UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2018/19
MASTER DEGREE
Earth Sciences (Classe LM-74)
Enrolled from 2009/2010 academic year

HEADING

Degree classification - Denomination and code:	LM-74 Geology
Degree title:	Dottore Magistrale
Curricula currently available:	Sedimentary basins and energetic resources / Geology applied to the territory, environment and hydrologic / Geophysics and structural geology with applications / Geology of mineral resources and geomaterials
Length of course:	2 years
Credits required for admission:	180
Total number of credits required to complete programme:	120
Years of course currently available:	1st , 2nd
Access procedures:	Open, subject to completion of self-assessment test prior to enrolment
Course code:	F97

PERSONS/ROLES

Head of Study Programme

Prof Massimo Tiepolo

Tutors - Faculty

Prof.ssa Tiziana Apuani, Prof. Fabrizio Berra, Prof.ssa Patrizia Fumagalli, Prof.ssa M. Iole Spalla, Prof.ssa Anna Maria Marotta.

Degree Course website

http://www.ccdgeo.unimi.it

Via Luigi Mangiagalli, 34 (piano terra) Ricevimento studenti: vedi sito. http://www.ccdgeo.unimi.it Email: cclsg@unimi.it

Via Botticelli, 23 Quando disponibile o su appuntamento. Email: massimo.tiepolo@unimi.it

Via Celoria, 22/26 Phone numero a pagamento (attivo dal lunedì al venerdì dalle ore 09.00 alle ore 17.00) 199188128 Orario di ricevimento al pubblico: http://www.unimi.it/studenti/segreterie/773.htm

www.unimi.it (scegli la Statale) www.unimi.infostudente.it

CHARACTERISTICS OF DEGREE PROGRAMME

General and specific learning objectives

The Master course forms geologists educated in various sectors of Earth Sciences offering opportunities of scientific development and of employment both in public and private fields. This degree provides theoretic and practical abilities based also on participation in field and laboratory activities, stages and novitiates, research stages in public and private institutions, national or international.

Some of the subjects offer nowadays solid professional opportunities: (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 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 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 archeological and cultural sites. (5) Field syrveys and direct/indirect prospecting for the parametrisation of technical properties and behavior of soils and rocks for wide and small scale engineering plans. (6) Exploration, exploitment, 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) Carachterisation and forestalling of natural hazards for territorial management.

During the Master in "Scienze della Terra" students will acquire theoretical, experimental and practical knowledge in various disciplines of Earth Sciences and widen their bases in chemistry, physics and mathematics, specialised and affine disciplines, as agronomy, engineering and others. They will analyse complexities of natural processes, transformations of natural resources, human-induced impacts, and propose solutions on the base of analytical techniques, field mapping methods, and

construction of interpretative models. They will properly transfer analytical results into interpretations, using modern softwares.

Scope of the Master is forming Geologists able to: (a) analyse evolutionary processes of geologic systems and obtain models adaptable to engineering appliaction; (b) develop basic and applied geological research of use for different sectors of private and public employment, both in academy and industry; (c) recognition and forecats, at medium and long term, effects of the interaction between various geologic processes, human impacts, global climatic changes, intervention on reclamation and conservation of the quality of complex natural systems, individuation of 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 analogic materials, and in similar public institutions, by running analytical laboratories, planning and executing measurements, in accordance with research and development plans, quality controls, in acccordance with law, or by industrial production processing; (e) operate slf-sufficiently in the professional activities, or employment with public and private companies or State organisations.

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

Professional profile and employment opportunities

Earth Science Master graduates are formed to perform the Geologist authonomous 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 opportuninties 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 listed within category 2 ISTAT (2.1.1.5; geologists, geophysicists and other related professions) are the following:

- Field mapping, updating of geolgical, technical and thematic maps;
- Planning, performing and interpretation of geophysical and geological investigations for civil engineering; prospecting and carachterisation of mineral, water end energy resources, environmental monitoring;
- Modeling of geologic processes for the analysis of slope instability, underground water circulation and pollutors 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 geotehcnical laboratories;
- Territorial planning of hazardous sites and hydrogeological protection systems;
- Environmental monitoring for protection of water resources, reclamation and de-pollutioning of acquifers and sites, waste management;
- Control of industrial quality, tecnological use of geomaterials for mecnanical, 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.

EXPERIENCE OF STUDY ABROAD AS PART OF THE TRAINING PROGRAM

The University of Milan supports the international mobility of its students, offering them the opportunity to spend periods of study and training abroad, a unique opportunity to enrich their curriculum in an international context.

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 apprentiships 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 apprentiships 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

To gain access to mobility programs for study purposes, lasting 3-12 months, the enrolled students of the University of Milan must attend a public selection that starts usually around the month of February each year through the presentation of specific competition announcements, which contain information on available destinations, respective duration of the mobility, requirements and deadlines for submitting the online application.

The selection, aimed at evaluating the proposed study abroad program of the candidate, knowledge of a foreign language, especially when this is a preferential requirement, and the motivations behind the request, is performed by specially constituted commissions.

Each year, before the expiry of the competition announcements, the University organises information sessions for the specific study course or groups of study courses, in order to illustrate to students the opportunities and participation rules.

To finance stays abroad under the Erasmus + program, the European Union assigns to the selected students a scholarship that - while not covering the full cost of living abroad - is a useful contribution for additional costs as travel costs or greater cost of living in the country of destination.

The monthly amount of the communitarian scholarship is established annually at national level; additional contributions may be provided to students with disabilities.

In order to enable students in economic disadvantaged conditions to participate in Erasmus+ program, the University of Milan assigns further additional contributions; amount of this contributions and criteria for assigning them are established from year to year.

The University of Milan promotes the linguistic preparation of students selected for mobility programs, organising every year intensive courses in the following languages: English, French, German and Spanish.

The University in order to facilitate the organisation of the stay abroad and to guide students in choosing their destination offers a specific support service.

More information in Italian are available on www.unimi.it > Studenti > Studiare all¿estero > Erasmus+

For assistance please contact:
Ufficio Accordi e relazioni internazionali
via Festa del Perdono 7 (ground floor)
Tel. 02 503 13501-12589-13495-13502
Fax 02 503 13503
E-mail: mobility.out@unimi.it
Desk opening hour: Monday-friday 9 - 12

1st COURSE YEAR Core/compulsory courses/activities common to all curricula		
Learning activity	**Ects**	**Sector**
Geology	6	(6) GEO/02, (6) GEO/03
Mineral Resources and Geomaterials	6	(6) GEO/07, (6) GEO/09
Physics of Earth's Interior	6	GEO/10
Technical Geology	6	GEO/05
Total compulsory credits	24	

2nd COURSE YEAR Core/compulsory courses/activities common to all curricula		
Learning activity	**Ects**	**Sector**

English II		3	L-LIN/12
	Total compulsory credits	3	

COURSE YEAR UNDEFINED Core/compulsory courses/activities common to all curricula		
Learning activity	**Ects**	**Sector**
Trainig Stage	6	NA
Total compulsory credits	6	

Further elective courses common to all curricula		
Environmental Geochemistry	6	GEO/08
Groundwater Modelling	6	GEO/05
Isotope Geochemistry and Geochronology	6	GEO/08
Mineral Physics	6	GEO/06
Subsurface Stratigraphy	6	GEO/02

End of course requirements common to all curricula		
Final Dissertation	30	ND
Total compulsory credits	30	

ACTIVE CURRICULA LIST

Sedimentary basins and energetic resources Course years currently available: 1st , 2nd
Geology applied to the territory, environment and hydrologic Course years currently available: 1st , 2nd
Geophysics and structural geology with applications Course years currently available: 1st , 2nd
Geology of mineral resources and geomaterials Course years currently available: 1st , 2nd

CURRICULUM: [F97-A] Sedimentary basins and energetic resources

1st COURSE YEAR Core/compulsory courses/activities Curriculum-specific features Sedimentary basins and energetic resources		
Learning activity	**Ects**	**Sector**
Regional Stratigraphy	9	GEO/02
Sedimentolgy and Laboratory	9	GEO/02
Total compulsory credits	18	

2nd COURSE YEAR Elective courses Curriculum-specific elective courses for Sedimentary basins and energetic resources		
Basin Analysis, Hidrocarbon Geology and Practicals	9	GEO/02
Micropaleontolgy and Laboratory	9	GEO/01

Further elective courses Curriculum-specific features Sedimentary basins and energetic resources		
Biostratigraphy	6	GEO/01
Complements of Paleontology	6	GEO/01
Diagenesis and Geochemistry	6	GEO/02
Geophysical Well Log and Physical Properties	6	GEO/11
Marine Geology Exploration and Georesources	6	GEO/01
Regional Stratigraphy	6	(6) GEO/02, (6) GEO/01
Seismic Exploration	6	GEO/11

CURRICULUM: [F97-B] Geology applied to the territory, environment and hydrologic

1st COURSE YEAR Core/compulsory courses/activities Curriculum-specific features Geology applied to the territory, environment and hydrologic		
Learning activity	**Ects**	**Sector**
Applied Geomorphology	6	GEO/04
Field Hydrogeology and Engineering Geology with laboratoty	9	GEO/05
Groundwater Exploration and Management with Laboratory	9	GEO/05
Total compulsory credits	24	

Further elective courses Curriculum-specific features Geology applied to the territory, environment and hydrologic		
Geotechnics and Laboratory	9	ICAR/07
Hydrostratigraphy and Aquifer Sedimentology with Practicals	9	GEO/02
Building Science	6	ICAR/07
Geographical Information System	6	(6) GEO/05, (6) ICAR/06
Rock Mechanics and Slope Stability	6	(6) GEO/05, (6) ICAR/07

Shallow Depth Geophysics	6	GEO/11
Water Quality and Remediaton Techniques	6	GEO/05

CURRICULUM: [F97-C] Geophysics and structural geology with applications

Further elective courses Curriculum-specific features Geophysics and structural geology with applications		
Advanced Seismology	9	GEO/10
Basement Geology and Laboratory	9	GEO/03
Geodynamics and Laboratory	9	GEO/03
Geophysical Fluid Dynamics and Laboratory	9	GEO/12
Seismic Exploration	6	GEO/11
Structural Analysis II and Laboratory	9	GEO/03
Mathematical Methods in Geophysics	6	GEO/10
Numerical Modelling of Geodynamic Processes	6	GEO/10
Regional Geology	6	GEO/03
Shallow Depth Geophysics	6	GEO/11

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

1st COURSE YEAR Core/compulsory courses/activities Curriculum-specific features Geology of mineral resources and geomaterials		
Learning activity	**Ects**	**Sector**
Crystallography with LAB	9	GEO/06
Petrology and Laboratory	9	GEO/07
Rocks, Minerals and Fluids Analysis and practicals	9	GEO/08
Total compulsory credits	27	

Further elective courses Curriculum-specific features Geology of mineral resources and geomaterials		
Applied Mineralogy	6	GEO/09
Applied Petrology	6	GEO/09
Geothermal Energy	6	(3) GEO/05, (3) GEO/09
Ore Geology and Mineral Prospecting	6	GEO/09
Ore Petrography and Evvironmental Evaluation of ore Minerals	6	GEO/09