

Faculty of Biological, Agronomic and Environmental Engineering

**BIR1130** Introduction to Earth sciences

[45h+30h exercises] 6 credits

This course is taught in the 2nd semester

Teacher(s): Joseph Dufey, Philippe Sonnet
Language: French
Level: First cycle

Aims

At the end of the course, the student will have acquired the knowledge every scientist should have about earth sciences, whatever its future specialisation. Basing on what he has learned about the functioning of the Earth as a system, the student will be able to develop reasoned approach toward its manifold consequences on our society: evolution of natural resources, environmental changes, prediction of natural risks, place of Life and Mankind in the history and evolution of the "space craft" we inhabit, etc.

Through to laboratory practical training, the student will know how to identify minerals and rocks, how to read a geological map and, after one half day of excursion in the field, how to apply a few elementary principles to the observation rock and their relationship with relief and land use.

For the student who chooses studies leading to the degree of Bioengineer, this course represents a first introduction to the environmental sciences as it explores the physical context for Life on Earth (vegetal, animal or human). He will find in the course, the practical trainings and in the field excursion, the basic pieces of information which are crucial for apprehending the physical context of his practical training placement.

The student in chemistry, physics, mathematics, biology and geography will be able to acquire, through the various topics which will be developed during the course, a first idea about some of the methods of scientific reasoning that are specific to geology compared to other scientific disciplines. Whatever specialisation the student chooses, the course will increase the student's awareness of several domains in which he might play a role during his professional life.

Main themes

The course views Earth as a system of interacting components which, as scientists increasingly realize, is subject to interference with mankind. Throughout the course, these interacting components put into the context of plate tectonics, which serves as framework connecting geologic phenomena.

The course consists in three activities:

1. Lectures in classes, based on the textbook " Understanding Earth ", 4th edition, by F. Press, R. Siever, J. Grotzinger and Th. Jordan, ed. Freeman & Co. Lectures follow the outline of the textbook and use its illustrations.
2. Practical lab work of mineral and rock identification, topographical and geological map interpretation.
3. One field trip (half day) to observe rocks outcrops as well as to introduce to various stratigraphic, geomorphologic, pedologic and cartographic aspects.

The course includes the following subjects (chapter numbering is that of the textbook and missing chapter numbers correspond to chapters of the textbook that will not be seen during the course).

- Chapitre 1 : Building of planet Earth
- Chapitre 2 : Plate tectonics, the unifying theory
- Chapitre 3 : Minerals, building blocks of rocks
- Chapitre 4 : Rocks, records of geologic processes
- Chapitre 5 : Igneous rocks, solids from melts
- Chapitre 6 : Volcanism
- Chapitre 7 : Weathering and erosion
- Chapitre 8 : Sediments and sedimentary rocks
- Chapitre 10 : The rock record and the geologic time scale
- Chapitre 12 : Mass wasting
- Chapitre 13 : The hydrologic cycle and groundwater
- Chapitre 14 : Streams, transport to the oceans
- Chapitre 15 : Winds and deserts
- Chapitre 16 : Glaciers, the work of ice.
- Chapitre 19 : Earthquakes
- Chapitre 20 : The evolution of the continents
- Chapitre 21 : Exploring Earth's interior

The course is taking place in two parts. The first part, given during the first half of the second quadrimester includes chapters 1 to 6 and 19 to 20. The second part, during the second half of the second quadrimester includes chapters 7 to 16. Students undertaking a science bachelor in physics and mathematics do not attend the second part of the course. They are exempted from participating to the practical laboratory exercises by must take part to the field trip. The course can also be chosen in part or as a whole by students from another faculty as part of their minor, since it is a course intended to provide a general scientific culture open to any student having completed its secondary studies.

Content and teaching methods

The course includes the following subjects (chapter numbering is that of the textbook and missing chapter numbers correspond to chapters of the textbook that will not be used for the course).

- Chapter 1 : Building planet Earth
- Chapter 2 : Plate tectonics: the unifying theory
- Chapter 3 : Minerals: building blocks of rocks
- Chapter 4 : Rocks: records of geologic processes
- Chapter 5 : Igneous rocks: solids from melts
- Chapter 6 : Volcanism
- Chapter 7 : Weathering and erosion
- Chapter 8 : Sediments and sedimentary rocks
- Chapter 10 : The rock record and the geologic time scale
- Chapter 12 : Mass wasting
- Chapter 13 : The hydrologic cycle and groundwater
- Chapter 14 : Streams, transport to the oceans
- Chapter 15 : Winds and deserts
- Chapter 16 : Glaciers: the work of ice
- Chapter 19 : Earthquakes
- Chapter 20 : The evolution of the continents
- Chapter 21 : Exploring Earth's interior

The course will take place in two parts. The first part, given during the first half of the second quadrimester includes chapters 1-6, 19 and 20. The second part, during the second half of the second quadrimester includes chapters 7 to 16. Students undertaking a bachelor of science degree in physics and mathematics are not required to attend the second part of the course. They are exempted from participating to the practical laboratory exercises by must participate in the field trip. The course can also be chosen, part I or part I and II, by students from another faculty as part of their minor since it is designed to provide a general scientific culture suitable for any student having completed his/her secondary studies.

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

Teaching aids

Students have to acquire the textbook " Understanding Earth ". They are also entitled to acquire the French translation of the textbook made by Prof. Ph. Sonnet et J. Dufey. This translation is partial and only covers the most important parts of the chapters which are taught during the course. Only students having acquired the textbook are entitled to have the French translation.

Students have access to three Websites, via the iCampus Webpage:

1. The Website by the editor of the textbook " Understanding Earth ", which contains animations, interactive exercises, online quizzes and other learning aids.
2. The Website created by Prof. Ph. Sonnet and J. Dufey, which includes, among others, the slides show presented during the courses, an introduction to the geology of Belgium, a set of pictures of the geological and geomorphological features observed during the field trip as well as additional animations.

During practical training, lab notes will be provided to the students: they contain, among others, the determination properties for identifying the most common rocks and minerals.

Grading

The practical exercises are graded and they make up for 5/20 points of the final grade. The grade of the practical exercises will be based on a practical exam of consisting in rock and mineral identification (scheduled during the class period and not during the exam period), on assignments about cartography and on assistance to the field trip.

The exam of theory is a written exam. It comprises two parts: questions about the course and questions on geography.

The questions about the course represent 13 out of the 20 points of the final grade. They can be multiple choice or more open questions. For instance, the students might be asked to justify their answer, a definition may be asked, or the question might be based on a figure or a map from the textbook. For questions that are not multiple-choice, a wrong answer or no answer represent zero point.

The questions about geography represent 2 out of 20 points of the final note. There are 10 questions which consist in indicating on a blank world map with country limits (downloadable on the course Web site) such geographic features such as: countries, seas, oceans, islands, straits, peninsulas and main deserts, plateaus or regions. The necessary knowledge for this exercise should be acquired by the students through personal work, as it corresponds to general geographic culture.

Other credits in programs

ARCH12BA	Deuxième année de bachelier en sciences de l'ingénieur, orientation ingénieur civil architecte	(6 credits)	
BIOL11BA	Première année de bachelier en sciences biologiques	(6 credits)	Mandatory
BIR11BA	Première année de bachelier en sciences de l'ingénieur, orientation bioingénieur	(6 credits)	Mandatory
CHIM11BA	Première année de bachelier en sciences chimiques	(6 credits)	Mandatory
FSA12BA	Deuxième année de bachelier en sciences de l'ingénieur, orientation ingénieur civil	(6 credits)	
GEOG11BA	Première année de bachelier en sciences géographiques	(6 credits)	Mandatory
SINF12BA	Deuxième année d'études de bachelier en sciences informatiques	(6 credits)	