



## University of Perugia Department of Physics and Geology

### Master of Science (MSc) Geosciences for Risks and Environment Management

#### **Aim of the Course**

The new Master of Science in Geosciences for Risk and Environment Management, activated in the academic year 2020-2021, represents the evolution of the previous course in Geological Sciences and Technologies, active at this Department until 2019-2020; it was updated in response to the evolution of cultural and practical issues, within the competence of Geology. The course is designed to train new generations of Geologists, who are able to deal concretely with the problems related to geological risks, spatial planning and the management and sustainable exploitation of georesources, with particular attention to the issues of global changes (Global Change).

The multiplication of increasingly complex environmental problems requires expert Geologists, able to face complex challenges and to combine the needs of an industrial development that requires increasing quantities of energy, which planet Earth cannot provide in an unlimited way, and the development of models for the management of efficient and effective energy resources, which minimize waste and at the same time protect the environment and human health.

Moreover, the constant growth of the population, combined with the poor awareness of terrestrial dynamics, has led to the colonization of areas of the planet where geological risks represent a problem of primary importance. In this area also, as never before, the presence of Geologists capable of implementing an effective planning and management of the territory is required, based on the understanding of risks deriving from its natural evolution and from anthropic pressure (exploitation of resources, occupation and alteration of the territory, impact of major works, mitigation of geological risks, pollution, etc.).

The new degree course, divided into two curricula, is aimed to train experts with in-depth multidisciplinary knowledge of the Earth System and its dynamics on a global and local scale, through modern teaching and training activities that integrate traditional methodologies, cutting-edge laboratory activities, field work, training internships in qualified companies and training periods abroad.

The skills acquired by the graduate will allow professional outlets in different working contexts, where the Geologist's exclusive technical-scientific knowledge is fundamental and integrates with that of other professional figures, according to an interdisciplinary and transdisciplinary approach. In view of the growing demand for internationalization of higher-level training courses, one of the two curricula (curriculum 2: Geosciences for Environmental Sustainability - GES) in which the course articulates, described below, is held entirely in English.

#### **Curriculum 1 – Geologia Applicata alla Salvaguardia e alla Pianificazione del Territorio - GASP (in Italian)**

The curriculum provides a typical and exclusive cultural and technical-professional training of the figure of the "Engineering Geologist", necessary to support the realization of engineering works, for the retrieval and the correct use of geological resources (with particular regard to groundwater), for geological risk assessment (especially for hydrogeological risk, geological-environmental risk, hydraulic risk, slope instability etc.) and for the realization of geological and geothematic

cartography. The training offered by this curriculum is addressed to Students who are particularly interested in professional opportunities, in the private or public sector, linked to territorial and environmental planning, the mitigation of geological risks, geoengineering and water resource management.

### Curriculum 2 - Geosciences for Environmental Sustainability – GES (in English)

The curriculum provides an in-depth basic knowledge of geological processes aimed at understanding and mitigating the risks associated with changes in our planet. In particular, the courses will be aimed at assessing seismic, volcanic and environmental geological risks, as well as identifying and exploiting renewable geo-resources and recyclable geomaterials for a circular economy and a more sustainable planet. Students will have the opportunity to spend stays at Northern Arizona University, Arizona, USA, to take courses, internships, field trips or prepare their degree thesis, thanks to the agreement in force between our and the aforementioned university.

The curriculum will train experts in the areas of resource and risk management in academia, in the private sector, in environmental institutions, in public territorial bodies and environmental scientific research as ISPRA (Higher Institute for Environmental Protection and Research), ARPA (Regional Environmental Protection Agencies), ASL (Local Healthcare Companies), etc.

### **Outline of the MSc in Geosciences for Risks and Environment Management**

The normal extent for obtaining the Master's Degree is two years. In order to achieve the final title, the student must have acquired 120 credits (CFU). Each credit corresponds to 25 hours of student work. For each training credit, considering the different variable commitment (personal study) required, the corresponding number of hours is determined as follow:

Frontal lecturers	7 hours
Practice in the classroom or laboratories	12 hours
Internships, preparation of the final Project and written Thesis	25 hours

The two academic years path (2020/2021 and 2021/2022) is organized in 4 semesters. The fourth semester is devoted to prepare the Master thesis. Students can choose to carry out their thesis project at the Department of Physics and Geology of this University or to apply for a stage in Industries, Research Centers and foreigner Universities (in the frame of the Erasmus Program). In all the cases the final dissertation of the MSc Thesis will be defended at the Perugia University with at least a tutor from the Perugia teaching staff.

## Academic Calendar

The educational activities during the 2 academic years (2020-2021 and 2021-2022) are divided into two semesters.

### *LM Geosciences for Risks and Environment Management*

#### *Teaching path cf. 2020/2021 - 2021/2022*

#### **Curriculum 1. Geologia Applicata alla Salvaguardia e alla Pianificazione del Territorio (GASP)**

##### *I year (2020/2021)*

<b>First semester</b>		
<b>Type of training activity</b>	<b>Name of the course</b>	<b>CFU</b>
Fundamental	Mathematical Methods for Geosciences <b>In English</b>	6
Fundamental	Prospezioni geofisiche	6
Fundamental	GIS - Geographic Information Systems <b>In English</b>	6
Fundamental	Idrogeologia	9
Student's option	1 optional course chosen by the Student during the first or second semester	6
<b>Second semester</b>		
<b>Type of training activity</b>	<b>Name of the course</b>	<b>CFU</b>
Fundamental	Progettazione tecnica	6
	Environmental Geochemistry <b>In English</b>	
Fundamental	Meccanica delle Terre e delle Rocce	6
Fundamental	Rischio Idrogeologico	6
Fundamental	Structural Geology <b>In English</b>	6
Supplementary educational activities	Excursions	3

Total CFU = 60

**II year (2021/2022)**

<b>First semester</b>		
<b>Type of training activity</b>	<b>Name of the course</b>	<b>CFU</b>
Fundamental	Geologia dei Terremoti e Rischio Sismico	6
Fundamental	Environmental Geology <b>In inglese</b>	6
Supplementary	Geotecnica	6
Student's option	Two optional courses chosen by the Student during the first or second semester	12
<b>Second semester</b>		
Supplementary educational activities	Stage and Internships	6
Final assessment	Final exam (experimental thesis)	24

Total CFU = 60

***Available courses among which the Student can choose***

<b>Nome</b>	<b>Semestre</b>	<b>CFU</b>
Rilevamento geologico-tecnico e monitoraggio	1	6
Chimica Ambientale	1	6
Geomatematica	1	6
Paleontologia dei Vertebrati	2	6
Micropaleontology <b>In English</b>	1	6
Sedimentary Petrography <b>In English</b>	1	6
Diritto Amministrativo	2	6
Geothermics <b>In English</b>	1	6

**Curriculum 2. Geosciences for Environmental Sustainability (GES) - in English****I year (2020/2021)**

<b>1<sup>st</sup> semester</b>		
<b>Type of activity</b>	<b>Name of the course</b>	<b>CFU</b>
Fundamental	Mathematical Methods for Geosciences	6
Fundamental	Applied Geophysics	9
Fundamental, to be chosen between the two	Global Tectonics	6
	Sedimentology	
Fundamental, to be chosen between the three	Environmental Geology	6
	GIS	
	Applied Hydrogeology	
Student's option, to be chosen between the two	Geologia dei Terremoti e Rischio sismico <b>In Italian</b>	6
	Geothermics	
Student option	1 optional course, chosen by the Student during the first or second semester	6
Supplementary educational activity	Geological field trips	3
<b>2<sup>nd</sup> semester</b>		
<b>Type of activity</b>	<b>Name of the course</b>	<b>CFU</b>
Fundamental	Ore deposits and sustainable mining	6
Fundamental	Structural Geology	6
Supplementary	Environmental Geochemistry	6

Total CFU = 60

**II year (2021/2022)**

<b>First semester</b>		
<b>Type of activity</b>	<b>Name of the course</b>	<b>CFU</b>
Fundamental	Medical geology	6
Supplementary	Volcanic risk	6
Fundamental	Earth system Science	6
Student's option	Two optional courses, chosen by the Student during the first or second semester	12
<b>2<sup>nd</sup> semester</b>		
Supplementary educational activity	Geological field trips (2)	<b>3</b>
Final Assessment	Final exam (experimental thesis)	<b>27</b>

**Description of geological field trips**

- a) Mt. Amiata: geothermics and environmental problems relate to mercury anomalies.
- b) Northern Tuscany and Eastern Liguria: environmental problems related to iron and manganese mines divestment. Ophiolites altered to serpentinites (chrysotile, asbestos).
- c) Volcanic activity in central and southern Italy. Impact of volcanic activity on the environment, gas emissions and health risks, volcanic risk.

**Available courses among which the Student can choose**

<b>Name of the course</b>	<b>Semester</b>	<b>CFU</b>
Chimica Ambientale	1	6
Vulcanologia	2	6
Geomateriali ed Economia circolare	3	6
Gemmology	1	6
Climate Change	1	6

## **Teaching methods and Assessment**

The course is delivered in Italian and English, but the Curriculum 2 is entirely delivered in English, and therefore it is required a properly certified knowledge of English language (see below).

The training activities will be performed with different modalities, such as frontal lectures, practical work (in classroom and laboratory), seminars, training courses, individual and assisted studies, field works.

The practical activities intend to develop the student's ability to solve efficiently problems, to work independently, and to develop skills in team-working and data sharing. Exercises will allow the teacher to verify the learning level of each student. To improve student's skills, seminars and meetings with experts will be organized each year.

Lecture attendance is strongly recommended for all courses; attendance at scheduled seminars and fieldworks is mandatory. The credits are acquired after positive assessment of profit (exams). Evaluations have individual character, and may consist of written and/or oral and/or exercise to be performed in laboratory or in the field. All activities allowing acquisition of credit must be assessed. The evaluation of the students is made by specific committee, consisting of at least two teachers. The mark is expressed in thirties. The composition of the committees and the calendar of exams are published on the website at the beginning of each academic year.

## **Pre-Requisites**

Personal preparation for access to the Master Course of Earth Sciences for Risk and Environment Management requires basic training in mathematical, physical and chemical disciplines and adequate knowledge in the various fields of geological sciences.

In general, the entry requirements are met for students with a Bachelor's Degree in Geological Sciences (class L 34 or class 16 ex DM 509/1999), of another equivalent foreign qualification, or a Bachelor's degree in one of the following classes:

- L32 - Scienze e Tecnologie per l'Ambiente e la Natura;
- L30 - Scienze e Tecnologie Fisiche;
- L7 - Ingegneria Civile e Ambientale

(or corresponding classes according to ex D.M. 509/1999).

Enrollment is however subject to the positive evaluation of the basic preparation of the graduate by the Degree Course Commission, to which the Student is subjected to an evaluation request. The three-year graduates who have obtained the three-year degree in class L34 (Geological Sciences), or in class 16 ex D.M. 509/1999, with a mark higher than 99/110, are exempted from the verification and are automatically enrolled in the course.

A knowledge of the English language of at least Level B1 is also required. If the training path chosen by the Student is carried out entirely in English, verification of at least B2 level is required.

### *Minimum language requirements for the admission*

ELTS International English Language Testing System <a href="http://www.ielts.org">http://www.ielts.org</a>	Cambridge ESOL Examinations General English Exams <a href="http://www.cambridgeenglish.org/exams">http://www.cambridgeenglish.org/exams</a>	TOEFL- ibt (internet based test) Test of English as a Foreign Language - <a href="http://www.ets.org/toefl">http://www.ets.org/toefl</a>
5.5	Cambridge English: Preliminary (PET) pass with Distinction $\geq 90$	$\geq 72$

Nevertheless, applicants who have at least one of the following conditions may be exempted from the presentation of a language certification:

- attendance of at least one year of studies in English language of High/Secondary School;
- possess of an educational qualification acknowledged as equivalent to the Italian High School Diploma, issued by a High/Secondary School where classes are held in the English language;
- BSc (or equivalent) diploma obtained in a University where lessons are taken in English.

However, the lack of B2 level in English does not preclude enrollment, but can be remedied during the first half of the first year.

Similarly, the recognition by the Commission of any other shortcomings in the curriculum of the enrolled candidate does not necessarily preclude access to the degree course: in this case the Commission determines an educational debt that can be covered by attending specific single courses and supporting the related exams so as to obtain the release of the authorization to enroll.

Applications must be sent by ordinary mail to:

**Dr. Raffaella Formiconi** (Secretary Office)

Address: Dipartimento di Fisica e Geologia, Via Pascoli, 06123 - Perugia (Italy)

or by email at: [raffaella.formiconi@unipg.it](mailto:raffaella.formiconi@unipg.it)

Applications will be evaluated by a committee of the Department of Physics and Geology.

### **Transfers**

*Procedures and criteria for the recognition of credits acquired in other courses of study.*

As for the recognition of credits, requests submitted by individual students will be examined by a committee and the earned credits will be evaluated taking into account the general criteria set out below.

If enrolled from study programs of the same class, the committee will recognize every credit earned by the Student in the previous curriculum. If enrolled from different class, the committee will evaluate the congruity of the teaching program with that of this Master Course.

Previously acquired knowledges and professional skills not corresponding to specific teaching courses will be checked by the committee regarding their consistency with the objectives of the Master Course. In any case the recognized credits will never exceed the amount of 12 CFU. The committee and the advisor of the Master Course will provide assistance to the Student in compiling the individual study plan.

The credits earned by students in the context of international study programs at Universities in force of bilateral agreements with the University of Perugia will be recognized with reference to the European Credit Transfer System (ECTS). Credits earned by students in other Italian Universities, European Union or in other countries not following the ECTS system, will be recognized on the basis of the documentation provided by the Student.

In the event of a bilateral agreement between the University of Perugia and the establishment of origin, we will proceed in accordance with the terms of the agreement.

### **Final exam**

After the exams, Students undertake an independent project (Thesis). The final exam aims to test the ability of the student to work independently and to present and discuss the results of an original work on a specific topic. Students are expected to demonstrate independent thinking, critical and creative analysis, technical judgment in their project work, and to manage both the technical analysis and time-management aspects of the project. The thesis is carried out with the supervision of a teacher (Supervisor), belonging to the teaching staff of the Geological Courses of the Department of Physics and Geology (Perugia University) eventually with one or more co-



Supervisors. The co-Supervisor must be expert in the topic of the thesis and not necessarily belonging to an academic staff. The Student makes his/her dissertation at the presence of a special committee appointed by the educational structure of reference.

The thesis can be written in Italian (with extended abstract in English) or in English (with extended abstract in Italian). The committee is composed of 7 professors, including the thesis Supervisor. For the evaluation and the final score the committee will take into account of the quality of the thesis and presentation and also of the whole student career.

At the final examination up to ten points will be awarded, that will be added to the base score resulting from the weighted average of the exams obtained during the two years of the course. If the final score is equal to or greater than 110, the committee, only if unanimously, may give honors (110 cum laude).

### **Tutoring**

The tutorial activities are organized and managed by the Director of the Geological Courses.

The tutor for the Academic Year 2020/21 will be:

Prof. **Costanza Cambi** (email: [costanza.cambi@unipg.it](mailto:costanza.cambi@unipg.it)).

Link to: <http://www.fisgeo.unipg.it/fisgejo/index.php/it/didattica/corsi-di-laurea-in-geologia/laurea-magistrale-in-scienze-della-terra-per-la-gestione-dei-rischi-e-dell-ambiente>

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**DIRECTOR OF THE GEOLOGICAL COURSES**

*Prof. Corrado Cencetti*