

Structural Geology with Exercises on Geological Maps (C000120)

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

Course size (nominal values; actual values may depend on programme)
Credits 5.0 Study time 150 h Contact hrs 62.5 h

Course offerings and teaching methods in academic year 2020-2021

A (semester 2)	Dutch	Gent	seminar: coached exercises	35.0 h
			lecture	27.5 h

Lecturers in academic year 2020-2021

De Batist, Marc WE13 lecturer-in-charge

Offered in the following programmes in 2020-2021

	crdts	offering
Bachelor of Science in Geology	5	A
Preparatory Course Master of Science in Geology	5	A

Teaching languages

Dutch

Keywords

Geological maps, geometry, kinematics, dynamics, stress, strain, fault behavior, plastic behavior

Position of the course

In the part Structural Geology the student gets acquainted with the terminology and methods used in structural geology. It will bring him/her the principles and insights necessary to follow the courses Geology of Belgium, Geological mapping A and Geological Mapping B.

In the part Exercises on Geological Maps, the student will learn how to deduce the three-dimensional structure of rock bodies in the subsurface from geological maps and to draw basic geological maps and sections.

Contents

Part Structural Geology:

- Introduction
What is structural geology; Subsequent steps in structural-geological studies
- Rheology, stress and strain
Stress; Stress ellipsoid; Stress components; Stress matrix - stress tensor; Mean stress versus deviatoric stress; Rheological behaviour (elastic, plastic, viscous, brittle); Rheological behaviour of rocks in the Earth's crust.
- Geometrical analysis: Stereoplots
Geometrical analysis; Geometrical analysis: plane; Geometrical analysis: line; Geometrical analysis: Stereoplots.
- Definitions and geometries: Bedding
Bedding; Polarity indicators
- Definitions and geometries: Fractures
Fracture; Fracture surface; Deformation band; Fractures and deformation bands and fluid flow
- Definitions and geometries: Faults
Fault; Geometry and definitions; Sense of movement; Dip of the fault plane; Bedding separation; Special types; Fault plane versus fault zone; Displacement distribution; Fault propagation.
- Definitions and geometries: Folds
Fold; Geometry and definitions; Scale; Fold attitude and orientation; Fold geometry; Dip isogons and bed thickness; Continuity of the axial plane; Special types; Hinge

structures.

- Definitions and geometries: Fabric

Fabric; Foliation; Cleavage; Bedding cleavage; Pencil cleavage; Slaty cleavage; phyllitic cleavage; Schistosity; Crenulation cleavage; axial plane cleavage; Lineation; Intersection lineation; Boudinage and mullions; Stretching lineations.

- Kinematics

Deformation mechanisms; Folding and faulting mechanisms; Strain; Strain ellipsoïde; Pure shear versus simple shear; Strain analysis; Cleavage; Shear zones; bedding-parallel shortening; bedding-parallel extension; Kinematic criteria; Strain chronology.

- Dynamics

Stress analysis; Mohr Circle.

Deel Geologische Kaart oefeningen:

- Horizontal and dipping layers or rock bodies, spatial orientation and thickness, calculations on dipping strata, outcrop pattern, isopleth maps.
- Faults: definitions, components of movement and of separation, subdivisions, outcrop pattern.
- Folds: components, types, outcrop pattern, effect of faults on folded structures.
- Magmatic rocks: map image of intrusive, extrusive and pyroclastic rocks.
- Study of geological structures with stereonets using Wulff- and Schmidt-projections

Initial competences

Basic knowledge in General Geology and Geology of Belgium. Mathematics 1 & 2 (knowledge on 2 and 3 dimensional trigonometry), Physics (mechanics).

Final competences

- 1 To be able to recognise, measure and reproduce on stereoplots the major geological structures (folds, faults, lineations, cleavage, shear, etc.); analyze the kinematics and dynamics of the structures.
- 2 An insight in the geometric characteristics and cartographic expression of rock formations in geological structures.
- 3 To be able to use the stereographical projections for analyzing the structures.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture, seminar: coached exercises

Extra information on the teaching methods

Part structural geology: lectures and practical exercises (stereoplots).

Part exercises on geological maps: lectures supported by the projection of figures and maps; practical exercises in the interpretation and drawing of geological maps and sections, using simplified examples, with additional exercises for homework.

Teaching methods may need to be adjusted, should the COVID19 situation demand this.

Learning materials and price

Annually updated syllabus, ppt-handouts and maps.

Price: Syllabus and maps about 20 Euro.

References

- Fossen, H. (2016) Structural Geology. Cambridge Academic Press.
- Maltmann, A. (1998). Geological maps an introduction. John Wiley & Sons.
- Ramsay, J.G. & Huber, M.I. (1983). The techniques of modern structural geology: Volume 1: Strain analysis. Academic Press.
- Ramsay, J.G. & Huber, M.I. (1987). The techniques of modern structural geology: Volume 2: Folds and Fractures. Academic Press
- Ramsay, J.G. & Lisle, R.J. (2000). The techniques of modern structural geology: Volume 3: Applications of continuum mechanics in structural geology. Academic Press.
- Lisle, R. (1995). Geological structures and maps. Butterworth-Heinemann.
- Butler, B.C.M. & Bell, J.D. (1988). Interpretation of geological maps. Longman Earth Science Series.
- Platt, J.I. (1961). Elementary exercises upon geological maps. Thomas Murby & Co.
- Platt, J.I. (1961). Selected exercises upon geological maps. Thomas Murby & Co.

Course content-related study coaching

Possibility to ask questions on the lectures by email. Personal contact after appointment or during the practical exercises. Coaching by the lecturers and assistants during the practical exercises.

Evaluation methods

end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Written examination with open questions, assignment

Examination methods in case of periodic evaluation during the second examination period

Written examination with open questions, assignment

Examination methods in case of permanent evaluation

Assignment

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

Part Structural Geology:

Written examination (50 %) with open questions about theory. The form and content of the examination of both parts will be discussed at the end of the lectures.

Part Exercises on Geological Maps:

Permanent evaluation of exercises (25 %) and written examination on theory and practical exercises (analysis of a geological map and construction of a section) after the last exercises (25%). If successful for this part, the points for this part can be transferred to the second session, but not to the following year.

Calculation of the examination mark

Part Structural Geology:

Written examination (50 %)

Part Exercises on Geological Maps:

Permanent evaluation of exercises (25 %)

Written examination (25%)