

**Polytechnic School - Department of Electrical, Electronic and Telecommunications
Engineering and Naval Architecture (DITEN)
Master's degree course in Engineering for Natural Risk Management**

Class LM-26

TEACHING REGULATIONS – Cohort 2023/2024

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Art. 1. Premise and area of competence

The present Teaching Regulations, in accordance with the Statute and the Teaching Regulations of the University of Genoa (general part and special part), determine the organisational aspects of the teaching activity of the Master's degree course in Engineering for Natural Risk Management, as well as any other subject of relevance based on other legislative and regulatory sources.

The Teaching Regulations of the Master's degree course in Engineering for Natural Risk Management are approved, pursuant to article 18, paragraphs 3 and 4 of the Teaching Regulations of the University of Genoa, general part, by the Council of the Course of Study (CCS) of Engineering for Natural Risk Management, based on a majority vote among its members, and submitted for approval to the Council of the DITEN Department (and to the Councils of the possible associated Departments), after consultation with the Polytechnic School, with the prior favourable opinion of the Teachers-Students Joint Committee of the Polytechnic School, if provided.

The resolutions of the CCS can also be taken in telematic mode according to the above-mentioned regulations and, in particular, to article 14 "meetings with telematic mode" of the current General Regulations of the University (in force since 19/12/2018).

Art. 2. Admission requirements and procedures for verifying individual preparation

Admission to the Master's degree course in Engineering for Natural Risk Management is subject to the possession of specific curriculum requirements and adequate personal preparation.

With reference to curriculum requirements, in order to access the Master's degree course in Engineering for Natural Risk Management, it is required:

- to be in possession of a bachelor's degree or a master's degree, as per Ministerial Decree 509/1999 or Ministerial Decree 270/2004, obtained at an Italian University, or a five-year degree (prior to Ministerial Decree 509/1999), obtained at an Italian University, or equivalent qualifications;
- to be in possession of at least 36 CFU (Italian university training credits, equivalent to the European credit transfer and accumulation system – ECTS) or equivalent knowledge, acquired in any university degree course (bachelor's, master's, five-year master's, first and second level “master universitario”) in the disciplinary-scientific sectors (SSD) indicated for the basic training activities of classes L-7 Civil and Environmental Engineering, L-8 Information Engineering, and L-9 Industrial Engineering, in the groupings MAT*, FIS*, CHIM*, ING-INF/05, INF/01, and SECS-S/02, of which no less than 30 CFU in the basic training activities of groupings MAT*, FIS*, CHIM* as a whole;
- to be in possession of at least 45 CFU or equivalent knowledge, acquired in any university degree course (bachelor's, master's, five-year master's, first and second level “master universitario”) in the SSDs indicated for the training activities characterising the classes:
 - L-7 Civil and Environmental Engineering: SSD BIO/07, CHIM/12, GEO/02, GEO/05, GEO/11, ICAR/01, ICAR/02, ICAR/03, ICAR/05, ICAR/06, ICAR/07, ICAR/08, ICAR/09, ICAR/11, ICAR/20, ING-IND/11, ING-IND/24, ING-IND/25, ING-IND/27, ING-IND/28, ING-IND/29, ING-IND/30, and ING-IND/31;
 - L-8 Information Engineering: SSD ING-INF/01, ING-INF/02, ING-INF/03, ING-INF/04, ING-INF/05, ING-INF/07, and ING-IND/31;
 - L-9 Industrial Engineering: SSD ICAR/08, ING-IND/10, ING-IND/14, ING-IND/16, ING-IND/17, ING-IND/19, ING-IND/22, ING-IND/25, ING-IND/28, ING-IND/31, ING-IND/33, ING-IND/35, and ING-INF/04.

For graduates abroad, the curricular requirements will be checked by considering appropriate equivalences between the classes passed and those ascribable to the SSDs indicated above. The equivalence of a degree obtained in a foreign university is established by analysing the related transcript of record.

It is admissible to validate credits following the acknowledgment of professional knowledge and skills certified individually in accordance with the regulations in force on the subject, as well as other knowledge and skills acquired in post-secondary level training activities to which the university has contributed.

Adequate knowledge of the English language is also required, with reference also to disciplinary lexicon, at the B2 level or higher.

In order to be admitted to the Master's degree course, students in possession of the curriculum requirements must successfully undergo a test to verify their personal preparation, except in the cases provided for in the last paragraph. The Examination Committee for this test is composed of at least two members of the Didactic and Admission Committee of the Master's degree course, which is, in turn, appointed by the CCS and composed of faculty lecturers belonging to the CCS. The test is carried out in the form of a public interview, a written test, or a video-interview through teleconference, and is aimed at ascertaining the general preparation of the student with particular reference to the knowledge of fundamental notions and of applicative and professional aspects related to engineering issues. For assessing the student, the Examination Committee also takes into account the curriculum obtained by the student in the three-year degree course. In the case of a student who

obtained a degree in a foreign university, the Committee also takes into consideration the quality of that university. The result of the test shall only include the words “passed” or “not passed”.

The composition of the Examination Committee, the modalities of the test, the place and dates of the tests, the topics to be examined, and the criteria for the evaluation of the candidates are indicated in the Call for Admission to the Master’s degree courses of the Polytechnic School and on the website of the present Master’s degree course.

A student certifies his/her English proficiency at the B2 level or higher by means of appropriate certificates in his/her possession or, in the absence thereof, by passing the B2 test organized by the Language Center of the University of Genoa (CLAT UniGe). The English proficiency requirement is also satisfied if the student holds a degree in English, to be certified through an official document or letter issued by the corresponding university and indicating that his/her studies were pursued in English. If the previous conditions are not fulfilled, English proficiency must be evaluated within the aforementioned personal preparation test by the corresponding Examination Committee. In this last case, the ability to use the English language fluently is also among the subjects of this test.

The adequacy of personal preparation is automatically verified for those who have obtained a Bachelor’s degree, Italian or foreign – or a qualification judged equivalent according to what has been indicated about the assessment of curricular requirements –, with a final mark of at least 9/10 of the maximum achievable mark of their degree, or who have obtained a final mark corresponding at least to the “A” classification of the ECTS system.

Art. 3. Training activities

The list of classes and other possible training activities is given in the relevant annex (Annex 1), which constitutes an integral part of these regulations. A responsible lecturer is identified for each class. A lecturer responsible of a class is whoever is in charge of teaching according to the law, i.e., he/she whom the relative Department Council has attributed the responsibility when assigning teaching tasks to lecturers.

The language used to provide training activities (lessons, exercises, workshops) shall be Italian or another EU language, where expressly decided by the CCS.

Annex 1 to these regulations specifies the language in which each training activity is carried out.

Art. 4. Enrolment in individual training activities

In accordance with Article 6 of the Regulations of the University of Genoa for students, a requirement in order to enrol in individual training activities is to have a qualification that allows accessing the university.

Art. 5. Curricula

The Master’s degree course in Engineering for Natural Risk Management is not structured in curricula.

Art. 6. Total time commitment

For each class, the definition of the hourly fraction dedicated to lessons or equivalent teaching activities is established by the CCS and specified in the special part of these regulations (Annex 1). In any case, the correspondence between classroom hours and CFUs is assumed to take values in the range: 8 ÷ 10 hours of lesson or assisted teaching activity per CFU.

For each class, the definition of the expected total time commitment reserved for personal study or other training activities of an individual type is specified in the special part of these regulations (Annex 1).

The director of DITEN and the head of the CCS shall be responsible for verifying compliance with the above requirements.

Art. 7. Study plans and prerequisites

Students can enrol full-time or part-time; for these two types of student, there are different rights and duties. Each student chooses the type of registration simultaneously with the presentation of his/her study plan. Each full-time student carries out his/her training activity considering the study plan established by the Master's degree course, which is organized into two distinct years and published in the Current Year Degree Programme Table ("Manifesto degli studi") of the Master's degree course. The study plan formulated by each student must contain an indication of the training activities, along with the related credits that he/she intends to achieve and that are provided by the official study plan for the corresponding teaching period, up to a maximum of 65 credits per year, except in the case of a transfer from another university. Such case will be evaluated individually.

Each part-time student is required to submit an individual study plan specifying the number of credits he/she intends to include, according to the regulations on the university fees of the University of Genoa.

The enrolment of full-time and part-time students is regulated by the Regulations of the University of Genoa for students, considering the operational provisions approved by the Central government bodies and indicated in the Student's Guide (which is published annually on the University website). The student's educational path can be bound by a system of prerequisites, indicated for each class in the special part of these Regulations (Annex 1).

Each student is allowed to include extracurricular classes in his/her study plan up to a maximum of 12 credits. These classes are not considered for the attainment of Master's degree title but could be considered should the student pursue a further degree course.

The modality and deadline for the submission of the study plan are established annually by the Polytechnic School and reported in the Current Year Degree Programme Table, which is published on the Master's degree website.

A study plan with a shorter duration than the nominal one needs approval from the CCS.

Art. 8. Attendance to and modalities of the teaching activities

The classes may take the form of: (a) lectures, including distance learning by telematic means; (b) practical exercises; (c) laboratory exercises; and (d) thematic seminars.

The complexity and the demanding nature of the classes taught in the various courses of study offered by the Polytechnic School make the attendance to the training activities strongly recommended for an adequate understanding of the topics and therefore a good success in the exams.

The class schedule is divided into semesters. As a rule, the semester is divided into at least 12 weeks of lesson plus at least overall 4 weeks for verification tests and examinations.

The examination period ends with the beginning of the lessons of the following semester. In the middle of the semester, the normal teaching activity (lessons, exercises, laboratories) can be interrupted according to the schedule indicated by the Polytechnic School.

The class schedule for the entire academic year is published, before the start of the classes of each academic year, on the website of the University of Genoa and can be reached from the website of the course of study. The class schedule guarantees the possibility of attending each year of the course as planned in the Current Year Degree Programme Table of the Master's degree course. For practical reasons, the compatibility among the timetables of all the formally possible elective classes is not guaranteed. Students must then formulate their study plan taking also into account the timetable of the classes.

Art. 9. Examinations and other performance verifications

Examinations can be carried out in written, oral, or both written and oral forms, according to the modalities indicated in the sheet of each class, which is published on the website of the University of Genoa and can be reached from the website of the Master's degree course.

Upon request, specific learning verification arrangements may be provided that take into account the needs of disabled students or students with specific learning disorders (D.S.A.), in accordance with article 29, paragraph 4 of the Teaching Regulations of the University of Genoa.

In the case of classes structured into modules with several lecturers, all such lecturers collectively participate in the overall evaluation of the student's performance, which cannot, in any case, be split into separate evaluations on the individual modules.

The examination schedule is established by the deadline defined by the Ministry for the following academic year, is published on the website of the University of Genoa, and can be reached from the website of the Master's degree course.

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

Before taking the final examination, each student must pass the exams of all his/her classes by the deadline defined by the Student Office of the Polytechnic School and indicated in the "memo" that is published on the website of the University of Genoa and can be reached from the website of the Master's degree course

The result of each examination, with the mark obtained, is recorded in accordance with article 29 of the Teaching Regulations of the University of Genoa.

The Examination Committees of all the classes are appointed by the director of DITEN or, on his behalf, by the head of the Master's degree course. For each class, the Examination Committee is composed of at least three members. For each exam session, at least two members participate. The lecturer responsible of a class is a member of the related Examination Committee in the capacity of president of this committee. "Cultori della materia" nominated by the CCS based on scientific, didactic, or professional criteria are allowed to be members of the Examination Committee. These criteria are held valid in the case of retired faculty lecturers. When the Examination Committee is nominated, a deputy president is also nominated. Each exam session is chaired by either the president or a deputy.

Art. 10. Acknowledgment of credits

The CCS decides upon the approval of applications for change from another degree course of the University of Genoa or applications for transfer from other universities in accordance with the rules provided for in the Teaching Regulations of the University of Genoa, article 21. It also decides upon the approval, in the form of training credits and for a maximum number of 12 CFU, of professional knowledge and skills certified in accordance with the current legislation.

The evaluation of applications for change will take into account the didactic specificities and the up-to-dateness of the educational content of the individual exams taken by the applicant, reserving the right to establish any forms of verification and supplementary exams on a case-by-case basis.

Art. 11. Mobility, studies abroad, international exchanges

The CCS strongly encourages internationalisation activities, in particular students' participation in mobility and international exchange programmes. For this purpose, it shall ensure, in accordance with the rules in force, the approval of the training credits obtained within these programmes and shall appropriately organise the training activities in order to make these activities efficient and effective.

The CCS acknowledges, for each enrolled student who has regularly completed a period of study abroad, the exams passed during such period and the relevant credits with which the student proposes to replace some of the exams of his/her own study plan.

For the purpose of the acknowledgment of these examinations, each student, when submitting the plan of the training activities he/she intends to attend at a university abroad, must submit suitable documentation proving the equivalence between the content of the classes abroad and the content of the classes that are taught in the Master's degree course and he/she intends to replace. Equivalence shall be evaluated by the CCS.

The conversion of the marks will take place according to the criteria approved by the CCS, in compliance with the European ECTS system whenever possible:

- If the hosting foreign university provides the necessary input information, then the CCS will apply the ECTS guidelines by applying the Grading Tables;
- Otherwise, the CCS will address the conversion by using the Mark Conversion table.

Prior to his/her mobility, the student can ask the lecturer responsible of the agreement with the hosting university (e.g., Erasmus+ agreement) for indications about the information available from this university and/or about the Mark Conversion table.

Any period of study abroad, which has lasted a minimum of one semester and has involved the approval of training credits, will be evaluated for the purpose of the final examination. In the case of a period of study abroad aimed at preparing for the final examination, the number of credits that are acknowledged as obtained abroad is related to the duration of the period.

Art. 12. Procedures for the final examination

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

For the purpose of obtaining a Master's degree, the final examination consists of the writing of a thesis dissertation, elaborated by the student in an original way under the guidance of one or more supervisors, on a subject relevant to a discipline for which he/she has passed the exam.

Among the supervisors, there must be at least one lecturer from the Polytechnic School and/or the reference or associate Department and/or the Master's degree course.

The thesis dissertation can be written in English; to use another EU language, the authorization of the CCS is required. In these cases, the thesis manuscript must be accompanied by the title and an extensive summary in Italian.

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

- adequate preparation in the disciplines characterising the Master's degree course;
- adequate engineering preparation;
- correct use of sources and bibliography;
- systematic and argumentative skills;
- clarity in the exposition;
- design and experimental skills;
- critical skills.

The Final Examination Committee is composed of at least five members including the Committee president, and is appointed by the Director of the DITEN Department.

The procedure for the final examination consists of the oral presentation of the thesis by the student to the Final Examination Committee, followed by a discussion of any questions raised by the members of the Committee.

The commitment required of the student for the preparation of the final examination must be aligned to the number of credits assigned to the final examination itself. If the final examination is passed, the Committee evaluates this examination by incrementing the average of the marks obtained in the examinations of the training activities that require a final mark and weighted on the number of credits associated with the individual training activities, of an amount ranging from 0 to 6 – six being the maximum established by the Polytechnic School in agreement with the Departments.

Any period of study abroad, lasting a minimum of one semester, which has involved the approval of training credits, may result in an increase of up to one point on the final mark of the Master's degree in the 110-scale.

Art. 13. Guidance services and tutoring

The Polytechnic School, in agreement with DITEN, organizes and manages a tutoring service for supporting students, aiming at preventing dropout and delays in studies and at promoting a fruitful active participation in university life in all its forms.

Art. 14. Verification of the obsolescence of the credits

CFUs acquired within the framework of the Master's degree course can be subject to an obsolescence verification after 6 years. If the CCS decides upon the obsolescence of even a single part of the relevant educational content, it establishes the supplementary tests that must be taken by the student, defining the topics, the verification modalities, and the composition of the Examination Committee. Once the required tests have been passed, the CCS validates the credits acquired with a resolution. If the related training activity provides a mark, this mark may update the one previously obtained by the student, upon proposal from the Examination Committee that carried out the verification.

Art. 15. Current Year Degree Programme Table

DITEN, after consulting the Polytechnic School, approves annually the Current Year Degree Programme Table of the Master's degree course, which is published on the University website and can be reached from the website of Master's degree course. In the Current Year Degree Programme Table, the main provisions of the teaching system and the teaching regulations of the Master's degree course, to which additional information may be added, are indicated.

The Current Year Degree Programme Table of the Master's degree course contains the list of the classes activated for the corresponding academic year. The sheets of the individual classes are published on the website of the University of Genoa and can be reached from the website of the Master's degree course.

Annex 1 to the Degree Regulation of the Master's degree course in Engineering for Natural Risk Management

List of training activities and related learning outcomes

Year	Code	Teaching course	CFU	SSD	Type	Area	Language	Prerequisites	Learning outcomes	Hours of assisted teaching activity	Hours of personal study
1	94626	ENVIRONMENTAL SYSTEMS MODELLING	5		CORE LEARNING ACTIVITY	Security Engineering and Information Protection				0	0
1	94626	ENVIRONMENTAL SYSTEMS MODELLING	5		RELATED OR SUPPLEMENTARY ACTIVITY	Related or Supplementary Learning Activity				0	0
1	94627	DYNAMICS OF ENVIRONMENTAL SYSTEMS	5	ING-INF/04	CORE LEARNING ACTIVITY	Security Engineering and Information Protection	English		This course is designed to provide the fundamental principles of the dynamic nature of environmental systems, and to provide students with basic conceptual tools for quantitative analysis of change for the most significant environmental problem areas. The course will provide the student with a unique combination of theoretical and conceptual basis for modelling environmental risks and sustainability, and hands-on knowledge on how to approach the modelling of complex environmental systems, often described as a system of systems with natural and anthropogenic interacting components.	40	85
1	94628	MODELS AND METHODS FOR DECISION SUPPORT	5	MAT/09	RELATED OR SUPPLEMENTARY ACTIVITY	Related or Supplementary Learning Activity	English		The course presents a set of mathematical models and methods for solving decision problems with a particular reference to natural risk and emergency management. The purpose of this course is to provide the students with competences in using a set of models for problem solving. In particular, the course mainly considers optimization problems faced by mathematical programming techniques and problems on graph and networks.	40	85
1	94629	TELECOMMUNICATION NETWORKS AND DISTRIBUTED ELECTRONIC SYSTEM	10		CORE LEARNING ACTIVITY	Security Engineering and Information Protection				0	0
1	94630	COMMUNICATION NETWORKS FOR EMERGENCY AND MONITORING	5	ING-INF/03	CORE LEARNING ACTIVITY	Security Engineering and	English		Basic concepts on modern Network and Internet technologies; introduction to the architecture and protocols for wireless communication; basic	40	85

						Information Protection			concepts on Radio Cellular Networks , WiFi, Bluetooth and sensor networks technologies. Machine to Machine standards. Laboratory practical and simulative experiences.		
1	94631	DISTRIBUTED ELECTRONIC SYSTEMS AND TECHNOLOGIES FOR ENVIRONMENTAL MONITORING	5	ING-INF/01	CORE LEARNING ACTIVITY	Security Engineering and Information Protection	English		Basic concepts on technologies for modern electronic embedded systems. Introduction to sensor devices and sensing methods. Embedded electronic sensing systems for Internet of Things (IoT) and for distributed monitoring. Basic concepts of radio transceivers. Distributed wireless sensing networks for environmental monitoring. Application examples.	40	85
1	94632	WEATHER RELATED HAZARDS	10	ICAR/02	CORE LEARNING ACTIVITY	Safety Engineering and Civil, Environmental and Land Protection	English			0	0
1	94633	ATMOSPHERIC DYNAMICS + IMPACTS OF CLIMATE CHANGE	5	ICAR/02	CORE LEARNING ACTIVITY	Safety Engineering and Civil, Environmental and Land Protection	English		The aim of the course is to introduce the fundamentals of atmospheric circulation that govern weather and climate from synoptic scale to meso-alpha scale. Attention will be paid to the extremes, climate change impacts on the environmental risks, impacts on the intensity and frequency of extreme meteorological and hydrological events (floods, droughts, hurricanes, wind storms, heat waves, etc). A review on formulation and parameterizations used in numerical weather prediction models will be presented. The concept of uncertainty in numerical modelling of the extreme events will be presented with idealized and real cases applications. Students will learn to treat numerical and observational atmospheric data using MATLAB.	40	85
1	94634	HYDRO-METEOROLOGICAL HAZARDS	5	ICAR/02	CORE LEARNING ACTIVITY	Safety Engineering and Civil, Environmental and Land Protection	English		The aim of the course is to introduce the student to the basic concepts and techniques for flood hazard mapping. These include: - the basics of flood hazard mapping: common terminology, indicators of hazard magnitude, basics of mapping techniques; - elements of the statistical analysis of the hydrological extremes (river discharge and rainfall). Source of data and common statistical techniques to derive rainfall and river flow quantiles; -elements of hydrological models: common simple rainfall-- At the end of the course the student is expected to be able to flood hazard	50	75

									mapping: empirical, physically based and geomorphological modelsrunoff and flow routing models. - understand the meaning of flood hazard magnitude and interpret flood hazard maps; - retrieve and manipulate series of hydrological extremes and apply basic statistics deriving rainfall and flood quantiles; - apply simple hydrological modelling to the result of the statistical analysis of extremes; - draw a flood hazard map for a small river basin using geomorphological methods		
1	94635	ENVIRONMENTAL AND TERRITORIAL RISK LAWS AND REGULATIONS:	10	IUS/10	CORE LEARNING ACTIVITY	Legal-Economic Area	English			0	0
1	94636	BASIC JURIDICAL NOTIONS FOR ENVIRONMENT LAW	5	IUS/10	CORE LEARNING ACTIVITY	Legal-Economic Area	English		The course will examine the main principles of law, the different juridical acts, the organization of public powers in Italy, the fundamental human rights, the relationships between Italian law and international law as well as European Union law. These notions are useful to understand problematical issues about environment.	40	85
1	94637	PRECAUTIONARY MEASURES, LIABILITY AND RESPONSIBILITY	5	IUS/10	CORE LEARNING ACTIVITY	Legal-Economic Area	English		The course will focus on the system of International, European and Italian environmental Laws and Regulations, also from a comparative law perspective, as well as it aims to provide an introduction to some of the key issues of territorial management in those Law and Regulation. First of all the course is underpinned by the main principles in environmental matter (such as prevention, precaution, best environmental protection and sustainable development). Secondly the course deals with the governance of risk (particularly in respect of natural hazard, various kinds of pollution and emerging technologies), providing students with an understanding of how the law seeks to regulate pollution control, conservation of the built and natural environment, and risk assessment and management, in particular through environmental authorisations and public planning policies. Finally the course aims to deepen the consequent liabilities and responsibilities, in particular of public powers or technicians, according to Laws and Jurisprudence.	40	85
1	94638	GEOHAZARDS	5		CORE LEARNING ACTIVITY	Safety Engineering and Civil, Environmental	English			0	0

						and Land Protection					
1	94638	GEOHAZARDS	5		RELATED OR SUPPLEMENTARY ACTIVITY	Related or Supplementary Learning Activity	English			0	0
1	94639	SEISMIC HAZARD AND RISK	5	GEO/10	RELATED OR SUPPLEMENTARY ACTIVITY	Related or Supplementary Learning Activity	English		The course is designed to provide the fundamental principles of seismic hazard and risk. Basic concepts of seismology and seismometry will be discussed before focusing on deterministic and probabilistic seismic hazard analysis. Subsequently, methods for ground response analysis will be presented in order to provide general knowledge on site effects (e.g., ground motion amplification, seismic slope stability, soil liquefaction). Finally, the basics of seismic microzonation and building codes will be discussed.	45	80
1	94641	LANDSLIDE HAZARDS	5	GEO/05	CORE LEARNING ACTIVITY	Safety Engineering and Civil, Environmental and Land Protection	English		"The course deals with hazards posed by landslides and erosional processes resulting from natural phenomena and/or man-made actions. Firstly, the geotechnical bases and the principles of landslide classification, investigation and mapping, as well as the basic approaches to assess slope stability conditions will be presented. Later, the various techniques of slope monitoring and the methods available for the assessment of landslide susceptibility will be discussed. At last, the course will deal with aspects of landslide risk management, namely prevention and mitigation measures.	40	85
1	94662	RANDOM PROCESSES FOR INFORMATION REPRESENTATION AND DECISION SUPPORT	5	ING-INF/03	CORE LEARNING ACTIVITY	Security Engineering and Information Protection	English		The course introduces the key concepts related to stochastic modeling in the framework of disaster risk prevention and assessment. Basic knowledge will be provided about probability theory, random variables, stochastic processes, and Bayesian decision theory. Examples of applications to problems of data modeling and analysis associated with risk applications will be discussed.	40	85
1	94667	SYSTEM MANAGEMENT FOR ENERGY AND ENVIRONMENT	5	ING-IND/09	RELATED OR SUPPLEMENTARY ACTIVITY	Related or Supplementary Learning Activity	English		The course will cover the topics related to the management of Large Combustion Plants, LCP, and their interaction with the environment. Fuel properties and associated risks are presented, with a focus on the Utilities network monitoring. Combustion process and its environmental impact will be investigated and the Best Available	40	85

									Technology to reduce pollutant emissions in LCP will be analyzed on the base of the 2016 European IPCC BrEFDocument. LCP pollutant monitoring and control strategies will be presented.		
2	94656	RISK IN NATURAL ENVIRONMENTS	5		CORE LEARNING ACTIVITY	Security Engineering and Information Protection				0	0
2	94656	RISK IN NATURAL ENVIRONMENTS	5		CORE LEARNING ACTIVITY	Safety Engineering and Civil, Environmental and Land Protection				0	0
2	94657	IMPACTS OF DISASTERS ON COASTAL ENVIRONMENTS	5	ICAR/02	CORE LEARNING ACTIVITY	Safety Engineering and Civil, Environmental and Land Protection	English		The course will be developed on three main areas: Hydraulic Maritime and Coastal Engineering, Marine Pollution and Marine ecosystem monitoring. In particular, they will address the following themes:prediction wave, action on the coasts, numerical models of simulation and forecasting, numerical models for the wave action on the morphology of the coast, wave river mouths interaction, analysis of the formation of coastal currents and their action on the coasts. The pollutant transport phenomena, numerical models for the transport of passive and chemically active substances in the coastal environment. The effects on the ecosystem as a result of input of pollutants, the creation of works, fluvial-marine system interactions, modeling and simulation of the dynamics of these ecosystems, interaction between coastal and ecosystem dynamics currents. The impact of Climate Change will be analyzed in the course focusing on the phenomenon of Sea Level Rise (SLR) correlated to the SDGs 13 of Agenda 2030.	40	85
2	94658	WILDFIRE RISK ASSESSMENT AND MANAGEMENT	5	ING-INF/04	CORE LEARNING ACTIVITY	Security Engineering and Information Protection	English		The course will provide the knowledge needed to understand the processes related with fire occurrence in the agro-forest environment. An overview of the problem of wildfires at global level will be introduced focusing on the several aspects involved in this kind of risk, including climate change. Firstly, the main aspects related with wildfire hazard will be analyzed. Techniques for assessing wildfire danger maps will be approached. In addition, the effects of	40	85

								meteorological variability will be described in order to predict local extremes in wildfire danger conditions. Tools and methodologies for the prediction of wildfire danger will be used and described. Finally, exposed elements and vulnerability will be introduced in order to evaluate risk and emergency scenarios through the application of simulation tools. The students will be able to make use of the knowledge acquired during the classes in order to provide support to decision makers both in prevention phase and suppression.		
2	94659	RISK ASSESSMENT AND MANAGEMENT	5		CORE LEARNING ACTIVITY	Safety Engineering and Civil, Environmental and Land Protection	English		0	0
2	94659	RISK ASSESSMENT AND MANAGEMENT	5		RELATED OR SUPPLEMENTARY ACTIVITY	Related or Supplementary Learning Activity	English		0	0
2	94660	INTEGRATED RISK ASSESSMENT AND MANAGEMENT	5	ICAR/02	CORE LEARNING ACTIVITY	Safety Engineering and Civil, Environmental and Land Protection	English	<p>The aim of the course is to introduce the student to the concept of risk management with and provide basic tools to draw risk maps starting from any hazard map.</p> <p>The topics include: -the analysis of risk management cycle and of the official terminology associated to it; - the basic concepts and the phases of risk assessment, differences between risk and disasters, classification of risks. - Elements of country risk profiles: sources of data and applications to real cases - Elements of mapping risk scenarios and Basic methods and sources of information for the Estimation of Exposure and Vulnerability at different spatial scales. - general methodologies for the calculation of standard parameters in the risk assessment procedures (eg. PML and AAL) and examples of applications - practical examples of real time risk management and disaster risk reduction</p> <p>At the end of the course the student is expected to be able to: - describe conceptually the phases of the risk management cycle, understanding the differences among them - interpret and understand the information provided by any risk map - know</p>	40	85

									and describe the most common methodologies for exposure and vulnerability assessment - know and describe common examples of real time risk management and disaster risk reduction policies - draw a risk map starting from a categorized hazard map at block and municipality scale.		
2	94661	ENVIRONMENTAL RISK ASSESSMENT OF CHEMICALS	5	ING-IND/24	RELATED OR SUPPLEMENTARY ACTIVITY	Related or Supplementary Learning Activity	English		The purpose of this course is to disseminate the basic principles and methods to characterize the nature and magnitude of health risks to humans and of ecological risk to organisms and receptors due to chemical contaminants that may be present in the environment, and released during Natural Events or from Human and Industrial Activities. Common environmental investigation scenarios are discussed together with the evidence collection strategies. Models to evaluate the transport and fate of pollutants in different environmental matrices and source/ pathway/receptor models are presented. Different methods for assessing risk (HHRA and ERA), with particular attention to the exposure assessment step, are discussed and compared (Tier I,II,III,IV level).	40	85
2	94663	REMOTE SENSING AND ELECTROMAGNETIC TECHNIQUES FOR RISK MONITORING	10		CORE LEARNING ACTIVITY	Security Engineering and Information Protection	English			0	0
2	94664	ELECTROMAGNETIC TECHNIQUES FOR MONITORING STRUCTURES AND PROTECTING SYSTEMS	5	ING-INF/02	CORE LEARNING ACTIVITY	Security Engineering and Information Protection	English		"The course provides the fundamental skills related to radar remote sensing and electromagnetic techniques for monitoring structures and protecting systems. In particular, approaches based on radar concepts, impedance and capacitance tomography, inverse scattering, and microwaves tomography will be discussed with particular reference to civil and environmental applications.	40	85
2	94666	REMOTE SENSING OF NATURAL DISASTERS	5	ING-INF/03	CORE LEARNING ACTIVITY	Security Engineering and Information Protection	English		"The course introduces the key concepts related to information extraction from remote sensing images in the framework of disaster risk prevention and assessment. Basic knowledge will be provided about remote sensing image acquisition through passive sensors; land cover mapping through remote sensing image classification in the application to risk prevention; detection of ground	40	85

								changes from multitemporal remote sensing images in the application to damage assessment; and data representation in a geographic information system (GIS).		
2	94669	CRITICAL ENERGY INFRASTRUCTURES MODELLING AND SIMULATION	5	ING-IND/33	ELECTIVE LEARNING ACTIVITY	Student's Elective Learning Activity	English	The course is focused on the modelling and simulation of critical energy infrastructures, such as smart grids, electricity production plants, electrical storage systems, electric mobility systems, transmission and distribution lines, considering also electrical system outages; the planning of power systems is faced also focusing on reliability and security of power supply, introducing different network infrastructures, advanced protection systems and reserve supply.	40	85
2	94673	MASTER THESIS	15		FINAL EXAMINATION	For the Final Examination	English		0	375
2	94674	STAGE	5		OTHER ACTIVITY	Learning and Orientation Traineeships	English		0	125
2	104394	RISK COMMUNICATION AND PERCEPTION	5	M-PSI/06	ELECTIVE LEARNING ACTIVITY	Student's Elective Learning Activity	English	The course will address the topic of risk from a psychosocial perspective, as it is perceived by stakeholders and as it is communicated among them. The participants will be able to describe the main factors concerning risk perception and its relationship with risk-protective behaviours. They will also be able to analyze case studies by means of theoretical frameworks and models concerning risk perception. In addition, they will be able to describe and apply the main principles of risk and crisis communication to specific cases.	40	85
2	108566	ADVANCED RISK ASSESSMENT	5		ELECTIVE LEARNING ACTIVITY	Student's Elective Learning Activity			0	0
2	108567	SEISMIC RISK ASSESSMENT AND MITIGATION OF THE BUILT ENVIRONMENT	2,5	ICAR/09	ELECTIVE LEARNING ACTIVITY	Student's Elective Learning Activity	English	This module aims to provide the fundamentals of seismic risk assessment, emergency management, and mitigation policies of the built environment, with particular emphasis on buildings. At the end of the module, the student will learn the concepts of seismic risk, focusing on their components (hazard, exposure, vulnerability, and resilience). Furthermore, the student will be able to discuss critically possible seismic risk reduction policies and finally acquire the tools to manage large-scale damage and vulnerability survey of existing buildings in the post-earthquake emergency phase.	20	42,5

2	108570	MULTI-HAZARD IMPACT AND RISK ASSESSMENT	2,5	ICAR/02	ELECTIVE LEARNING ACTIVITY	Student's Elective Learning Activity	English	The aim of this module is to provide fundamentals of multi-hazard and multi-risk modelling. At the end of the course the student will be able to apply multi-hazard and multi-risk concepts and definitions and describe the available approaches for qualitative and quantitative multi-hazard risk modelling. Furthermore, the student will be able to select the best approaches to manage multi-hazard risk and implement multi-hazard disaster risk reduction (DRR) strategies. The knowledge of risk assessment and management approaches that consider multiple hazards and their potential interactions will help the student to better understand and capture the real risk that many areas of the world are prone to, allowing to implement more successful DRR measures.	20	42,5
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Scuola Politecnica
Dipartimento di Ingegneria Navale, Elettrica, Elettronica e delle Telecomunicazioni (DITEN)
Corso di Laurea Magistrale in Engineering for Natural Risk Management

Classe LM-26 REGOLAMENTO DIDATTICO – Coorte 2023/2024

Deliberato dal Consiglio del Corso di Studi del 28/04/2023

Approvato dal Consiglio di Dipartimento del 19/05/2023

Descrizione del funzionamento del corso di laurea magistrale

Art. 1. Premessa e ambito di competenza

Art. 2. Requisiti di ammissione e modalità di verifica della preparazione individuale

Art. 3. Attività formative

Art. 5. Curricula

Art. 6. Impegno orario complessivo

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Art. 12. Modalità della prova finale

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Art. 14. Verifica dell'obsolescenza dei crediti

Art. 15. Manifesto degli studi

Art. 1. Premessa e ambito di competenza

Il presente Regolamento, in conformità allo Statuto ed al Regolamento didattico di Ateneo (parte generale e parte speciale), disciplina gli aspetti organizzativi dell'attività didattica del corso di laurea magistrale in *Engineering for Natural Risk Management*, nonché ogni diversa materia ad esso devoluta da altre fonti legislative e regolamentari.

Il Regolamento didattico del corso di studio (CdS) in *Engineering for Natural Risk Management* è deliberato, ai sensi dell'articolo 18, commi 3 e 4 del Regolamento didattico di Ateneo, parte generale, dal consiglio del corso di studio (CCS) di *Engineering for Natural Risk Management* a maggioranza dei componenti e sottoposto all'approvazione del Consiglio del Dipartimento DITEN (e dei Consigli degli eventuali Dipartimenti associati), sentita la Scuola Politecnica, previo parere favorevole della Commissione Paritetica Docenti Studenti della Scuola Politecnica, ove disponibile.

Le delibere del CCS possono essere assunte anche in modalità telematica ai sensi dei sovraordinati regolamenti e, in particolare, dell'articolo 14 "Riunioni con modalità telematiche" del vigente Regolamento Generale di Ateneo (in vigore dal 19/12/2018).

Art. 2. Requisiti di ammissione e modalità di verifica della preparazione individuale

L'ammissione alla laurea magistrale in *Engineering for Natural Risk Management* è subordinata al possesso di specifici requisiti curriculari e di adeguatezza della preparazione personale.

In riferimento ai requisiti curriculari, per l'accesso alla laurea magistrale in *Engineering for Natural Risk Management*, occorre:

- essere in possesso di laurea, laurea specialistica o laurea magistrale, di cui al DM 509/1999 o DM 270/2004, conseguita presso una università italiana, oppure una laurea quinquennale (ante

- DM 509/1999), conseguita presso una università italiana, oppure titoli esteri equivalenti;
- essere in possesso di almeno 36 crediti formativi universitari (CFU), o conoscenze equivalenti, acquisiti in un qualunque corso universitario (laurea, laurea specialistica, laurea magistrale, laurea quinquennale, master universitario di primo e secondo livello) nei settori scientifico disciplinari (SSD) indicati per le attività formative di base delle lauree delle classi L-7 Ingegneria Civile e Ambientale, L-8 Ingegneria dell'Informazione, L-9 Ingegneria industriale nei raggruppamenti MAT*, FIS*, CHIM*, ING-INF/05, INF/01 e SECS-S/02, dei quali non meno di 30 CFU nelle attività formative di base dei raggruppamenti MAT*, FIS*, CHIM* nel loro complesso;
 - essere in possesso di almeno 45 CFU, o conoscenze equivalenti, acquisiti in un qualunque corso universitario (laurea, laurea specialistica, laurea magistrale, master universitari di primo e secondo livello) nei settori scientifico-disciplinari indicati per le attività formative caratterizzanti delle lauree afferenti alle classi:
 - L-7 Ingegneria Civile e Ambientale: SSD BIO/07, CHIM/12, GEO/02, GEO/05, GEO/11, ICAR/01, ICAR/02, ICAR/03, ICAR/05, ICAR/06, ICAR/07, ICAR/08, ICAR/09, ICAR/11, ICAR/20, ING-IND/11, ING-IND/24, ING-IND/25, ING-IND/27, ING-IND/28, ING-IND/29, ING-IND/30, ING-IND/31;
 - L-8 Ingegneria dell'Informazione: SSD ING-INF/01, ING-INF/02, ING-INF/03, ING-INF/04, ING-INF/05, ING-INF/07 e ING-IND/31;
 - L-9 Ingegneria industriale: SSD ICAR/08, ING-IND/10, ING-IND/14, ING-IND/16, ING-IND/17, ING-IND/19, ING-IND/22, ING-IND/25, ING-IND/28, ING-IND/31, ING-IND/33, ING-IND/35, ING-INF/04.

Per i laureati all'estero, la verifica dei requisiti curricolari è effettuata considerando opportune equivalenze tra gli insegnamenti seguiti con profitto e quelli ascrivibili ai SSD sopra indicati. L'equivalenza dei titoli di studio stranieri è determinata attraverso l'analisi dei relativi *transcript of record*.

È prevista la convalida di CFU a seguito del riconoscimento di conoscenze e abilità professionali certificate individualmente ai sensi della normativa vigente in materia, nonché di altre conoscenze e abilità maturate in attività formative di livello post-secondario alla cui progettazione e realizzazione l'università abbia concorso.

È richiesto inoltre il possesso di un'adeguata conoscenza della lingua inglese, con riferimento anche ai lessici disciplinari, di livello pari a B2 o superiore.

Ai fini dell'ammissione al corso di laurea magistrale, gli studenti in possesso dei requisiti curricolari devono sostenere con esito positivo una prova per la verifica della preparazione personale, salvo i casi disposti dall'ultimo comma. La Commissione d'esame di tale prova è composta da almeno due componenti la Commissione Didattica e Ammissione alla Laurea Magistrale del CdS, la quale è, a sua volta, nominata dal CCS e composta da docenti afferenti al CCS. La prova è svolta sotto forma di colloquio pubblico, test scritto o video-intervista per via telematica ed è finalizzata ad accertare la preparazione generale dello studente con particolare riferimento alla conoscenza di nozioni fondamentali e di aspetti applicativi e professionali relativi alle tematiche proprie dell'ingegneria. Ai fini della valutazione dello studente, la Commissione d'esame tiene conto anche del curriculum ottenuto nel percorso di laurea di primo livello. Nel caso di studenti con titoli di studio estero, la Commissione prende in considerazione anche la qualità dell'università che ha erogato il titolo di studio di primo livello. L'esito della prova prevede la sola dicitura "superato" o "non superato".

Nel bando per l'ammissione ai corsi di laurea magistrale della Scuola Politecnica e sul sito web del CdS sono indicati: la composizione della Commissione d'esame, le modalità della prova, il luogo e la data, gli argomenti oggetto d'esame, i criteri di valutazione dei candidati.

La conoscenza della lingua inglese pari al livello B2 o superiore è verificata tramite certificazione in possesso dello studente, o, in assenza di essa, tramite superamento del test B2 erogato dal Settore Sviluppo Competenze linguistiche (di Ateneo). Il requisito della conoscenza linguistica è altresì soddisfatto se lo studente è in possesso di un titolo di laurea in lingua inglese, da certificarsi tramite documento ufficiale o lettera dell'università che abbia erogato tale titolo, da cui si evinca che gli studi si sono svolti in lingua inglese. Se nessuna delle precedenti condizioni è soddisfatta, la conoscenza linguistica deve essere verificata durante la prova di verifica della preparazione personale da parte della relativa Commissione d'esame. In quest'ultimo caso, costituisce quindi oggetto della verifica

della preparazione personale anche la capacità di utilizzare fluentemente la lingua inglese. L'adeguatezza della preparazione personale è automaticamente verificata per coloro che abbiano conseguito la laurea triennale, italiana o estera, o titolo giudicato equivalente in sede di accertamento dei requisiti curricolari, con una votazione finale di almeno 9/10 del voto massimo previsto dalla propria laurea oppure che abbiano conseguito una votazione finale corrispondente almeno alla classifica "A" del sistema ECTS.

Art. 3. Attività formative

L'elenco degli insegnamenti e delle altre attività formative attivabili è riportato nell'apposito allegato (ALL.1) che costituisce parte integrante del presente Regolamento.

Per ogni insegnamento è individuato un docente responsabile. È docente responsabile di un insegnamento chi ne sia titolare a norma di legge, ovvero colui al quale il Consiglio del Dipartimento di afferenza abbia attribuito la responsabilità stessa in sede di affidamento dei compiti didattici ai docenti.

La lingua usata per erogare le attività formative (lezioni, esercitazioni, laboratori) è l'italiano o un'altra lingua della UE ove espressamente deliberato dal CCS.

Nell'allegato (ALL.1) al presente Regolamento è specificata la lingua in cui viene erogata ogni attività formativa.

Art. 4 Iscrizione a singole attività formative

In conformità con l'articolo 6 del Regolamento di Ateneo per gli studenti, per iscriversi a singole attività formative occorre possedere un titolo di studio che permetta l'accesso all'Università.

Art. 5. Curricula

Il CdS in *Engineering for Natural Risk Management* non è articolato in curricula.

Art. 6. Impegno orario complessivo

La definizione della frazione oraria dedicata a lezioni o attività didattiche equivalenti è stabilita, per ogni insegnamento, dal CCS e specificata nella parte speciale del Regolamento. In ogni caso si assumono i seguenti intervalli di variabilità della corrispondenza ore aula/CFU: $8 \div 10$ ore di lezione o di attività didattica assistita.

La definizione dell'impegno orario complessivo presunto, riservato allo studio personale o ad altre attività formative di tipo individuale, è stabilito, per ogni insegnamento, nell'allegato (ALL.1) del presente regolamento. Il Direttore del DITEN e il Coordinatore del CCS sono incaricati di verificare il rispetto delle predette prescrizioni.

Art. 7. Piani di studio e propedeuticità

Gli studenti possono iscriversi a tempo pieno o a tempo parziale; per le due tipologie di studente sono previsti differenti diritti e doveri. Lo studente sceglie la tipologia di iscrizione contestualmente alla presentazione del proprio piano di studio.

Lo studente a tempo pieno svolge la propria attività formativa tenendo conto del piano di studio predisposto dal CdS, distinto per anni di corso e pubblicato nel Manifesto degli studi del CdS. Il piano di studio formulato dallo studente deve contenere l'indicazione delle attività formative, con i relativi CFU che intende conseguire, previsti dal piano di studio ufficiale per tale periodo didattico, fino ad un massimo di 65 dei crediti previsti in ogni anno, salvo in casi di trasferimento da altri Atenei che verranno valutati singolarmente.

Lo studente a tempo parziale è tenuto a presentare un piano di studio individuale, specificando il numero di CFU che intende inserire secondo quanto disposto dal regolamento per la contribuzione studentesca di Ateneo.

L'iscrizione degli studenti a tempo pieno e a tempo parziale è disciplinata dal Regolamento di Ateneo per gli studenti, tenuto conto delle disposizioni operative deliberate dagli Organi centrali di governo

ed indicate nella Guida dello studente (pubblicata annualmente sul sito web dell'Università). Il percorso formativo dello studente può essere vincolato attraverso un sistema di propedeuticità, indicate per ciascun insegnamento nella parte speciale del presente Regolamento (ALL. 1). Lo studente può inserire insegnamenti "fuori piano/extracurricolari" fino ad un massimo di 12 CFU. Tali insegnamenti non sono presi in considerazione ai fini del conseguimento della laurea, ma possono essere valutati per il conseguimento di un ulteriore titolo di studio. La modalità e il termine per la presentazione del piano di studio sono stabiliti annualmente dalla Scuola Politecnica e riportati sul sito web del CdS. Un piano di studio articolato su una durata più breve rispetto a quella normale deve essere sottoposto all'approvazione del CCS.

Art. 8. Frequenza e modalità di svolgimento delle attività didattiche

Gli insegnamenti possono assumere la forma di: (a) lezioni, anche a distanza mediante mezzi telematici; (b) esercitazioni pratiche; (c) esercitazioni in laboratorio, (d) seminari tematici.

Il profilo articolato e la natura impegnativa delle lezioni tenute nell'ambito dei vari CdS offerti dalla Scuola Politecnica rendono la frequenza alle attività formative fortemente consigliata per una adeguata comprensione degli argomenti e quindi per una buona riuscita negli esami. Il calendario delle lezioni è articolato in semestri. Di norma, il semestre è suddiviso in almeno 12 settimane di lezione più almeno 4 settimane complessive per prove di verifica ed esami di profitto.

Il periodo destinato agli esami di profitto termina con l'inizio delle lezioni del semestre successivo. A metà semestre, la normale attività didattica (lezioni, esercitazioni, laboratori) può essere interrotta seguendo le indicazioni del calendario della Scuola Politecnica.

L'orario delle lezioni per l'intero anno accademico è pubblicato sul sito web di Ateneo e accessibile da quello del CdS prima dell'inizio delle lezioni dell'anno accademico. L'orario delle lezioni garantisce la possibilità di frequenza per anni di corso previsti dal vigente Manifesto degli Studi del CdS. Per ragioni pratiche non è garantita la compatibilità dell'orario per tutte le scelte formalmente possibili degli insegnamenti opzionali. Gli studenti devono quindi formulare il proprio piano di studio tenendo conto dell'orario delle lezioni.

Art. 9. Esami e altre verifiche del profitto

Gli esami di profitto possono essere svolti in forma scritta, orale, o scritta e orale, secondo le modalità indicate nelle schede di ciascun insegnamento pubblicate sul sito web di Ateneo e accessibili da quello del CdS.

A richiesta, possono essere previste specifiche modalità di verifica dell'apprendimento che tengano conto delle esigenze di studenti disabili e di studenti con disturbi specifici dell'apprendimento (D.S.A.), in conformità all'art. 29 comma 4 del Regolamento didattico di Ateneo.

Nel caso di insegnamenti strutturati in moduli con più docenti, questi partecipano collegialmente alla valutazione complessiva del profitto dello studente che non può, comunque, essere frazionata in valutazioni separate sui singoli moduli.

Il calendario degli esami di profitto è stabilito entro la scadenza ministeriale per l'anno accademico successivo e viene pubblicato sul sito web di Ateneo ove è accessibile dal sito web del CdS.

Gli esami si svolgono nei periodi di interruzione delle lezioni. Possono essere previsti appelli durante il periodo delle lezioni soltanto per gli studenti che, nell'anno accademico in corso, non abbiano inserito attività formative nel proprio piano di studio.

Tutte le verifiche di profitto relative alle attività formative devono essere superate dallo studente entro la scadenza prevista dalla segreteria studenti della Scuola Politecnica in vista della prova finale, come indicato nel "promemoria" pubblicato sul sito web di Ateneo e accessibile da quello del CdS.

L'esito dell'esame, con la votazione conseguita, è verbalizzato secondo quanto previsto all'art. 29 del regolamento didattico di Ateneo.

Le commissioni di esame di profitto sono nominate dal Direttore del DITEN o, su sua delega, dal Coordinatore del CdS e sono composte da almeno tre componenti. Ad ogni sessione di esame sono presenti almeno due membri. Il docente responsabile dell'insegnamento è membro con funzione di presidente. Possono essere componenti la commissione cultori della materia individuati dal CCS sulla

base di criteri che assicurino il possesso di requisiti scientifici, didattici o professionali; tali requisiti si possono presumere posseduti da parte di docenti universitari a riposo. Per ogni commissione, all'atto di nomina, va individuato almeno un presidente supplente. In ogni sessione di esame le commissioni sono presiedute dal presidente o da un supplente.

Art. 10. Riconoscimento di crediti

Il CCS delibera sull'approvazione delle domande di passaggio o trasferimento da un altro CdS dell'Ateneo o di altre università secondo le norme previste dal Regolamento didattico di Ateneo, art. 21. Delibera altresì il riconoscimento, quale credito formativo, per un numero massimo di 12 CFU, di conoscenze e abilità professionali certificate ai sensi della normativa vigente.

Nella valutazione delle domande di passaggio si tiene conto delle specificità didattiche e dell'attualità dei contenuti formativi dei singoli esami sostenuti, riservandosi di stabilire di volta in volta eventuali forme di verifica ed esami integrativi.

Art. 11. Mobilità, studi compiuti all'estero, scambi internazionali

Il CCS incoraggia fortemente le attività di internazionalizzazione, in particolare la partecipazione degli studenti ai programmi di mobilità e di scambio internazionale. A tal fine garantisce, secondo le modalità previste dalle norme vigenti, il riconoscimento dei crediti formativi conseguiti all'interno di tali programmi, e organizza opportunamente le attività didattiche in modo da rendere agevoli ed efficaci tali attività.

Il CCS riconosce agli studenti iscritti, che abbiano regolarmente svolto e completato un periodo di studi all'estero, gli esami sostenuti fuori sede e il conseguimento dei relativi crediti che lo studente intenda sostituire ad esami del proprio piano di studio.

Ai fini del riconoscimento di tali esami, lo studente, all'atto della compilazione del piano delle attività formative che intende seguire nell'ateneo estero, deve produrre idonea documentazione comprovante l'equivalenza dei contenuti tra gli insegnamenti impartiti all'estero e gli insegnamenti che intende sostituire fra quelli impartiti nel CdS in *Engineering for Natural Risk Management*. L'equivalenza è valutata dal CCS.

La conversione dei voti avviene secondo criteri approvati dal CCS, quando possibile congruenti con il sistema europeo *European Credit Transfer and Accumulation System* (ECTS):

- se l'università straniera mette a disposizione i dati necessari, il consiglio adotterà la guida europea ECTS utilizzando le Grading Tables;
- altrimenti, il consiglio convertirà i voti seguendo la tabella di Conversione dei Voti.

Le indicazioni relative alla disponibilità dei dati necessari messi a disposizione dall'università ospitante e/o alla tabella di conversione dei voti possono essere richiesti dallo studente, prima della partenza per la propria mobilità, al docente referente dell'accordo di mobilità (es.: Erasmus+).

Un periodo di studio all'estero che abbia comportato riconoscimento di crediti formativi viene valutato ai fini della prova finale. Per periodi di studio dedicati alla preparazione della prova finale, il numero di CFU riconosciuti come acquisiti all'estero è messo in relazione alla durata del periodo svolto all'estero.

Art. 12. Modalità della prova finale

La prova finale consiste nella discussione di un elaborato scritto, tendente ad accertare la preparazione tecnico-scientifica e professionale del candidato.

Ai fini del conseguimento della laurea magistrale, l'elaborato finale consiste nella redazione di una tesi, elaborata dallo studente in modo originale sotto la guida di uno o più relatori, su un argomento definito attinente ad una disciplina di cui abbia superato l'esame.

Tra i relatori deve essere presente almeno un docente della Scuola Politecnica e/o del Dipartimento di riferimento o associato e/o del CdS.

La tesi può essere redatta anche in lingua inglese; in caso di utilizzo di altra lingua della UE è necessaria l'autorizzazione del CCS. In questi casi la tesi deve essere corredata dal titolo e da un ampio sommario in italiano.

La tesi deve rivelare le capacità dello studente nell'affrontare tematiche di ricerca e/o di tipo applicativo. La tesi deve essere costituita da un progetto e/o dallo sviluppo di un'applicazione che proponga soluzioni innovative rispetto allo stato dell'arte e dimostri le capacità di analisi e di progetto dello studente. La tesi deve altresì rivelare:

- adeguata preparazione nelle discipline caratterizzanti la laurea magistrale;
- adeguata preparazione ingegneristica;
- corretto uso delle fonti e della bibliografia;
- capacità sistematiche e argomentative;
- chiarezza nell'esposizione;
- capacità progettuale e sperimentale;
- capacità critica.

La Commissione per la prova finale è composta da almeno cinque componenti, compreso il presidente ed è nominata dal Direttore del DITEN.

Le modalità di svolgimento della prova finale consistono nella presentazione orale della tesi da parte dello studente alla Commissione per la prova finale, seguita da una discussione sulle questioni eventualmente poste dai membri della Commissione.

L'impegno richiesto allo studente per la preparazione della prova finale deve essere commisurato al numero di CFU assegnati alla prova stessa.

La valutazione della prova finale da parte della commissione avviene, in caso di superamento della stessa, attribuendo un incremento, variabile da 0 a 6 (massimo stabilito dalla Scuola Politecnica di concerto con i Dipartimenti), alla media ponderata dei voti riportati nelle prove di verifica relative ad attività formative che prevedono una votazione finale, assumendo come peso il numero di CFU associati alla singola attività formativa.

Un periodo di studio all'estero, della durata minima di un semestre, che abbia comportato riconoscimento di CFU, può dar luogo all'incremento fino ad un massimo di un punto sul voto finale di laurea magistrale in centodecimi.

Art. 13. Orientamento e tutorato

La Scuola Politecnica, di concerto con il DITEN, organizza e gestisce un servizio di orientamento e di sostegno degli studenti, al fine di promuovere i diversi percorsi formativi di secondo livello e incentivare una proficua partecipazione attiva alla vita universitaria in tutte le sue forme.

Art. 14. Verifica dell'obsolescenza dei crediti

I CFU acquisiti nell'ambito del CdS possono essere sottoposti a verifica di obsolescenza dopo 6 anni. Qualora il CCS riconosca l'obsolescenza anche di una sola parte dei relativi contenuti formativi, lo stesso CCS stabilisce le prove integrative che dovranno essere sostenute dallo studente, definendo gli argomenti delle stesse, le modalità di verifica e la composizione della commissione di esame.

Una volta superate le verifiche previste, il CCS convalida i CFU acquisiti con apposita delibera. Qualora la relativa attività formativa preveda una votazione, la stessa potrà essere variata rispetto a quella precedentemente ottenuta, su proposta della Commissione d'esame che ha proceduto alla verifica.

Art. 15. Manifesto degli studi

DITEN, sentita la Scuola Politecnica, approva annualmente il Manifesto degli Studi del CdS, che viene pubblicato sul sito web di Ateneo ove è accessibile dal sito web del CdS. Nel Manifesto sono indicate le principali disposizioni dell'Ordinamento didattico e del Regolamento didattico del CdS, a cui eventualmente si aggiungono indicazioni integrative.

Il Manifesto degli Studi del CdS contiene l'elenco degli insegnamenti attivati per l'anno accademico in questione. Le schede dei singoli insegnamenti sono pubblicate sul sito web di Ateneo e accessibili da quello del CdS.

**Allegato 1 Parte speciale del Regolamento didattico del Corso di Laurea Magistrale in
Engineering for Natural Risk Management della Scuola Politecnica**

Elenco delle attività formative attivabili e relativi obiettivi formativi

Anno di corso	Codice Ins.	Nome insegnamento	C F U	SSD	Tipologia	Ambito	Lingua	Promedenicità	Obiettivi formativi	Ore riservate attività didattica	Ore riservate allo studio personale
1	94626	ENVIRONMENTAL SYSTEMS MODELLING	5		CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione dell'Informazione				0	0
1	94626	ENVIRONMENTAL SYSTEMS MODELLING	5		AFFINI O INTEGRATIVE	Attività Formative Affini o Integrative				0	0
1	94627	DYNAMICS OF ENVIRONMENTAL SYSTEMS	5	ING-INF/04	CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione dell'Informazione	Inglese		This course is designed to provide the fundamental principles of the dynamic nature of environmental systems, and to provide students with basic conceptual tools for quantitative analysis of change for the most significant environmental problem areas. The course will provide the student with a unique combination of theoretical and conceptual basis for modelling environmental risks and sustainability, and hands-on knowledge on how to approach the modelling of complex environmental systems, often described as a system of systems with natural and anthropogenic interacting components.	40	85
1	94628	MODELS AND METHODS FOR DECISION SUPPORT	5	MAT/09	AFFINI O INTEGRATIVE	Attività Formative Affini o Integrative	Inglese		The course presents a set of mathematical models and methods for solving decision problems with a particular reference to natural risk and emergency management. The purpose of this course is to provide the students with competences in using a set of models for problem solving. In particular, the course mainly considers optimization problems faced by mathematical programming techniques and problems on graph and networks.	40	85
1	94629	TELECOMMUNICATION NETWORKS AND DISTRIBUTED ELECTRONIC SYSTEM	10		CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione dell'Informazione				0	0
1	94630	COMMUNICATION NETWORKS FOR EMERGENCY AND MONITORING	5	ING-INF/03	CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione	Inglese		Basic concepts on modern Network and Internet technologies; introduction to the architecture and protocols for wireless communication; basic	40	85

						dell'informazione			concepts on Radio Cellular Networks , WiFi, Bluetooth and sensor networks technologies. Machine to Machine standards. Laboratory practical and simulative experiences.		
1	94631	DISTRIBUTED ELECTRONIC SYSTEMS AND TECHNOLOGIES FOR ENVIRONMENTAL MONITORING	5	ING-INF/01	CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione dell'Informazione	Inglese		Basic concepts on technologies for modern electronic embedded systems. Introduction to sensor devices and sensing methods. Embedded electronic sensing systems for Internet of Things (IoT) and for distributed monitoring. Basic concepts of radio transceivers. Distributed wireless sensing networks for environmental monitoring. Application examples.	40	85
1	94632	WEATHER RELATED HAZARDS	10	ICAR/02	CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione Civile, Ambientale e del Territorio	Inglese			0	0
1	94633	ATMOSPHERIC DYNAMICS + IMPACTS OF CLIMATE CHANGE	5	ICAR/02	CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione Civile, Ambientale e del Territorio	Inglese		The aim of the course is to introduce the fundamentals of atmospheric circulation that govern weather and climate from synoptic scale to meso-alpha scale. Attention will be paid to the extremes, climate change impacts on the environmental risks, impacts on the intensity and frequency of extreme meteorological and hydrological events (floods, droughts, hurricanes, wind storms, heat waves, etc). A review on formulation and parameterizations used in numerical weather prediction models will be presented. The concept of uncertainty in numerical modelling of the extreme events will be presented with idealized and real cases applications. Students will learn to treat numerical and observational atmospheric data using MATLAB.	40	85
1	94634	HYDRO-METEOROLOGICAL HAZARDS	5	ICAR/02	CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione Civile, Ambientale e del Territorio	Inglese		"The aim of the course is to introduce the student to the basic concepts and techniques for flood hazard mapping. These include: - the basics of flood hazard mapping: common terminology, indicators of hazard magnitude, basics of mapping techniques; - elements of the statistical analysis of the hydrological extremes (river discharge and rainfall). Source of data and common statistical techniques to derive rainfall and river flow quantiles; -elements of hydrological models: common simple rainfall-- At the end of the course the student is expected to be able to flood hazard mapping: empirical, physically based and	50	75

								geomorphological modelsrunoff and flow routing models. - understand the meaning of flood hazard magnitude and interpret flood hazard maps; - retrieve and manipulate series of hydrological extremes and apply basic statistics deriving rainfall and flood quantiles; - apply simple hydrological modelling to the result of the statistical analysis of extremes; - draw a flood hazard map for a small river basin using geomorphological methods		
1	94635	ENVIRONMENTAL AND TERRITORIAL RISK LAWS AND REGULATIONS:	10	IUS/10	CARATTERIZZANTI	Ambito Giuridico-Economico	Inglese		0	0
1	94636	BASIC JURIDICAL NOTIONS FOR ENVIRONMENT LAW	5	IUS/10	CARATTERIZZANTI	Ambito Giuridico-Economico	Inglese	The course will examine the main principles of law, the different juridical acts, the organization of public powers in Italy, the fundamental human rights, the relationships between Italian law and international law as well as European Union law. These notions are useful to understand problematical issues about environment.	40	85
1	94637	PRECAUTIONARY MEASURES, LIABILITY AND RESPONSIBILITY	5	IUS/10	CARATTERIZZANTI	Ambito Giuridico-Economico	Inglese	The course will focus on the system of International, European and Italian environmental Laws and Regulations, also from a comparative law perspective, as well as it aims to provide an introduction to some of the key issues of territorial management in those Law and Regulation. First of all the course is underpinned by the main principles in environmental matter (such as prevention, precaution, best environmental protection and sustainable development). Secondly the course deals with the governance of risk (particularly in respect of natural hazard, various kinds of pollution and emerging technologies), providing students with an understanding of how the law seeks to regulate pollution control, conservation of the built and natural environment, and risk assessment and management, in particular through environmental authorisations and public planning policies. Finally the course aims to deepen the consequent liabilities and responsibilities, in particular of public powers or technicians, according to Laws and Jurisprudence.	40	85
1	94638	GEOHAZARDS	5		CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione Civile, Ambientale e del Territorio	Inglese		0	0

1	94638	GEOHAZARDS	5		AFFINI O INTEGRATIVE	Attività Formative Affini o Integrative	Inglese		0	0
1	94639	SEISMIC HAZARD AND RISK	5	GEO/10	AFFINI O INTEGRATIVE	Attività Formative Affini o Integrative	Inglese	The course is designed to provide the fundamental principles of seismic hazard and risk. Basic concepts of seismology and seismometry will be discussed before focusing on deterministic and probabilistic seismic hazard analysis. Subsequently, methods for ground response analysis will be presented in order to provide general knowledge on site effects (e.g., ground motion amplification, seismic slope stability, soil liquefaction). Finally, the basics of seismic microzonation and building codes will be discussed.	45	80
1	94641	LANDSLIDE HAZARDS	5	GEO/05	CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione Civile, Ambientale e del Territorio	Inglese	"The course deals with hazards posed by landslides and erosional processes resulting from natural phenomena and/or man-made actions. Firstly, the geotechnical bases and the principles of landslide classification, investigation and mapping, as well as the basic approaches to assess slope stability conditions will be presented. Later, the various techniques of slope monitoring and the methods available for the assessment of landslide susceptibility will be discussed. At last, the course will deal with aspects of landslide risk management, namely prevention and mitigation measures.	40	85
1	94662	RANDOM PROCESSES FOR INFORMATION REPRESENTATION AND DECISION SUPPORT	5	ING-INF/03	CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione dell'Informazione	Inglese	The course introduces the key concepts related to stochastic modeling in the framework of disaster risk prevention and assessment. Basic knowledge will be provided about probability theory, random variables, stochastic processes, and Bayesian decision theory. Examples of applications to problems of data modeling and analysis associated with risk applications will be discussed.	40	85
1	94667	SYSTEM MANAGEMENT FOR ENERGY AND ENVIRONMENT	5	ING-IND/09	AFFINI O INTEGRATIVE	Attività Formative Affini o Integrative	Inglese	The course will cover the topics related to the management of Large Combustion Plants, LCP, and their interaction with the environment. Fuel properties and associated risks are presented, with a focus on the Utilities network monitoring. Combustion process and its environmental impact will be investigated and the Best Available Technology to reduce pollutant emissions in LCP will be analyzed on the base of the 2016 European IPCC BrEFDocument. LCP pollutant monitoring	40	85

								and control strategies will be presented.		
2	94656	RISK IN NATURAL ENVIRONMENTS	5		CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione dell'Informazione			0	0
2	94656	RISK IN NATURAL ENVIRONMENTS	5		CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione Civile, Ambientale e del Territorio			0	0
2	94657	IMPACTS OF DISASTERS ON COASTAL ENVIRONMENTS	5	ICAR/02	CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione Civile, Ambientale e del Territorio	Inglese	The course will be developed on three main areas: Hydraulic Maritime and Coastal Engineering, Marine Pollution and Marine ecosystem monitoring. In particular, they will address the following themes: prediction wave, action on the coasts, numerical models of simulation and forecasting, numerical models for the wave action on the morphology of the coast, wave river mouths interaction, analysis of the formation of coastal currents and their action on the coasts. The pollutant transport phenomena, numerical models for the transport of passive and chemically active substances in the coastal environment. The effects on the ecosystem as a result of input of pollutants, the creation of works, fluvial-marine system interactions, modeling and simulation of the dynamics of these ecosystems, interaction between coastal and ecosystem dynamics currents. The impact of Climate Change will be analyzed in the course focusing on the phenomenon of Sea Level Rise (SLR) correlated to the SDGs 13 of Agenda 2030.	40	85
2	94658	WILDFIRE RISK ASSESSMENT AND MANAGEMENT	5	ING-INF/04	CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione dell'Informazione	Inglese	The course will provide the knowledge needed to understand the processes related with fire occurrence in the agro-forest environment. An overview of the problem of wildfires at global level will be introduced focusing on the several aspects involved in this kind of risk, including climate change. Firstly, the main aspects related with wildfire hazard will be analyzed. Techniques for assessing wildfire danger maps will be approached. In addition, the effects of meteorological variability will be described in order to predict local extremes in wildfire danger	40	85

								conditions. Tools and methodologies for the prediction of wildfire danger will be used and described. Finally, exposed elements and vulnerability will be introduced in order to evaluate risk and emergency scenarios through the application of simulation tools. The students will be able to make use of the knowledge acquired during the classes in order to provide support to decision makers both in prevention phase and suppression.		
2	94659	RISK ASSESSMENT AND MANAGEMENT	5		CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione Civile, Ambientale e del Territorio	Inglese		0	0
2	94659	RISK ASSESSMENT AND MANAGEMENT	5		AFFINI O INTEGRATIVE	Attività Formative Affini o Integrative	Inglese		0	0
2	94660	INTEGRATED RISK ASSESSMENT AND MANAGEMENT	5	ICAR/02	CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione Civile, Ambientale e del Territorio	Inglese	<p>The aim of the course is to introduce the student to the concept of risk management with and provide basic tools to draw risk maps starting from any hazard map.</p> <p>The topics include: -the analysis of risk management cycle and of the official terminology associated to it; - the basic concepts and the phases of risk assessment, differences between risk and disasters, classification of risks. - Elements of country risk profiles: sources of data and applications to real cases - Elements of mapping risk scenarios and Basic methods and sources of information for the Estimation of Exposure and Vulnerability at different spatial scales. - general methodologies for the calculation of standard parameters in the risk assessment procedures (eg. PML and AAL) and examples of applications - practical examples of real time risk management and disaster risk reduction</p> <p>At the end of the course the student is expected to be able to: - describe conceptually the phases of the risk management cycle, understanding the differences among them - interpret and understand the information provided by any risk map - know and describe the most common methodologies for exposure and vulnerability assessment - know and describe common examples of real time risk</p>	40	85

									management and disaster risk reduction policies - draw a risk map starting from a categorized hazard map at block and municipality scale.		
2	94661	ENVIRONMENTAL RISK ASSESSMENT OF CHEMICALS	5	ING-IND/24	AFFINI O INTEGRATIVE	Attività Formative Affini o Integrative	Inglese		The purpose of this course is to disseminate the basic principles and methods to characterize the nature and magnitude of health risks to humans and of ecological risk to organisms and receptors due to chemical contaminants that may be present in the environment, and released during Natural Events or from Human and Industrial Activities. Common environmental investigation scenarios are discussed together with the evidence collection strategies. Models to evaluate the transport and fate of pollutants in different environmental matrices and source/ pathway/receptor models are presented. Different methods for assessing risk (HHRA and ERA), with particular attention to the exposure assessment step, are discussed and compared (Tier I,II,III,IV level).	40	85
2	94663	REMOTE SENSING AND ELECTROMAGNETIC TECHNIQUES FOR RISK MONITORING	10		CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione dell'Informazione	Inglese			0	0
2	94664	ELECTROMAGNETIC TECHNIQUES FOR MONITORING STRUCTURES AND PROTECTING SYSTEMS	5	ING-INF/02	CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione dell'Informazione	Inglese		"The course provides the fundamental skills related to radar remote sensing and electromagnetic techniques for monitoring structures and protecting systems. In particular, approaches based on radar concepts, impedance and capacitance tomography, inverse scattering, and microwaves tomography will be discussed with particular reference to civil and environmental applications.	40	85
2	94666	REMOTE SENSING OF NATURAL DISASTERS	5	ING-INF/03	CARATTERIZZANTI	Ingegneria della Sicurezza e Protezione dell'Informazione	Inglese		"The course introduces the key concepts related to information extraction from remote sensing images in the framework of disaster risk prevention and assessment. Basic knowledge will be provided about remote sensing image acquisition through passive sensors; land cover mapping through remote sensing image classification in the application to risk prevention; detection of ground changes from multitemporal remote sensing images in the application to damage assessment; and data representation in a geographic	40	85

								information system (GIS).		
2	94669	CRITICAL ENERGY INFRASTRUCTURES MODELLING AND SIMULATION	5	ING-IND/33	A SCELTA	A Scelta dello Studente	Inglese	The course is focused on the modelling and simulation of critical energy infrastructures, such as smart grids, electricity production plants, electrical storage systems, electric mobility systems, transmission and distribution lines, considering also electrical system outages; the planning of power systems is faced also focusing on reliability and security of power supply, introducing different network infrastructures, advanced protection systems and reserve supply.	40	85
2	94673	MASTER THESIS	15		PROVA FINALE	Per la Prova Finale	Inglese		0	375
2	94674	STAGE	5		ALTRE ATTIVITA'	Tirocini Formativi e di Orientamento	Inglese		0	125
2	104394	RISK COMMUNICATION AND PERCEPTION	5	M-PSI/06	A SCELTA	A Scelta dello Studente	Inglese	The course will address the topic of risk from a psychosocial perspective, as it is perceived by stakeholders and as it is communicated among them. The participants will be able to describe the main factors concerning risk perception and its relationship with risk-protective behaviours. They will also be able to analyze case studies by means of theoretical frameworks and models concerning risk perception. In addition, they will be able to describe and apply the main principles of risk and crisis communication to specific cases.	40	85
2	108566	ADVANCED RISK ASSESSMENT	5		A SCELTA	A Scelta dello Studente			0	0
2	108567	SEISMIC RISK ASSESSMENT AND MITIGATION OF THE BUILT ENVIRONMENT	2,5	ICAR/09	A SCELTA	A Scelta dello Studente	Inglese	This module aims to provide the fundamentals of seismic risk assessment, emergency management, and mitigation policies of the built environment, with particular emphasis on buildings. At the end of the module, the student will learn the concepts of seismic risk, focusing on their components (hazard, exposure, vulnerability, and resilience). Furthermore, the student will be able to discuss critically possible seismic risk reduction policies and finally acquire the tools to manage large-scale damage and vulnerability survey of existing buildings in the post-earthquake emergency phase.	20	42,5

2	108570	MULTI-HAZARD IMPACT AND RISK ASSESSMENT	2,5	ICAR/02	A SCELTA	A Scelta dello Studente	Inglese	The aim of this module is to provide fundamentals of multi-hazard and multi-risk modelling. At the end of the course the student will be able to apply multi-hazard and multi-risk concepts and definitions and describe the available approaches for qualitative and quantitative multi-hazard risk modelling. Furthermore, the student will be able to select the best approaches to manage multi-hazard risk and implement multi-hazard disaster risk reduction (DRR) strategies. The knowledge of risk assessment and management approaches that consider multiple hazards and their potential interactions will help the student to better understand and capture the real risk that many areas of the world are prone to, allowing to implement more successful DRR measures.	20	42,5
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