



**UNIVERSITA' DEGLI STUDI DI MILANO**  
**PROGRAMME DESCRIPTION - ACADEMIC YEAR 2024/25**  
**MASTER DEGREE**  
**Earth Sciences (Classe LM-74)**  
**Enrolled from 2024/2025 academic year**

### HEADING

<b>Degree classification - Denomination and code:</b>	LM-74 Geology
<b>Degree title:</b>	Dottore Magistrale
<b>Curricula currently available:</b>	Environmental Geology, Engineering Geology and Hydrogeology / Geology of mineral resources and geomaterials / Sedimentary Geology and Environmental Changes / Geodynamics of Active Margins and Applications
<b>Length of course:</b>	2 years
<b>Credits required for admission:</b>	180
<b>Total number of credits required to complete programme:</b>	120
<b>Years of course currently available:</b>	1st
<b>Access procedures:</b>	Open, subject to entry requirements
<b>Course code:</b>	F97

### PERSONS/ROLES

#### Head of Study Programme

Prof. Michele Zucali

#### Degree Course Coordinator

Prof. Michele Zucali

#### Tutors - Faculty

Tutors per l'orientamento: Dott.ssa Francesca Forni, Dott. Mattia Marini, Prof. Davide Zanoni, Prof. Stefano Poli, Prof. Francesco Cecinato

Tutors Tirocini: Prof. Riccardo Bersezio, Prof.ssa Tiziana Apuani

Tutors Piani di Studio: Prof. Fabrizio Berra, Prof. Daniele Pedretti, Prof. G. Diego Gatta, Prof. Federico Farina, Prof. Alessandro Comunian, Prof. Davide Zanoni

Tutor Ammissione Laurea Magistrale: Prof. G. Diego Gatta, Prof. Massimo Tiepolo, Prof.ssa Paola Tartarotti, Prof. Gabriele Cambiotti, Prof. Fabrizio Felletti, Prof.ssa Maria Rose Petrizzo, Dott. Daniele Pedretti, Prof. Fernando Càmara Artigas

#### Degree Course website

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

Via Luigi Mangiagalli, 34 Milano III piano Ricevimento: quando disponibile o su appuntamento via mail.

Email: [michele.zucali@unimi.it](mailto:michele.zucali@unimi.it)

#### Course Management

Per info contattare: <https://informastudenti.unimi.it/saw/ess?AUTH=SAML> <https://informastudenti.unimi.it/saw/ess?AUTH=SAML>

#### Libraries

Via Luigi Mangiagalli, 34, 20133 Milano Phone telefono 02.50315560 dal lunedì al venerdì, dalle ore 08:45 alle ore 17:15

<https://www.sba.unimi.it/Biblioteche/terra/1877.html> Email: [geobib@unimi.it](mailto:geobib@unimi.it)

#### Student registrar

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

<https://informastudenti.unimi.it/saw/ess?AUTH=SAML>

### CHARACTERISTICS OF DEGREE PROGRAMME

#### General and specific learning objectives

The Master's Degree Course aims to train Graduates with in-depth preparation in various branches of the Earth Sciences, offering opportunities of scientific development and of employment both in public and private fields. The Degree Course provides theoretical and practical preparation based also on participation in field and laboratory activities, internships and traineeships, research stages in public and private institutions including international ones.

Some of the thematic areas offering solid professional opportunities are: (1) Analysis, quantification and modeling of Earth

processes interacting within the planet, on its surface, in atmosphere and hydrosphere, related to the origin of energy, water and mineral resources. (2) Evaluation and characterization 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 at various scales. (4) Analysis and interpretation of geologic processes interacting with human activities for a balanced use of natural resources and for protection of the environment and archaeological and cultural sites. (5) Field surveys and direct/indirect prospecting for the parametrization of technical properties and behavior 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 resources, with particular reference to energy and mineral resources, also in relation to the environmental impact deriving from their exploitation. (8) Characterization and prevention deriving from natural risks affecting the territory, and their evaluation in the context of territorial planning.

### **Expected learning outcomes**

In the Master's Degree Course in Earth Sciences, students will acquire in-depth knowledge in the different branches of geological sciences in their theoretical, experimental and practical aspects. They will have to address the analysis of complex problems inherent in natural processes, in the transformation of natural resources, and in the processes resulting from human activities, relying on solid skills regarding analytical-instrumental techniques, methodologies for data acquisition on the field, and construction of theoretical-interpretative models. They will properly transfer analytical results into interpretations, using modern software. The goal is to train geologists who are able to: (a) perform the analysis of geological systems and processes, their temporal evolution and modeling also for application purposes; (b) develop basic and applied geological research in different public and private areas, including academic and industrial fields; (c) recognize and predict, in the medium and long term, the effects of the interaction among geological processes of different nature, human impact, and global climate changes, as well as restore and preserve the quality of complex natural realities, identify the vulnerability of the sites, the danger of geological phenomena and the interactions with anthropic systems, providing for the management and mitigation of the risk; (d) operate both in industries that process natural materials (and synthetic analogues) and in public institutions, in order to manage instrumentation, organize and carry out measures to meet research/development, quality control requirements in the framework of legislative regulations or processes manufacturing; (e) carry out their activity independently in a professional or subordinate context with public bodies or companies in the corporate world that have skills in the geological and geological application fields. Activities and knowledge can provide skills in planning actions on the environment, even in an interdisciplinary way.

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

Earth Science Master graduates are formed 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 law D.P.R. 5 Giugno 2001, n. 328; after passing a State Exam.

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

Generally, the various sectors of the employment market, included in the intellectual, scientific and highly specialised professions are the following:

- Field mapping, updating of geological, technical and thematic maps;
- Planning, performing and interpretation of geophysical and geological investigations for civil engineering; prospecting and characterisation of mineral, water and energy resources, environmental monitoring;
- Modeling of geologic processes for the analysis of slope instability, underground water circulation and pollutants transport, tunneling, 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;
- 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 de-pollutioning of aquifers and sites, waste management;
- Control of industrial quality, technological use of geomaterials for mechanical, chemical and electronic industries, use of dimension stones; gemmology;
- Analysis, reclamation and managing of degraded sites, modeling of geoenvironmental processes and systems, managing, yard direction, testing and monitoring;
- Managing of Geographic Information Systems, particularly the ones oriented to geoenvironment;
- Protection of cultural and paleontological heritages, monuments conservation, geoarchaeology;
- Planning of civil engineering constructions and of environmental and soil protection, in collaboration with affine professionals;
- Evaluation of the environmental impact of wide engineering interventions (VIA) and strategic environmental evaluation (VAS);
- Scientific outreach and journalism;
- Didactics of Earth Sciences;
- Forensic Geology;

The Earth Science Master represents a preferential quality in PhD selections.

### **Initial knowledge required**

Access to the Master's Degree in Earth Sciences is open, after an interview, to all graduates from Italian universities in the class of Degrees in Geological Sciences (Class L-34) and of the corresponding class relating to Ministerial Decree 509/99. Graduates in other degree classes of any Italian university, or those in possession of another qualification obtained abroad, recognized as suitable, who demonstrate adequate preparation in the disciplines characterizing Earth Sciences, can also access it.

### Curricular Requirements

Access to the Master's Degree requires the possession of a solid foundation in mathematics, physics, chemistry, and at least 44 credits in disciplines related to Earth Sciences.

Assessment methods of knowledge and personal preparation.

The personal preparation of all candidates will be verified through an interview carried out by a commission made up of professors appointed by the Teaching Board which will evaluate any shortcomings of the candidates in the subject areas.

The interview can also be carried out before the bachelor's degree which, for enrolment purposes, must be obtained by 31 December 2024.

For the recognition of ECTS credits in the case of transfer from another University or transfer from another University degree programme, the provisions of the University Teaching Regulations apply.

The Didactic Board decides on a case-by-case basis whether or not forms of verification of acquired credits and any supplementary exams should be provided.

For the recognition of study activities carried out abroad and the related CFUs, the provisions of the University Teaching Regulations apply.

The maximum number of credits that can be individually recognised, pursuant to Art. 5, paragraph 7, of Ministerial Decree 270/2004, for certified professional knowledge and skills, as well as for other knowledge and skills gained in post-secondary training activities to the design and implementation of which the university has contributed, is quantified in a maximum of 12 credits. For the A.Y. 2024/2025, the following dates have been set for the interview, which will be carried out in person (except for future provisions that will be communicated in time), as listed below:

- 5 July 2024, 2:00 pm Room A, Via Botticelli, 23 - 20133 Milan;
- 12 September 2024, 2:00 pm Room A, Via Botticelli, 23 - 20133 Milan;

Students must present a valid identity document and a copy of the same to be delivered to the commission. It is advisable to check often, close to the interview, the e-mail box with which you are registered, for urgent communications.

The dates are intended as notification and candidates will not receive a call.

### Application for admission.

Graduates and undergraduates can apply for admission to the Master's Degree in Earth Sciences from 22/01/2024 to 25/8/2024 (in any case, graduating students must graduate no later than 31 December 2024). The application for admission, which is mandatory for all graduate and undergraduate students, must be submitted electronically taking into account the deadlines that can be found on the website of the student secretariats at the following link: <https://www.unimi.it/it/studiare/frequentare-un-corso-di-laurea/iscriversi/corsi-magistrali-biennali/magistrali-ad-accesso-libero>. The interview will be carried out by a commission made up of professors appointed by the Teaching Board of the course of study.

### Compulsory attendance

Attendance is not compulsory, but highly recommended especially for all laboratories, field activities and many lectures of specialist courses with contents that are not easily available through textbooks.

### Internship criteria

The internship is a period of training in the actual world of work. It completes scientific-technological training with professional technical-practical skills in the field of geology. The internship is a form of training with a view to orientation, employability and integration into the labour market. The internship awards 6 CFU and can be carried out in companies, professional firms or other organizations outside the University, as well as within the University.

Learn more on internship procedures at

<https://scienzetera.cdl.unimi.it/it/studiare/stage-e-tirocini>

<https://www.unimi.it/en/study/traineeships-and-work/traineeships-and-internships/activating-curricular-internship>

### Degree programme final exams

Upcoming graduates are required to conduct an original experimental work, including individually or with a multidisciplinary bent, and writing a degree thesis. This thesis consists of an original work addressing an Earth Sciences topic with a scientifically rigorous approach.

The final exam will award 30 credits. The thesis application must be submitted by the end of the first year of the programme, during which thesis work can already begin.

The thesis subject may also involve topics covered by similar curricula. The students must work under the guidance of a supervisor, who will be a lecturer from the Master's Degree Programme in Earth Sciences. Thesis work may be conducted, in whole or in part, at external research institutions.

The degree thesis must be submitted to a co-examiner appointed by the Chair of the Academic Board for the study programme, after hearing the opinion of the supervisor, at least one month before the final exam. The co-examiner will submit their written opinion to the Degree Board, which will take it into account when assessing the candidate's following

thesis presentation and defence. The co-examiner may be a member of the Degree Board.

Upcoming graduates must:

- 1) have earned 90 credits, including: 81 CFU for curricular exams; 3 CFU for English language proficiency (English II); 6 CFU for the internship;
- 2) have written the final paper awarding the remaining 30 credits.

<https://www.unimi.it/en/study/bachelor-and-master-study/graduation>

## **Campus**

Teaching infrastructures for the Bachelor's degree programme in Earth Sciences are located in the three structures of the Department of Earth Sciences "A. Desio". The main teaching areas are: Geology and Paleontology (via L. Mangiagalli, 34); Mineralogy, Petrography, Geochemistry and Mineral Fields and Geophysics via Botticelli, 23/via L. Mangiagalli, 32.

## **Laboratories**

Teaching laboratories take place both in departmental structures, equipped with technical-scientific instruments and collections, and on-field, using customised logistics solutions.

Educational collections for the recognition and study of fossils, minerals and rocks are available in classrooms and ad-hoc teaching laboratories. Computerized classrooms offer software for data processing and for the simulation of geological processes.

Scientific instruments available at the Department of Earth Sciences (<https://distad.unimi.it/it/didattica/progetti-e-laboratori/didattica-laboratorio>) offer learning and application tools for optical, chemical and physical-mechanical characterization of minerals, fossils, rocks, soils, other natural or synthetic materials, as well as water and other terrestrial fluids. Practical exercises are carried out in laboratories of optical microscopy, scanning electron microscopy, transmission electron microscopy, X-ray diffraction, X-ray spectrometry, micro-Raman spectroscopy, mass spectrometry and experimental petrology, mechanics of rocks and sedimentology.

Field laboratories take place in areas where students can learn geological cartography, process geological data and reconstruct the genetic processes of terrestrial materials (e.g. Valchiavenna Station).

## **Notes**

For-credit assessment B2

In order to obtain their degree, students must be proficient in English at a B2 level under the Common European Framework of Reference for Languages (CEFR). This proficiency level may be certified as follows:

- By submitting a language certificate attesting B2 or higher level in English and issued no more than three years before the date of submission. You will find the list of language certificates recognized by the University at: <https://www.unimi.it/en/node/39322>). The certificate must be uploaded during the enrolment procedure, or subsequently to the portal <http://studente.unimi.it/uploadCertificazioniLingue>;
- By taking a placement test offered by the University Language Centre (SLAM) between October and January of the first year. Students who fail the test will be required to take a SLAM course. The placement test is mandatory for all those who do not hold a valid certificate attesting to B2 or higher level.

Those who have not taken the placement test by the end of January or fail the end-of-course exam six times must obtain the necessary certification privately before graduating.

## **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 the 27 EU member 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 internship 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 internship 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, Greece, Spain, Holland and Switzerland. However the agreements for bursaries specifically devoted to applied research/internship 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/internship 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

The students of the University of Milan can participate in mobility programmes, through a public selection procedure.

Ad hoc commissions will evaluate:

- Academic career
- 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 for Erasmus+ mobility for study generally begins around February each year with the publication of a call for applications specifying destinations and requirements. Regarding the Erasmus+ Mobility for Traineeship, the University of Milan usually publishes two calls a year enabling students to choose a destination defined by an inter-institutional agreement or to find a traineeship position on their own.

The University organizes informative meetings to illustrate mobility opportunities and rules for participation.

Erasmus+ scholarship

The European Union grants the winners of the Erasmus+ programme selection a scholarship to contribute to their mobility costs, which may be 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 Language Centre (SLAM). <https://www.unimi.it/en/node/8/> Learn more at <https://www.unimi.it/en/node/274/>

For assistance, please contact:

International Mobility Office

Via Santa Sofia 9 (second floor)

Tel. 02 503 13501-12589-13495-13502 Contacts: InformaStudenti; [mobility.out@unimi.it](mailto:mobility.out@unimi.it) Student Desk booking through InformaStudenti

<b>1st COURSE YEAR Core/compulsory courses/activities common to all curricula</b>		
Learning activity	Ects	Sector
English proficiency B2 (3 ECTS)	3	NN
Geology	6	(3) GEO/02, (3) GEO/03
Mineral Resources and Geomaterials	6	(3) GEO/07, (3) GEO/09
Physics of Earth's Interior	6	GEO/10
Technical Geology	6	GEO/05
Total compulsory credits		27
<b>COURSE YEAR UNDEFINED Core/compulsory courses/activities common to all curricula</b>		
Learning activity	Ects	Sector
Trainig Stage	6	NN
Total compulsory credits		6
<b>Further elective courses common to all curricula</b>		
The student must acquire 18 ECTS by freely choosing among all the courses activated by the University as long as they are culturally consistent with his educational path and cannot be superimposed, in terms of content, on the fundamental and elective courses already used in the study plan.		
Therefore, all the teachings and/or modules present in this Study Manifesto that meet these criteria are included in the choice of the 18 credits.		
The Academic Board of the course of study in the academic year 2024-2025 will also make available the following courses:		
Environmental Geochemistry	6	GEO/08
<b>End of course requirements common to all curricula</b>		
Final Dissertation	30	NN
Total compulsory credits		30

### ACTIVE CURRICULA LIST

Environmental Geology, Engineering Geology and Hydrogeology Course years currently available: 1st  
 Geology of mineral resources and geomaterials Course years currently available: 1st  
 Sedimentary Geology and Environmental Changes Course years currently available: 1st  
 Geodynamics of Active Margins and Applications Course years currently available: 1st

## Procedure for choosing a curriculum

### Curriculum selection

The selection of the curriculum will be performed through the compilation of the study plan during the first or second year.

## CURRICULUM: [F97-B] Environmental Geology, Engineering Geology and Hydrogeology

### Qualifying Training Objectives

#### Educational Objectives:

One of the key sub-disciplines of Geology is Engineering Geology, i.e. the application of Geology to civil and infrastructure engineering works of any size and importance.

To this aim, the measurement or estimation of rock and soil properties (strength, deformability and permeability), in relation with geological properties, is of paramount importance. Measurement techniques include site surveying and investigation, adopting both direct and indirect exploration techniques, and laboratory experiments, also aimed at producing thematic maps.

Identifying the relevant parameters of the geologic medium serves the scope of designing engineering works such as dams, tunnels, roads, bridges, landfills, and assessing the ground-structure interactions. To support the design of engineering works, both theoretical and numerical modelling techniques are employed, aimed at optimizing their performance from the technical and economical point of view, as well as minimizing their environmental impact, in agreement with relevant design standards.

Among problems related to land and environment protection, hydrogeological instability phenomena (e.g. landslides and floods) issues are quantitatively addressed, by means of empirical, analytical and numerical methods, aimed at monitoring and preventing unwanted events as well as designing remediation measures.

### Skills acquired

The graduate will have the knowledge to plan and carry out the investigations and participate to the design of the above mentioned engineering works. She/He will be able to plan and carry out investigations for the assessment of slope instabilities and suggest remediation and protection measures.

Concerning the sustainable use of the resources, the Engineering Geology curriculum trains geologists for the quantitative investigation, qualitative evaluation, intelligent management, and overall protection of water resources, providing for their restoration in case of contamination. The curriculum will furnish an advanced training on aquifer, aquitard, and aquiclude parameterization, as well as on groundwater flow in both porous and fissured materials. Groundwater flow modelling oriented at an optimal use of the resource, including its relationships with superficial waters and climatic forcing, will be a key topic of the degree. The behavior of organic compounds in groundwater will be investigated, too. Regarding contamination, problems related to both point and non-point sources will be addressed, considering their specificities, through state-of-the-art identification and remediation techniques, including numerical modelling. All these instruments are essential to design groundwater protection and remediation measures at different scales, and to perform environmental risk analyses. The curriculum will provide the know-how for designing groundwater collection and abstraction systems, and organizing optimal groundwater monitoring networks, in respect of the existing legislation.

The graduate will have the knowledge to plan and carry out the appropriate investigations to assess quantity and quality of water resources, to map with modern information technology instruments their distribution and vulnerability to contamination, to design groundwater collection and abstraction systems, and to set-up groundwater monitoring networks with special attention

<b>Further elective courses Curriculum-specific features Environmental Geology, Engineering Geology and Hydrogeology</b>		
<b>The student will have to choose three of the following courses:</b>		
Applied Geomorphology and Laboratory	9	GEO/04
Geotechnical and Hydrogeological Survey and Laboratory	9	GEO/05
Groundwater Exploration and Management with Laboratory	9	GEO/05
Slope Stability and Stabilization Methods	9	GEO/05
<b>The student will have to choose two of the following courses:</b>		
Geographic Information System	6	(5) GEO/05, (1) ICAR/06
Geotechnics	6	ICAR/07
Groundwater Modelling	6	GEO/05
Hydrostratigraphy and Aquifer Sedimentology	6	GEO/02
course not active for the a.y. 2024-25		
Water Quality and Remediation Techniques	6	GEO/05

## CURRICULUM: [F97-D] Geology of mineral resources and geomaterials

### Qualifying Training Objectives

## Learning Objectives

The main objectives of the curriculum are the education and training of graduates in managing projects dealing with: 1) geological mapping of crystalline basement s.l., with particular interest on the evaluation of the economic resources and related geological risks; 2) determination of the properties of minerals and rocks and the applications in civil engineering; 3) evaluation of the environmental effects of the extraction and transformation processes of mineral georesources; 4) the supply of mineral resources and waste disposals, including radioactive ones; 5) the use of mineral resources in the industrial world bearing in mind the fast technological evolution and the needs of new materials; 6) research and development of new lithoid materials in the ceramic field; 7) fundamental and basic research on processes acting within the Earth's interior and planetary evolution.

## Skills acquired

### Expected Learning Outcomes

The curriculum aims to provide an effective study method and tools for understanding the geological, chemical and physical properties of minerals and rocks, as well as complex transformation processes involving natural materials during their use in industrial production cycles.

The curriculum is based on three fundamental teachings on the methodological bases and analytical techniques peculiar to the study of minerals, rocks and geological fluids, which are then connected to a wide range of geological disciplines, starting from the collection of field data to laboratory research. Particular attention is paid to the learning of instrumental and experimental methods, profiting of the wide laboratory facilities, which includes scanning and transmission electron microscopes, X-ray diffractometers, spectrometers for chemical and micro-chemical determinations, high pressure and/or high temperature experimental laboratory and apparatus for the determination of the petrophysical characteristics of rocks. The quantitative study approach is completed by the application of analytical and numerical models for solving both fundamental and applied problems.

<b><i>Further elective courses Curriculum-specific features Geology of mineral resources and geomaterials</i></b>		
<b>The student will have to choose three of the following courses:</b>		
Analytical Geochemistry and Laboratory	9	GEO/08
Applied Mineralogy and Laboratory	9	GEO/09
Crystallography and Laboratory	9	GEO/06
Petrology and Laboratory	9	GEO/07
<b>The student will have to choose two of the following courses:</b>		
Applied Geochemistry	6	GEO/08
Applied Petrography	6	GEO/07
Metallogenesis and Ore Minerals	6	GEO/09
Mineral Thermodynamics	6	GEO/06
Ore Deposits and Sustainability	6	GEO/09

## ***CURRICULUM: [F97-E] Sedimentary Geology and Environmental Changes***

<b><i>Further elective courses Curriculum-specific features Sedimentary Geology and Environmental Changes</i></b>		
<b>The student will have to choose three of the following courses:</b>		
Integrated Stratigraphy: Principles and Laboratory	9	GEO/02
Micropaleontology and Laboratory	9	GEO/01
Sedimentary Basins: Processes and Evolution and Laboratory	9	GEO/02
Sedimentology and Laboratory	9	GEO/02
<b>The student will have to choose two of the following courses:</b>		
Biostratigraphy <i>course active for the a.y. 2024-25</i>	6	GEO/01
Marine Geology <i>course active for the a.y. 2024-25</i>	6	GEO/01
Paleontology and Paleoenvironments <i>course not active for the a.y. 2024-25</i>	6	GEO/01
Regional Stratigraphy <i>course not active for the a.y. 2024-25</i>	6	(3) GEO/02, (3) GEO/01
Sedimentary Rock Diagenesis and Environmental Record <i>course not active for the a.y. 2024-25</i>	6	GEO/02
Subsurface Sedimentary System for the Energy Transition <i>course not active for the a.y. 2024-25</i>	6	GEO/02

## ***CURRICULUM: [F97-F] Geodynamics of Active Margins and Applications***

<b><i>Further elective courses Curriculum-specific features Geodynamics of Active Margins and Applications</i></b>		
<b>The student will have to choose three of the following courses:</b>		
Geodynamics and Laboratory	9	GEO/03
Numerical Modelling of Geodynamic Processes and Laboratory	9	GEO/10
Seismic and Wave Field Exploration and Laboratory	9	GEO/11
Structural Analysis II and Laboratory	9	GEO/03
<b>The student will have to choose two of the following courses:</b>		

Advanced Mineralogy and Crystal Physics	6	GEO/06
Basement Geology <i>course active for the a.y. 2024-25</i>	6	GEO/03
Geochronology and crustal Evolution	6	GEO/08
Geophysical Fluid Dynamics <i>course active for the a.y. 2024-25</i>	6	GEO/12
Regional Geology <i>course active for the a.y. 2024-25</i>	6	GEO/03

## ***COURSE PROGRESSION REQUIREMENTS***

There are no preparatory courses between the teachings.