowledge and skills.

- **Curricular requirements:**

- pursuant to Italian Min. Decree 270/04: L-32 Environmental Sciences;
  - pursuant to Italian Min. Decree 509/99: 27-Environmental Sciences;
  - Previous degree programme system: Environmental Sciences; Natural Sciences;
- or
- have a first-cycle degree from a different class to those indicated and have obtained the credits indicated in the degree programme teaching regulations.

Admission to the master's degree programme requires candidates to pass an assessment of personal competencies that will be held according to the methods defined in the degree programme teaching regulations.

English language skills are also required to at least level B1 of the Common European Framework of Reference for Languages.

- **Admission modalities:**

Admission to the Master's Degree is permitted to students holding a degree belonging to the classes indicated in the admission requirements or to a degree programme belonging to a different class having acquired at least 36 CFU/ECTS distributed in the following subject groups:

- Naturalistic and environmental area (at least 24 CFU/ECTS):  
BIO/01...19, GEO/01...12, AGR/07, AGR/11, AGR/13, AGR/14, AGR/16, VET/01, VET/02, VET/07, ICAR/03
- Mathematics, computer science and physics area (at least 6 CFU/ECTS):  
MAT/01...09; INF/01; ING-INF/05; FIS/01...08, SECS- S/01/02, MED/01
- Chemical area (at least 6 CFU/ECTS):  
CHIM/01...12

Credits acquired in subject groups other than those indicated may be evaluated as equivalent on the basis of the contents.

- **Assesment of personal competences and skills:**

In the absence of a degree qualification or of the credits indicated in the previous paragraph, admission to the Master's Degree Course is permitted only to those who demonstrate the required knowledge and skills, assessed by a Examination Commission through the analysis of the curriculum and an interview (in person or online) according to the methods, criteria and procedures established by the Degree Programme Board and published on the University portal. In case the Commission deems the level of knowledge and skills and the adequacy of the graduate's personal preparation to be sufficient, it expresses a judgment of eligibility, which allows enrolment in the Master's Degree Course in Science and Technologies for Environmental Sustainability.

- **Assesment of linguistic skills – Verification of English language knowledge**

For students enrolled in the italian curriculum Analisi e Gestione dell'Ambiente (AGA) is requested a B1 level of English knowledge of the Common European Framework (CEFR), while admission to the curriculum Water Costal Management (WACOMA) is subject to proving at least a B2 level.

Knowledge of English language is verified through the submission of an official certificate and/or a proficiency test.

### **ART. 2 MOBILITY RULES BETWEEN DEGREE PROGRAMME CURRICULA. INDIVIDUAL STUDY PLANS**

It is not possible to submit individual Study Plans and it is not permitted to switch between the available curricula, except for exceptional and duly motivated reasons, approved by the Degree Programme Board.

### **ART. 3 IMPLEMENTATION OF LEARNING ACTIVITIES AND TYPES OF TEACHING ACTIVITIES**

The attached course structure diagram indicates all the learning activities and their division into hours of classroom teaching, practical exercises or internship, as well as the type of teaching methods. Any further information will be published annually on the University website.

### **ART. 4 ATTENDANCE AND COURSE UNIT PREREQUISITES**

Compulsory attendance is specified in the attached course structure diagram, as well as any prerequisites for individual course units. Methods of verification of the attendance requirement, if applicable, are established annually by the Degree Programme Board when presenting the teaching planning and are made known to students before the start of lessons via the University Portal.

### **ART. 5 PART-TIME STUDENT STATUS**

Students can choose to enroll as a part-time student that allows to complete the degree programme in a longer or shorter time than the standard duration (2 years for Second Cycle degree programmes), according to the procedures defined in the University Teaching Regulation.

In case of necessary deactivation, learning activities provided by the degree programme can be replaced to guarantee the quality and sustainability of the programme catalogue.

### **ART. 6 ASSESSMENT OF LEARNING ACTIVITIES**

The attached course structure diagram defines cases in which the learning activities end with an exam marked (with a score out of 30) or by a “pass”.

The assessment methods (oral, written or practical exam or any combination thereof; individual or group exams) are established annually by the Degree Programme Board during the presentation of the teaching planning and are notified to the students via the University Portal prior to start of the programme.

### **ART. 7 ELECTIVE LEARNING ACTIVITIES**

Students may autonomously select one or more learning activities among those offered by the degree programme and available in the attached course structure diagram.

If students intend to sit exams concerning an activity that is not included among those available in the course catalogue, they should submit an official request to the Degree Programme Board in the terms established annually and published on the University website. The Board will assess the coherence of the choice with the student’s study programme.

### **ART. 8 CRITERIA FOR THE RECOGNITION OF CREDITS ACQUIRED IN DEGREE PROGRAMMES IN THE SAME CLASS**

The acquired university credits are recognised up to the number of credits of the same subject group provided by the Degree Programme Regulations

If, after credits have been recognised as provided for in this regulation, there are unused credits remaining, the Degree Programme Board may recognise them by evaluating the specific case in coherence with the teaching and cultural affinities.

With reference to the WACOMA international curriculum taught in English, the recognition will only concern the teaching and the training activities carried out in English.

### **ART. 9 CRITERIA FOR THE RECOGNITION OF CREDITS ACQUIRED WITHIN DEGREE PROGRAMMES IN DIFFERENT CLASSES, FROM TELEMATIC UNIVERSITIES OR INTERNATIONAL DEGREE PROGRAMMES**

The acquired credits are recognised by the Degree Programme Board on the basis of the congruence of the subject groups and the content of the learning activities in which the student has acquired the credits with the specific learning outcomes of the Degree Programme and of the single learning activities to be recognized, pursuing in any case the purpose of student mobility.

Recognition is carried out up to the number of university training credits required by the Degree Programme Regulations of the Course.

If, after credits have been recognised as provided for in this regulation, there are unused credits remaining, the Degree Programme Board may recognise them by evaluating the specific case in coherence with the teaching and cultural affinities.

### **ART. 10 CRITERIA FOR THE RECOGNITION OF EXTRA-UNIVERSITY COMPETENCIES AND SKILLS**

Competences acquired outside University may be recognised in the following cases:

- professional knowledge and skills certified in accordance with the terms of the applicable laws;
- competences and skills acquired in post-graduate learning activities run or planned by the University.

The request for recognition will be assessed by the Degree Programme Board, taking into account the indications of the Academic Bodies and the maximum number of recognisable credits determined in the Degree Programme Regulations.

This recognition is subject to the activities being coherent with the specific learning outcomes of the Degree Programme and of the learning activities which are recognised, also in consideration of the contents and duration of the activity.

### **ART. 11 INTERNSHIPS FOR THE PREPARATION OF THE FINAL EXAMINATION OR LINKED TO A PROJECT AIMING TO DEVELOP LEARNING AND ACADEMIC SKILLS**

At the student's request, the Degree Programme may, following the procedures laid down in the University Regulations concerning internships and international mobility programmes, and in compliance with EU laws, authorize an internship for the preparation of the final examination or, in any case, linked to a project aimed at developing learning and academic skills.

These learning experiences shall not exceed 6 months, and shall be completed by the date of graduation. Credits for their recognition may be awarded:

- within the quota for the final examination;
- for the internship activities laid down in the course structure diagram;
- for additional activities, whose credits exceed the number required for graduation.

### **ART. 12 PREPARING THE FINAL EXAMINATION**

#### **• Characteristics of the Final Examination**

The final examination of a Second Cycle Degree Programme consists in the production and public discussion of an original dissertation based on a topic that is consistent with the programme objectives, under the guidance of a supervising professor.

The dissertation must demonstrate the student's ability to work independently and to clearly and fully present and discuss the results of an original research project, of an experimental or theoretical nature, on a specific topic.

#### **• Procedure for carrying out the Final Examination**

The thesis can be written in Italian or English.

The title of the thesis must be submitted at least six months before the discussion and must be approved by the Degree Programme Board. The preparation of the thesis is carried out under the supervision of a professor supervisor from Unibo and is discussed in a cross-examination with a counter-supervisor chosen from among the members of the Degree Programme Board.

The course structure diagram allows students to choose the preparation of the final exam in Italy or abroad or, alternatively, an internship for the thesis in Italy or abroad.

The discussion of the thesis takes place with the support of a power point presentation lasting 30 minutes. Score: 9 points can be awarded: 4 of which are available to the Supervisor, 3 to the Counter-Supervisor and 2 to the Commission. Students who have participated in 14 'Thursday Seminars' organized and certified by the Degree Programme are entitled to 1 additional point on the final grade.

### **ART. 13 CORRESPONDENCE BETWEEN THE CREDITS ASSIGNED TO EACH LEARNING ACTIVITY AND THE PLANNED LEARNING OUTCOMES**

On 16/12/2022 the Joint Teacher-Student Committee expressed its favourable opinion under the terms of article 12 para. 3 of Ministerial Decree no. 270/04.



Anno Accademico 2023/2024

Scuola **Scienze****ClasseCorso** LM-75-SCIENZE E TECNOLOGIE PER L'AMBIENTE E IL TERRITORIO5900-ANALISI E GESTIONE DELL'AMBIENTE**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.
5900 000 000 78487 - 0 - BIOREMEDIATION AND EXPLOITATION OF MARINE BIORESOURCES	CON	ICAR/03		6	48/0/0/0	No	Voto
Ambito: 1277 - Discipline giuridiche, economiche e valutative <b>B</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.							
5900 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>B</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.							
5900 000 000 99148 - 0 - ECOLOGY OF COASTAL ENVIRONMENTS	CON	BIO/07		6	48/0/0/0	No	Voto
Ambito: 069 - Discipline ecologiche <b>B</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.

5900 000 000 99146 - 0 - GEOGRAPHIC INFORMATION SYSTEMS	CON	AGR/14	6	24/30/0/0	No	Voto
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Ambito: 1144 - Attivita' 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.

5900 000 000 88166 - 0 - HYDROCOMPLEXITY OF THE COASTAL ZONE	CON	GEO/05	6	32/20/0/0	No	Voto
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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.

5900 000 000 88165 - 0 - INTEGRATED COASTAL ZONE MANAGEMENT	CON	FIS/07	6	40/0/12/0	No	Voto
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Ambito: 1278 - Discipline agrarie, tecniche e gestionali 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.

5900 000 000 99150 - 0 - INTEGRATED FIELD AND LABORATORY COURSE

CON

6

0/0/72/0

No

Voto

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 responsables 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 responsables 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.

5900 000 000 99147 - 0 - ISOTOPES AS TRACERS OF THE SEA	CON	FIS/07	6		No	Voto
			0	32/10/12/		

Ambito: 1278 - Discipline agrarie, tecniche e gestionali 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.

5900 000 000 99149 - 0 - MODELLING AND ASSESSING CLIMATE-RELATED OCEAN AND COASTAL HAZARDS AND CONRISKS		GEO/12 C	6		No	Voto
			0	32/10/12/		

Ambito: 1144 - Attivita' formative affini o integrative

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.

5900 000 000 88164 - 0 - PHYSIOLOGY APPLIED TO THE ENVIRONMENT: POLLUTANT IMPACTS ON HUMANHEALTH AND ECOSYSTEM	CON	BIO/09	6	40/0/12/0	No	Voto
			B			

Ambito: 042 - Discipline biologiche

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.

**Gruppo: 1) Compulsory academic activities**

Secondo Anno di Corso

**TAF: Ambito:****Cfu min: Cfu max:**

Note:

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.
5900 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.

5900 000 000 94533 - 0 - FINAL EXAMINATION (18 CFU)	CON		18	0/0/0/0	No	Giudizio
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Ambito: 1018 - Per la prova finale E

5900 000 000 99154 - 0 - SEDIMENT CHARACTERIZATION AND MANAGEMENT IN COASTAL AREAS	CON	GEO/08	6	32/20/0/0	No	Voto
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Ambito: 1144 - Attivita' 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 dredged 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 dredged 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.
5900 000 000 94535 - 0 - INTERNSHIP ABROAD FOR THE PREPARATION OF THE FINAL EXAMINATION (18 CFU)				18	0/0/450/0	No	Giudizio
Ambito: 1018 - Per la prova finale E							
5900 000 000 94536 - 0 - INTERNSHIP FOR THE PREPARATION OF THE FINAL EXAMINATION (18 CFU)				18	0/0/450/0	No	Giudizio
Ambito: 1018 - Per la prova finale E							
5900 000 000 87955 - 0 - PREPARATION FOR THE FINAL EXAMINATION (18 CFU)				18	0/0/450/0	No	Giudizio
Ambito: 1018 - Per la prova finale E							
Obiettivi: The preparation of the final examination is devoted to activities of higher formation, in the field of scientific research or technological advances, to be carried out in a Department or research Laboratory of the University of Bologna.							
The student develops an experimental, computational and/or theoretical work on a topic which is at the frontier of science, containing an advanced application of the investigation methodologies of the chosen curriculum and yielding a deepening in the sector of specialization.							
Obiettivi inglese: The preparation of the final examination is devoted to activities of higher formation, in the field of scientific research or technological advances, to be carried out in a Department or research Laboratory of the University of Bologna.							
The student develops an experimental, computational and/or theoretical work on a topic which is at the frontier of science, containing an advanced application of the investigation methodologies of the chosen curriculum and yielding a deepening in the sector of specialization.							
5900 000 000 94534 - 0 - PREPARATION FOR THE FINAL EXAMINATION ABROAD (18 CFU)				18	0/0/450/0	No	Giudizio

Ambito: 1018 - Per la prova finale E

Obiettivi: The preparation of the final examination is devoted to activities of higher formation, in the field of scientific research or technological advances, to be carried out in a Department or research Laboratory of the University of Bologna.

The student develops an experimental, computational and/or theoretical work on a topic which is at the frontier of science, containing an advanced application of the investigation methodologies of the chosen curriculum and yielding a deepening in the sector of specialization.

Obiettivi inglese: The preparation of the final examination is devoted to activities of higher formation, in the field of scientific research or technological advances, to be carried out in a Department or research Laboratory of the University of Bologna.

The student develops an experimental, computational and/or theoretical work on a topic which is at the frontier of science, containing an advanced application of the investigation methodologies of the chosen curriculum and yielding a deepening in the sector of specialization.



Gruppo: 3) Free-choice academic activities - regolamento TAF: D Ambito: 1008 - A scelta dello studente

**Cfu min: 12 Cfu max: 12** Num. Esami: 1 Num. Idoneità: 0

Note: La Scuola garantisce che, ai fini del rispetto del limite massimo di 12 esami/5 idoneità i CFU a scelta saranno acquisibili con 1 esami e 0 idoneità

<b>Attività formativa</b>	<b>TIP</b>	<b>SSD</b>	<b>TAF</b>	<b>CFU</b>	<b>ORE F/E/L/N</b>	<b>FREQ. VER.</b>
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Anno Accademico **2023/2024**

Scuola Scienze

**ClasseCorso LM-75-SCIENZE E TECNOLOGIE PER L'AMBIENTE E IL TERRITORIO5900-ANALISI E GESTIONE DELL'AMBIENTE**

Curriculum

## 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.
5900 000 000 37358 - 0 - ANALISI CHIMICA DELLA QUALITA' AMBIENTALE Ambito: 051 - Discipline chimiche <sup>B</sup>	CON	CHIM/01		6	40/0/12/0	No	Voto
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.							
5900 000 000 37361 - 0 - FISIOLOGIA APPLICATA ALL'AMBIENTE Ambito: 042 - Discipline biologiche <sup>B</sup>	CON	BIO/09		6	40/10/0/0	No	Voto
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.							
5900 000 000 37364 - 0 - IDROLOGIA AMBIENTALE Ambito: 402 - Discipline di scienze della Terra <sup>B</sup>	CON	GEO/03		6	32/10/12/0	No	Voto

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.

5900 000 000 58305 - 0 - LABORATORIO  
INTERDISCIPLINARE

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.

5900 000 000 55012 - 0 - LEGISLAZIONE  
AMBIENTALE

CON IUS/10 6 48/0/0/0 No Voto

Ambito: 1277 - Discipline giuridiche, economiche e valutative B

Obiettivi: Al termine del corso, lo studente possiede conoscenze approfondite 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.

5900 000 000 37362 - 0 - METODI ECOLOGICI PER L'ANALISI E LA  
GESTIONE DELL'AMBIENTE

CON BIO/07 6 48/0/0/0 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 ecologici, applicando opportuni disegni di campionamento.

5900 000 000 94443 - 0 - MONITORAGGIO E PIANIFICAZIONE DEL TERRITORIO

GEO/04 6 32/20/0/0 No Voto

Ambito: 402 - Discipline di scienze della Terra B

Obiettivi: Al termine del corso, lo studente possiede le conoscenze di base indispensabili per inquadrare, definire e sviluppare la pianificazione ambientale del territorio ("Environmental land use planning"). Conosce i riferimenti alle linee guida internazionali (Ramsar, ICZM, ecc.) e i principali strumenti di pianificazione territoriale nazionale (PTRC, PTCP, Piani regolatori generali, Piani particolareggiati, Piani settoriali). Lo studente è in grado di utilizzare i fondamentali strumenti di georeferenziazione e restituzione cartografica. Conosce inoltre i più recenti programmi europei ed internazionali di monitoraggio del territorio tramite telerilevamento e i principali processi che, partendo dal dato telerilevato (aereo e satellitare), portano alla cartografia tematica (es. uso del suolo).

5900 000 000 99107 - 0 - SCIENZA DEI DATI PER L'AMBIENTE 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.

Gruppo: 2) Corso opzionale

**TAF: C Ambito: 1144 - Attivita' formative affini o integrative**

Cfu min: 6 Cfu max: 6

Note: Almeno 6 cfu esclusivamente a scelta tra i corsi proposti

<b>Attività formative</b>	<b>TIP</b>	<b>SSD</b>	<b>TAF</b>	<b>CFU</b>	<b>ORE F/E/L/N</b>	<b>FREQ. VER.</b>
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5900 000 000 99169 - 0 - ANALISI DEL CICLO DI VITA E CHIMICA SOSTENIBILE (C.I.)

6

Modulo integrato: 99167 - SOSTENIBILITÀ DEI PROCESSI CHIMICI CHIM/06

3

24/0/0/0

Voto

No

Ambito: 1144 - 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.

Modulo integrato: 99166 - PRINCIPI, METODOLOGIA E APPLICAZIONI DEL LIFE CYCLE ASSESSMENT

FIS/07 3

16/0/12/0

No

Ambito: 1144 - 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.

5900 000 000 66090 - 0 - CARATTERIZZAZIONE GEOCHIMICA DI MATERIALI CONTAMINATI

CON

GEO/08

6

32/20/0/0

No

Voto

Ambito: 1144 - Attività 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 minerali);  
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.

5900 000 000 58465 - 0 - ECOLOGIA DEL PAESAGGIO

CON

BIO/03

6

32/20/0/0

No

Voto

Ambito: 1144 - Attività 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 multiscale e 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.

5900 000 000 28121 - 0 - GEOFISICA DEI RISCHI AMBIENTALI

CON

GEO/10

6

32/0/24/0

No

Voto

Ambito: 1144 - 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. È 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.

5900 000 000 37378 - 0 - PEDOLOGIA E GESTIONE DEL SUOLO	CON	AGR/14	6	32/10/12/	No	Voto
			0			

Ambito: 1144 - Attività 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.

5900 000 000 37377 - 0 - PROCESSI DI TRASPORTO E DISPERSIONE DEGLI INQUINANTI IN ATMOSFERA	CON	CHIM/02	6	32/20/0/0	No	Voto
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Ambito: 1144 - Attività 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 deposizioni al suolo degli inquinanti e di confrontare i risultati con i valori di riferimento della qualità dell'aria.

Gruppo: 3) Corsi a libera scelta dello studente - regolamento TAF: D Ambito: 1008 - A scelta dello studente

Cfu min: 12 Cfu max: 12 Num. Esami: 1 Num. Idoneità: 0

La Scuola garantisce che, ai fini del rispetto del limite massimo di 12 esami/5 idoneità i CFU a scelta saranno acquisibili con 1 esami e 0 idoneità

Note: Tra il primo e secondo anno 12 cfu a libera scelta tra i corsi proposti e/o tra tutti gli esami attivati dalla Scuola di Scienze.

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.
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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.
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CLIR 000 000 26337 - 6 - IDONEITA' LINGUA INGLESE B - 2	CON			6	0/0/0/0	No	Giudizio
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Ambito: 1007 - Ulteriori conoscenze linguistiche F

5900 000 000 37381 - 0 - PREVENZIONE E CONTROLLO DELL'IMPATTO AMBIENTALE	CON	FIS/07	6	32/10/12/	No	Voto
			0			

Ambito: 1278 - Discipline agrarie, tecniche e gestionali 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 realizzazioni di piani e progetti. E' in grado di comprendere, interpretare in modo critico ed impostare autonomamente un rapporto di impatto ambientale.

5900 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.

5900 000 000 37382 - 0 - SISTEMI DI GESTIONE AMBIENTALE, DI POLITICA ED  
ECONOMIA AMBIENTALE

CON

FIS/07

6

No

Voto

24/10/22/

0

Ambito: 1278 - Discipline agrarie, tecniche e gestionali B

Obiettivi: Al termine del corso lo studente è in grado di poter rappresentare un sistema e modellare le relazioni che intercorrono tra gli elementi del sistema per una loro gestione. Lo studente conosce gli strumenti economici e politici per la gestione dell'ambiente. E' in grado di impostare uno studio di valutazione del ciclo di vita di un sistema di prodotto e di poter distinguere tra i diversi strumenti che applicano l'approccio di lifecycle thinking per analizzare e certificare le prestazioni ambientali di prodotti, processi e servizi. Lo studente è in grado di valutare le problematiche dell'incertezza.

Gruppo: 2) Attività Formative Legate 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.
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5900 000 000 44304 - 0 - PREPARAZIONE PROVA FINALE

15

0/0/0/0

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.

5900 000 000 81355 - 2 - PREPARAZIONE PROVA  
FINALE ALL'ESTERO

15

0/0/375/0

No

Giudizio

Ambito: 1018 - Per la prova finale E

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.

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.

5900 000 000 70441 - 0 - TIROCINIO IN PREPARAZIONE  
DELLA PROVA FINALE

15

0/0/375/0

No

Giudizio

Ambito: 1018 - Per la prova finale E

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.

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).

5900 000 000 81354 - 0 - TIROCINIO IN PREPARAZIONE DELLA PROVA  
FINALE ALL'ESTERO

15 0/0/375/0 No Giudizio

Ambito: 1018 - Per la prova finale E

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.

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).

Gruppo: 3) Corso opzionale

**TAF: C Ambito: 1144 - Attività formative affini o integrative**

Cfu min: 6 Cfu max: 6

Note: Almeno 6 cfu esclusivamente a scelta tra i corsi proposti

Attività formativa	TIP	SSD	TAF	CFU	ORE F/E/L/N	FREQ.	VER.
5900 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		FIS/07		3	16/0/12/0	No	

Ambito: 1144 - 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 CHIM/06 3 24/0/0/0 No

Ambito: 1144 - 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.

5900 000 000 66090 - 0 - CARATTERIZZAZIONE GEOCHIMICA DI  
MATERIALI CONTAMINATI CON GEO/08 6 32/20/0/0 No Voto

Ambito: 1144 - Attività 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.

5900 000 000 58465 - 0 - ECOLOGIA DEL PAESAGGIO	BIO/03	6	32/20/0/0	No	Voto
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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.

5900 000 000 28121 - 0 - GEOFISICA DEI RISCHI AMBIENTALI	CON	GEO/10	6	32/0/24/0	No	Voto
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Ambito: 1144 - Attivita' 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.

5900 000 000 37378 - 0 - PEDOLOGIA E GESTIONE DEL SUOLO	CON	AGR/14	6	32/10/12/ 0	No	Voto
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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.

5900 000 000 37377 - 0 - PROCESSI DI TRASPORTO E DISPERSIONE DEGLI INQUINANTI IN ATMOSFERA	CON	CHIM/02	6	32/20/0/0	No	Voto
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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 deposizioni al suolo degli inquinanti e di confrontare i risultati con i valori di riferimento della qualità dell'aria.

## 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.