



UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2023/24
BACHELOR
Geological Sciences (Classe L-34)
enrolled from 2014-2015 academic year

HEADING

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

PERSONS/ROLES

Head of Study Programme

Prof. Massimo Tiepolo

Degree Course Coordinator

Prof Massimo Tiepolo

Tutors - Faculty

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.

Docenti Tutor, e per la compilazione dei piani di studio:

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

Prof.ssa Tiziana Apuani, (ambito geologico applicativo - geomorfologico);

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

Prof.ssa Anna Maria Marotta (ambito geofisico).

Degree Course website

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

Via Botticelli, 23 al II piano riceve quando disponibile o su appuntamento via mail Email: massimo.tiepolo@unimi.it

Course management

Ufficio per la Didattica, per info scrivere a: cclsg@unimi.it <https://www.unimi.it/it/corsi/corsi-di-laurea/scienze-geologiche>
Email: cclsg@unimi.it

Libraries

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

Student registrar

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

CHARACTERISTICS OF DEGREE PROGRAMME

General and specific learning objectives

The general objectives of the degree course in Geological Sciences are to offer: a solid basic knowledge of the main sectors of Geological Sciences, a personal capacity for choice and action in the methods and techniques of the related fields of scientific investigation, an adequate preparation for address and assimilate forthcoming scientific and technological advances and knowledge to properly address the fundamental processes of the exogenous and endogenous Earth system.

The degree course aims to define, characterize and understand current and past events, predict evolutionary scenarios and plan human interventions. Geologists read the records of the Earth's evolution imprinted in rocks and fossils, compare them with what is happening before our eyes and plan the human impact on Nature, since any intervention on the territory involves a modification of the superficial functioning of the Earth System.

The course aims to train graduates with:

- good knowledge of fundamentals of Mathematics, Physics, Chemistry, Computer Science which then allow to quantify and interpret the geological processes and the structure of the Earth;

- solid basic preparation in all sectors of Geological Sciences in order to be able to recognize and interpret the natural mechanisms that characterize the geological environment;
- analytical skills in field geology, aimed at basic geological cartography in various territories;
- laboratory analytical skills, aimed at the characterization of geomaterials and their behavior;
- technical skills for the use of tools for basic geological surveys;
- ability to collect and process data with general and specific computer methods of Geological Sciences;
- ability to apply mathematical models able to simulate geophysical and geological processes.

Expected learning outcomes

Graduates in Geological Sciences must be identified: for a solid ability to read the territory, in terms of superficial and deep geological structure; for the ability to understand the modalities and the temporal development of the natural mechanisms that influence the evolution of the territory; for the ability to process and translate the data collected in terms of modern cartographic representation; for the ability to recognize the evolution of the geological environment, also in relation to the incidence of anthropic activity.

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

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

The verification of the acquisition of the knowledge and understanding listed above will take place by passing the teaching exams relating to the basic and characterizing areas, and through laboratory and field exercises.

- Ability to apply knowledge and understanding (applying knowledge and understanding) - ability to accurately record and describe natural materials; to independently analyze geomaterials in the field and in the laboratory, to describe, analyse, document and report the results. Ability to apply quantitative methods with a professional approach to geological problems in the broadest sense. Ability to operate using computer systems.

The verification of the acquisition of the ability to apply the knowledge and understanding listed above will take place through the integration of tests in the field and in the laboratory with exercises in the application of quantitative methods. The drafting of written papers and the passing of practical tests will be evaluated in the context of the exams.

- Making judgments - assessment of the complexities of the natural environment; interest in quality; recognize the responsibilities of Earth Sciences and its role in society, such as spatial planning and the use and conservation of its resources.

The verification of the acquisition of independent judgment will take place by evaluating the acquisition by the student during the examination of the ethical principles and behavior towards nature and the environment. The ability to estimate the quality and reliability of groups of geological data aimed at the definition of geological risk, the protection and correct use of natural resources will be verified.

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

These results will be achieved and verified in particular through the preparation and evaluation of the final exam, normally connected to the training internship activity carried out, which must be written by the student at the end of the course of study and presented orally to a special commission for the final exam. The student will also have to prepare papers in digital form through the use of commonly used software aimed at promoting concise and effective communication.

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

The verification of the acquisition of learning skills will take place above all by passing the examination tests for third year courses and by drafting the papers for the final exam which normally require the student to consult databases and scientific bibliography in foreign language as well as personal study of topics not covered in the common teaching activities.

Professional profile and employment opportunities

Geological Science graduates will be able to embark on careers in which geologists hold specific, purely operational skills, as defined by legislation (Presidential Decree of the Republic no. 328 dated 5 June 2001), relating to the capture and representation of field and laboratory data using direct and indirect methods. The professional role of geologist is officially recognised by Italy's national organisation of geologists, through membership in its B category (Junior Geologist) after passing a state exam.

Some examples of the various careers open to graduates are outlined below. They include academic, scientific and highly specialist professions, within the scope of implementation and technical-operational support commensurate with the knowledge acquired on the course.

- Updating and amending geological maps, both technically and thematically.
- Operational support during geophysical and geological surveys aimed at carrying out civil engineering works, prospecting and characterising energy, mineral and water resources, and monitoring the environment.
- Land planning; operations for hydrogeological setting and protection, in addition to safeguarding and containing risk areas.
- Environmental control to safeguard water resources, the remediation and decontamination of aquifers, polluted sites and the disposal of waste.
- Industrial quality control; the technological use of geomaterials in the engineering, chemical and electronics industries;

techniques for using decorative stone materials, gemmology.

- Protection of cultural and palaeontological heritage, preservation of historic sites, geoarchaeology.

Initial knowledge required

Admission requirements:

Admission to the Bachelor's degree programme in Geological Sciences is open, subject to a mandatory, though non-selective, assessment test before enrolment.

Applicants to the degree programme in Geological Sciences must hold an upper secondary-school diploma or an equivalent qualification obtained abroad.

Admission assessment:

Candidates will have to sit for the TOLC (Test Online CISIA) at the University of Milan or any other member university of CISIA (Consortium of Inter-University Integrated Access Systems). Register to the TOLC test on the CISIA website (www.cisiaonline.it).

The tests providing access to the degree programme in Geological Sciences are: TOLC-B, TOLC-S, TOLC-I.

Only after taking one of these tests, will you be able to enrol, **WHATEVER THE RESULT**:

TOLC-B divided into 4 sections: Basic mathematics (20 questions - 50 minutes), Biology (10 questions - 20 minutes), Physics (10 questions - 20 minutes), Chemistry (10 questions - 20 minutes).

TOLC-S, divided into 4 sections: Basic mathematics (20 questions - 50 minutes), Reasoning and Problems (10 questions - 20 minutes), Reading comprehension (10 questions - 20 minutes), Basic sciences (chemistry, physics and geology - 10 questions - 20 minutes).

TOLC-I divided into 4 sections: Mathematics (20 questions - 50 minutes), Logic (10 questions - 20 minutes), Science (10 questions - 20 minutes), Verbal comprehension (10 questions - 20 minutes).

Each question has 5 answer options, of which only one is correct.

Score: +1 for a correct answer, -0.25 for a wrong answer, 0 for a no answer.

Each TOLC test includes an additional English section, consisting of 30 questions to be answered in 15 minutes. This section does not count toward the overall test score.

Test structure and topics, registration procedures, dates, deadlines and any other useful information are set out in the call for applications.

See also <https://www.unimi.it/en/study/bachelor-and-master-study/degree-programme-enrolment/enrolment-first-degree-programme>

Candidates are required to show up with a valid ID on the date and time shown on the TOLC registration receipt.

Admission of transfer or graduate students:

Transfer students from a degree programme of the University of Milan, or another university, and graduate students will be waived from the test requirement only if admitted to years subsequent to Year I.

To this end, they will have to submit a specific request for prior assessment of their academic records using the online service as shown in the call for applications.

These candidates must provide a full transcript of records (listing exams, subject areas, credits, grades) and attach the course syllabi. For more details, please refer to the call for applications.

For the deadlines for applying for academic records assessments, please refer to the call.

The outcome will be notified via e-mail.

Students admitted to the first year will be required to take the test.

Additional learning requirements (OFA) and remedial activities:

Students who have not achieved at least 10 points in the Mathematics module will have to fulfil additional learning requirements (OFA).

Students with additional learning requirements will have to carry out remedial activities organised by the University in the period October-December, and then take a test to prove they have filled their gaps. Otherwise, they may not take any second-year exams before passing the Mathematics I and Computer Science exams.

Learn more at <https://geologia.cdl.unimi.it/it/studiare/le-matricole>

Compulsory attendance

In addition to required field training, attendance is mandatory for practical laboratories. Attendance is essential for students to learn and pass exams.

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 awards 5 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://geologia.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

For the student to be admitted to the final exam, they must: a) have earned 176 CFU, including 3 CFU for proficiency in a foreign language; b) have written a final paper. By writing and defending the final paper, the student may earn an additional 4 credits.

The final exam consists in the discussion of an essay written by the student, covering:

a field test and/or laboratory measurements for basic geological investigation of geomaterials and/or the soil; or computer-based processing of geological data as well as simulations of geological and geophysical processes using mathematical models; or processing of geological data collected during the internship.

The final exam will award a number of CFU in line with thesis work. The paper may be in Italian or English.

Admission to the final exam:

- submit the APPLICATION FOR FINAL PAPER/THESIS to cclsg@unimi.it, using the form available at <https://geologia.cdl.unimi.it/it/avvisi>, well before starting thesis work;
- submit an online GRADUATION APPLICATION to the Student Registrar within the deadline
- deliver a soft copy to the board on the day of thesis defence and upload a thesis summary to www.riassuntitesi.scienzemfn.unimi.it by the dates notified by Student Registrars.

The exam board will award the following score points, which will count towards the final degree mark:

- from 0 to 3 points for internship work;
- from 0 to 2 points for the assessment of compulsory first- and second-year academic activities;
- from 0 to 6 points for thesis defence (assessment of the final paper).

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

Campus

Teaching infrastructures for the Bachelor's degree programme in Geological Sciences are located in the three structures of the Department of Earth Sciences "A. Desio". The main teaching areas are: Geology and Paleontology (via Mangiagalli, 34); Mineralogy, Petrography, Geochemistry and Mineral Fields (via Botticelli, 23); Geophysics (via Cicognara, 7). Exercises for Minerals and Rocks Laboratory, Introduction to Geology and Laboratory (including Geological Cartography), Paleontology and Laboratory take place in dedicated teaching laboratories.

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, rocks, thin sections of rocks, topographic and geological maps are available in classrooms and in 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 (<http://www.dipterra.unimi.it/ecm/home/laboratori>) help provide an introduction to 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, mechanics of rocks, sedimentology, X-ray diffraction, X-ray spectrometry, absorption and emission spectrophotometry, visible and infrared spectroscopy.

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

In order to obtain their degree, students must be proficient in English at a B1 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 B1 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/297/>). 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 December 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 B1, B2, or higher level.

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

Computer skills

Students who are supposed to earn 3 credits (CFU) for basic computer skills, as provided by their degree programme, have to attend the 'Computer Science Course 3CFU'.

It is a blended course with a compulsory final exam.

The first exam session is scheduled for January, and more will follow according to a calendar to be made available on the course delivery platform.

The 'Computer Science Course 3CFU' course is managed by the CTU - Teaching and Learning Innovation and Multimedia Technology Centre.

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, 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

Student Desk booking through InformaStudenti

1st COURSE YEAR Core/compulsory courses/activities common		
Learning activity	Ects	Sector
Chemistry and Laboratory	9	CHIM/03
English assessment B1 (3 ECTS)	3	NN
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

2nd COURSE YEAR Core/compulsory courses/activities common

Learning activity	Ects	Sector
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

3rd COURSE YEAR Core/compulsory courses/activities common

Learning activity	Ects	Sector
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

Elective courses

The student must also acquire 12 credits in educational activities freely chosen from those activated by the University provided they are consistent with the study plan, submitted to the judgment of the competent commission of the Academic Board of the study course.

For the 2023/2024 academic year, the Academic Board of the study program provides for the activation of the following courses for free choice:

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
Raw Materials and Industry	6	GEO/09
Structural Analysis I	6	GEO/03
Volcanology	6	GEO/08

End of course requirements

Final Dissertation	4	NN
Training <i>The student must acquire 5 credits with an internship that can be internal (carried out in university laboratories), or external (carried out in research laboratories, companies or professional studios outside the University).</i>	5	GEO/04, GEO/01
	Total compulsory credits	9

COURSE PROGRESSION REQUIREMENTS

Prerequisites are recommended for the following courses:

Physics I on Physics II;

Mineralogy on Geochemistry.

Consult the following table for the compulsory preparatory courses.

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
	Mineralogy	Core/compulsory
Engineering Geology and Laboratory	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
	Structural Geology and Tectonics and Laboratory	Recommended
	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
Physics of the Earth and Laboratory	Physics I	Core/compulsory
Physics I	Mathematics I and Information Tecnology	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
	Petrography and Laboratory	Core/compulsory
	Structural Geology and Tectonics and Laboratory	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
	Petrography and Laboratory	Recommended
	Structural Geology and Tectonics and Laboratory	Recommended
	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	Petrography and Laboratory	Core/compulsory
	Sedimentary Geology and Laboratory	Core/compulsory
	Mineralogy and Lithology Practicals	Core/compulsory
	Mineralogy	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