



**UNIVERSITA' DEGLI STUDI DI MILANO**  
**PROGRAMME DESCRIPTION - ACADEMIC YEAR 2020/21**  
**BACHELOR**  
**Geological Sciences (Classe L-34)**  
**enrolled from 2014-2015 academic year**

### HEADING

<b>Degree classification - Denomination and code:</b>	L-34 Geology
<b>Degree title:</b>	Dottore
<b>Length of course:</b>	3 years
<b>Total number of credits required to complete programme:</b>	180
<b>Years of course currently available:</b>	1st , 2nd , 3rd
<b>Access procedures:</b>	Open, subject to completion of self-assessment test prior to enrolment
<b>Course code:</b>	F65

### PERSONS/ROLES

#### Head of Study Programme

Prof. Massimo Tiepolo

#### Tutors - Faculty

Docenti Tutors: Prof. Riccardo Bersezio, Prof. Giovanni Grieco, Prof. Michele Zucali, Prof.ssa Monica Dapiaggi, Prof. Roberto Sabadini.

Per la laurea Triennale sono disponibili vari tutori che forniscono assistenza per raggiungere gli obiettivi che gli studenti vogliono perseguire e per la scelta di corsi opzionali.

I tutori per la compilazione dei piani di studio a disposizione sono:

Prof Riccardo Bersezio, Prof Marco Balini (ambito geologico stratigrafico paleontologico- strutturale);

Prof Giovanni Beretta, Prof Marco Masetti, Prof Tiziana Apuani (ambito geologico applicativo - geomorfologico);

Prof Stefano Poli, Prof Giovanni Grieco (ambito mineralogico-petrografico geochimico);

Prof Roberto Sabadini (ambito geofisico).

#### Degree Course website

<https://geologia.cdl.unimi.it/it>

Ufficio per la Didattica, al momento solo via mail scrivendo a: [cclsg@unimi.it](mailto:cclsg@unimi.it) <https://www.unimi.it/it/corsi/corsi-di-laurea/scienze-geologiche>

Email: [cclsg@unimi.it](mailto:cclsg@unimi.it)

Via Botticelli, 23 al II piano riceve quando disponibile o su appuntamento Email: [massimo.tiepolo@unimi.it](mailto:massimo.tiepolo@unimi.it)

Via Celoria, 18 - 20133 Milano Phone 0250325032 <https://www.unimi.it/it/node/360> <https://www.unimi.it/it/node/359>

<https://www.unimi.it/it/studiare/biblioteche>

### CHARACTERISTICS OF DEGREE PROGRAMME

#### General and specific learning objectives

The Master course in Earth Sciences prepares geologists with an in-depth knowledge in various fields of the Earth Sciences offering opportunities of scientific development and employment both in public and private sectors. This degree provides theoretic and practical skills deriving from the field-based and laboratory training, internships and research stages in public and private institutions, national or international.

Some of the teaching subjects, which can offer solid professional opportunities are: (1) Analysis, quantification and modelling of Earth processes interacting within the Planet, on its surface, in the atmosphere and hydrosphere, related to the origin of energy, water and mineral resources. (2) Evaluation and characterisation of natural minerals for their role in geologic processes and with respect to industrial applications. (3) Basic field mapping and thematic mapping for the interpretation of geologic processes/products at various scales. (4) Analysis and interpretation of geological processes interacting with human activities for a balanced use of natural resources and for protection of the environment and archeological and cultural sites. (5) Field surveys and direct/indirect prospecting for the parameterisation of technical properties and behaviour of soils and rocks for wide and small scale engineering plans. (6) Exploration, exploitation, protection and reclamation of underground water resources, after local and diffuse pollution events. (7) Exploration, evaluation and management of natural and energy resources, and of environmental effects of their exploitation. (8) Characterisation and prevention of natural hazards for territorial management.

During the Master in Earth Sciences/"Scienze della Terra", students will acquire theoretical, experimental and practical knowledge in various disciplines of the Earth Sciences and widen their background knowledge in chemistry, physics and

mathematics, specialised and related disciplines, as agronomy, and engineering. Students will analyse the complexities of natural processes, transformations of natural resources, human-induced impacts, and propose solutions on the basis of analytical techniques, field mapping methods, and construction of interpretative models. They will properly transfer analytical results into interpretations, using modern software packages.

The aims of the Master are to form Geologists able to: (a) analyse evolutionary processes of geologic systems and obtain models adaptable to engineering applications; (b) develop basic and applied geological research for different sectors of private and public employment, both in academia and industry; (c) recognise and forecast the medium and long term effects of the interaction between various geological processes, anthropogenic impacts, global climatic changes, intervention on reclamation and conservation of the quality of complex natural systems, individuation of the vulnerability of specific locations, evaluation of intrinsic hazard of geological phenomena interacting with human activities and proposal of risk reduction; (d) operate in industries for treatment of natural and analogue materials, and in similar public institutions, by running analytical laboratories, planning and executing measurements, in agreement with research and development plans, quality controls, and law, or by industrial production processing; (e) operate independently in the professional activities, or employment with public and private companies or State organisations.

These activities and the acquired knowledge can provide expertise in the design of interventions on the territory, even in an interdisciplinary way.

### **Expected learning outcomes**

The graduate must be identified: for a robust ability to understand the territory, in terms of superficial and deep geological structures; for understanding the temporal development of the natural mechanisms that influence the evolution of the territory; for the ability to process data collected in terms of modern cartographic representation; for the ability to recognize the evolution of the geological environment, also in relation to the anthropic activity.

In compliance with the principles of European harmonization, the outgoing skills developed by graduates during the degree course meet the specific requirements listed below according to the Dublin descriptor system:

- Knowledge and understanding - ability to think in a large-scale space-time context typical of Earth Sciences; understanding of a multi- and interdisciplinary systemic approach to complex natural systems, with recognition of the processes responsible for the formation of rocks; knowledge of safety rules; ability to work independently.

The acquisition of the knowledge and understanding skills will be verified by passing the exams, and through laboratory and field activities.

- Ability to apply knowledge and understanding - ability to accurately record and describe natural materials; to independently analyze geomaterials in the field and in the laboratory and to describe, analyze, and report the results. Ability to apply quantitative methods with a professional approach to geological problems in a broad context. Ability to operate through informatic systems.

The acquisition of the skills to apply the knowledge and understanding will be verified through the integration of field and laboratory exercises for the application of quantitative methods. Examination tests will include the preparation of written documents and practical tests.

- Making judgments - assessment of the complexities of the natural environment; interest in quality; recognize the responsibilities of Earth Sciences and their role in the society.

Acquisition of independent judgment will be verified by evaluating the acquisition of ethical principles towards nature and the environment. The ability to estimate the quality and reliability of geological data aimed at defining geological risk and correct use of the natural resources will be verified.

- Communication skills - oral and written communication in the mother tongue; knowledge of technical language in a second language, ability to team-working by correctly transferring information, ideas, problems and solutions related to Earth Sciences. Ability to speak with both specialist and non-specialist operators.

These results will be achieved and verified, in particular, through the preparation of the final dissertation, normally related to the training internship activity. The latter must be written by the student at the end of the course of study and presented orally to a specific commission during the final exam. The student will also have to prepare documents in digital form through the use of commonly used software aimed at promoting synthetic and effective communication.

- Learning skills - Ability to develop and acquire additional skills to manage complex information deriving from a multidisciplinary approach to the natural environment; ability to consult databases and other information on the network necessary for continuous updating.

Acquisition of learning skills will be verified by passing the exams of the third year and by the final test which normally require the student to consult databases and scientific bibliography in foreign language as well as personal deepening of topics not covered in common teaching activities.

### **Professional profile and employment opportunities**

The graduates from the Earth Science Master will be trained to perform the Geologist autonomous professional activity. The role of Professional Geologist is officially attributed by Ordine Nazionale dei Geologi by means of insertion in Section A (Geologo senior), in accordance with the Italian law D.P.R. 5 Giugno 2001, n. 328; following the successful completion of a national examination (State Exam).

Master graduates will find employment opportunities with research companies, public administrations, professional and consulting companies in Italy and abroad, companies and laboratories for treatment of natural materials.

The various fields of the employment market to which the Master graduate will be able to access, concerning the intellectual, scientific and highly-specialised professional roles acquired, are listed within category 2 ISTAT (2.1.1.5; geologists, geophysicists and other related professions) and are the following:

- Field mapping, updating of geological, technical and thematic maps;

- Planning, execution and interpretation of geophysical and geological investigations for civil engineering; prospecting and characterisation of mineral, water and energy resources, and environmental monitoring;
  - Modelling of geologic processes for the analysis of slope instability, underground water circulation and pollutant transport, tunnelling, and related activities;
  - Prospecting, evaluation and managing of geological resources, direction of mining and quarrying works;
  - Coordination of protection systems in mobile and temporary yards and construction sites;
  - Direction of mineralogical, petrographical, sedimentological, geochemical and geotechnical laboratories;
  - Territorial planning of hazardous sites and hydrogeological protection systems;
  - Environmental monitoring for protection of water resources, reclamation and remediation of polluted aquifers and sites, waste management;
  - Control of industrial quality, technical use of geomaterials for mechanical, chemical and electronic industries, use of ornamental stones; gemmology;
  - Analysis, reclamation and managing of degraded sites, modelling of geoenvironmental processes and systems, managing, construction site direction, testing and monitoring;
  - Managing of Geographic Information Systems, particularly the ones oriented to geoenvironmental studies;
  - Protection of cultural and paleontological heritages, monument conservation, geoarchaeology;
  - Planning of civil engineering constructions and of environmental and soil protection, in collaboration with related professionals;
  - Evaluation of the environmental impact of wide engineering interventions (VIA) and strategic environmental evaluation (VAS);
  - Science dissemination and journalism;
  - Teaching of Earth Sciences;
  - Forensic Geology;
- The Earth Science Master represents a preferential title to access to PhD studentships.

## Notes

To obtain the degree, students are required to demonstrate an English language proficiency at level B1 within the Common European Framework of Reference for Languages (CEFR). This level can be assessed in the following ways:

- by submitting the language certificate achieved no more than three years prior to the submission, at level B1 or higher, recognised by the University (the list of recognised language certificates can be found at: <https://www.unimi.it/en/node/297/>). The language certificate must be uploaded during the admission process;
- by taking the Placement Test, organised by SLAM exclusively during the first year, from October to December. Students who fail to reach level B1 will have to attend an English course organised by SLAM. The Placement Test is compulsory for all students who do not have a valid language certificate.

Students who do not take the Placement Test within the deadline and students who fail the SLAM end-of-course test within six attempts will have to obtain a language certificate within the year in which the language exam is scheduled.

The 3 CFU of basic computer skills are acquired through an online course in Computer Science (teaching that is part of the course of Mathematics I and Computer Science).

The teaching is delivered in "blended learning" mode with a final assessment test in the computer room. The Basic Computer Skills Assessment Service is managed by the CTU - Center for educational innovation and multimedia technologies. The grade out of thirty received in the computer science test, together with the score of Mathematics I, determines the overall grade of the course.

## **EXPERIENCE OF STUDY ABROAD AS PART OF THE TRAINING PROGRAM**

The University of Milan supports international mobility by providing its students with the opportunity to spend study and internship periods abroad. It is a unique chance to enrich your educational path in a new exciting environment.

The agreements entered into by the University with over 300 universities from 30 different countries under the European Erasmus+ programme allow regularly enrolled students to carry out part of their studies at one of the partner universities or to undertake internships at companies, training and research centres and other organizations.

Similar international mobility opportunities are provided outside Europe, through agreements with a number of prestigious institutions.

## **Study and internships abroad**

The department of Earth Sciences offers opportunities for spending time as guest students at European universities and research centres both for attending courses/exams and for research and apprenticeships related to projects for graduate, post-graduate and PhD students. Studying and doing research in foreign universities is not only an important life experience and the occasion for thorough learning of a foreign language, but is also, and primarily, the opportunity for experiencing and acquiring different and more flexible learning approaches. Doing research and apprenticeships abroad may allow the access to facilities not available here (e.g., highly specialized labs), the performance of applied research on specific fields as well as the first-hand interaction with wider, international research groups. At present our partner universities in official Erasmus

exchange agreements devoted to course/exams and, where indicated, research activity, are located in France, Germany, Spain, Holland, Switzerland and Turkey. However the agreements for bursaries specifically devoted to applied research/apprentiships can be stipulated with any other university or research centre with which any members of our department have or may establish collaboration on common research interests. For these research bursaries and, in general, for the correct validation of the research activity done by our students abroad, the role and the active involvement of a local member of the department is of fundamental importance, as he/she will act as official, competent internal scientific tutor for the student hosted in the guest foreign university. Students may access to “normal” Erasmus bursarships, allowing course/exam in addition to research activities in partner universities, as well as Erasmus Student Placement bursaries exclusively devoted to research/apprentiship activities. The access to the different types of bursary is done by means of separate application procedures. The activity (course/exam or research) that the candidate will do in the guest foreign university has to be agreed with the local professors/tutors in both original and guest universities by means of the “Learning Agreement”. This document is of prime importance for the final validation and official administrative registration of the activity done abroad.

### How to participate in Erasmus mobility programs

How to participate in Erasmus+ mobility programmes:

The students of the University of Milan can participate in mobility programmes, which last 3 to 12 months, through a public selection procedure.

Ad hoc commissions will evaluate:

- the candidate's proposed study programme abroad
- his/her foreign language proficiency
- the reasons behind his/her application

Call for applications and informative meetings

The public selection generally begins around February each year with the publication of a call for applications specifying the destinations, with the respective programme duration, requirements and online application deadline.

Every year, before the deadline for the call, the University organizes informative meetings to illustrate opportunities and rules for participation to students.

Erasmus+ scholarship

The European Union grants the winners of the Erasmus+ programme selection a scholarship to contribute to their mobility costs, which is supplemented by the University funding for disadvantaged students.

Language courses

Students who pass the selections for mobility programmes can benefit from intensive foreign language courses offered each year by the University.

Learn more at <https://www.unimi.it/en/international/study-abroad/studying-abroad-erasmus>

For assistance, please contact:

International Mobility Office

Via Santa Sofia 9 (second floor)

Tel. 02 503 13501-12589-13495-13502

E-mail: [mobility.out@unimi.it](mailto:mobility.out@unimi.it)

Desk opening hours: Monday to Friday 9 am - 12 noon

<b>1st COURSE YEAR Core/compulsory courses/activities common</b>		
<b>Learning activity</b>	<b>Ects</b>	<b>Sector</b>
Chemistry and Laboratory	9	CHIM/03
English assessment B1 (3 ECTS)	3	ND
Geomorphology and Laboratory	10	GEO/04
Introduction to Geology and Laboratory	7	GEO/02, GEO/03, GEO/07, GEO/01
Mathematics I and Information Tecnology	9	(6) MAT/09, (6) MAT/01, (6) MAT/02, (6) MAT/03, (3) INF/01, (6) MAT/04, (6) MAT/05, (6) MAT/06, (6) MAT/07, (6) MAT/08
Mineralogy and Lithology Practicals	10	GEO/02, GEO/06
Paleontology and Laboratory	9	GEO/01
Physics I	6	FIS/01
Total compulsory credits		63
<b>2nd COURSE YEAR Core/compulsory courses/activities common</b>		
<b>Learning activity</b>	<b>Ects</b>	<b>Sector</b>
Mathematics II	6	MAT/01, MAT/02, MAT/05
Mineralogy	6	GEO/06
Petrography and Laboratory	10	GEO/07
Physics II	6	FIS/01
Physics of the Earth and Laboratory	9	GEO/10

Sedimentary Geology and Laboratory	10	GEO/02
Structural Geology and Tectonics and Laboratory	10	GEO/03
Total compulsory credits	57	
<b>3rd COURSE YEAR Core/compulsory courses/activities common</b>		
<b>Learning activity</b>	<b>Ects</b>	<b>Sector</b>
Engineering Geology and Laboratory	9	GEO/05
Geochemistry	6	GEO/08
Geological Mapping and fieldwork practicals	9	GEO/02, GEO/03, GEO/07, GEO/09
Georesources	9	GEO/09
Topography and GIS	6	ICAR/06
Total compulsory credits	39	
<b>Elective courses</b>		
Applied Geophysics	6	GEO/11
Facies Analysis	6	GEO/02
Geotechnical field test and measures	6	GEO/05
Mineralogy of Earth and Planets and analytical methods	6	GEO/06
Palaeoecology	6	GEO/01
Photogeology	6	GEO/04
Raw Materials and Industry	6	GEO/09
Structural Analysis I	6	GEO/03
Volcanology	6	GEO/08
<b>End of course requirements</b>		
Final Dissertation	4	ND
Training	5	GEO/02, GEO/03, GEO/04, GEO/05, GEO/06, GEO/07, GEO/08, GEO/09, GEO/10, GEO/01, GEO/12, GEO/11
Total compulsory credits	9	

## COURSE PROGRESSION REQUIREMENTS

The exams of the elective courses must be incurred after the characteristic of the same scientific-disciplinary or related fields; they must also comply with the following mandatory prerequisites:

Learning activity	Prescribed foundation courses	O/S
Topography and GIS	English assessment B1 (3 ECTS)	Core/compulsory
	Paleontology and Laboratory	Core/compulsory
	Mathematics I and Information Tecnology	Core/compulsory
	Physics II	Core/compulsory
	Chemistry and Laboratory	Core/compulsory
	Physics I	Core/compulsory
	Mathematics II	Core/compulsory
	Sedimentary Geology and Laboratory	Core/compulsory
	Mineralogy and Lithology Practicals	Core/compulsory
	Geomorphology and Laboratory	Core/compulsory
	Introduction to Geology and Laboratory	Core/compulsory
Engineering Geology and Laboratory	Mineralogy	Core/compulsory
	English assessment B1 (3 ECTS)	Core/compulsory
	Paleontology and Laboratory	Core/compulsory
	Mathematics I and Information Tecnology	Core/compulsory
	Physics II	Core/compulsory
	Chemistry and Laboratory	Core/compulsory
	Physics I	Core/compulsory
	Mathematics II	Core/compulsory
	Sedimentary Geology and Laboratory	Core/compulsory
	Mineralogy and Lithology Practicals	Core/compulsory
	Geomorphology and Laboratory	Core/compulsory
Physics of the Earth and Laboratory	Introduction to Geology and Laboratory	Core/compulsory
	Mineralogy	Core/compulsory
Physics I	Physics I	Core/compulsory
Physics II	Physics I	Core/compulsory
Geological Mapping and fieldwork practicals	English assessment B1 (3 ECTS)	Core/compulsory
	Paleontology and Laboratory	Core/compulsory
	Mathematics I and Information Tecnology	Core/compulsory
	Physics II	Core/compulsory

	Chemistry and Laboratory	Core/compulsory
	Physics I	Core/compulsory
	Mathematics II	Core/compulsory
	Sedimentary Geology and Laboratory	Core/compulsory
	Mineralogy and Lithology Practicals	Core/compulsory
	Geomorphology and Laboratory	Core/compulsory
	Introduction to Geology and Laboratory	Core/compulsory
	Mineralogy	Core/compulsory
Georesources	English assessment B1 (3 ECTS)	Core/compulsory
	Paleontology and Laboratory	Core/compulsory
	Mathematics I and Information Tecnology	Core/compulsory
	Physics II	Core/compulsory
	Chemistry and Laboratory	Core/compulsory
	Physics I	Core/compulsory
	Mathematics II	Core/compulsory
	Sedimentary Geology and Laboratory	Core/compulsory
	Mineralogy and Lithology Practicals	Core/compulsory
	Geomorphology and Laboratory	Core/compulsory
	Introduction to Geology and Laboratory	Core/compulsory
	Mineralogy	Core/compulsory
Petrography and Laboratory	Mineralogy and Lithology Practicals	Core/compulsory
	Mineralogy	Core/compulsory
Structural Geology and Tectonics and Laboratory	Mineralogy and Lithology Practicals	Core/compulsory
Mathematics II	Mathematics I and Information Tecnology	Core/compulsory
Sedimentary Geology and Laboratory	Mineralogy and Lithology Practicals	Core/compulsory
Mineralogy	Chemistry and Laboratory	Core/compulsory
	Mineralogy and Lithology Practicals	Core/compulsory
Geochemistry	English assessment B1 (3 ECTS)	Core/compulsory
	Paleontology and Laboratory	Core/compulsory
	Mathematics I and Information Tecnology	Core/compulsory
	Physics II	Core/compulsory
	Chemistry and Laboratory	Core/compulsory
	Physics I	Core/compulsory
	Mathematics II	Core/compulsory
	Sedimentary Geology and Laboratory	Core/compulsory
	Mineralogy and Lithology Practicals	Core/compulsory
	Geomorphology and Laboratory	Core/compulsory
	Introduction to Geology and Laboratory	Core/compulsory
	Mineralogy	Core/compulsory