GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Origin, Evolution and Modelling of Sedimentary Basins (COO3335)

Course size *(nominal values; actual values may depend on programme)*

Credits 6.0 **Study time 150 h**

Course offerings and teaching methods in academic year 2024-2025

A (semester 1)	English	Gent	lecture
			seminar

Lecturers in academic year 2024-2025

Wils, Katleen	WE13	lecturer-in-charge
Poort, Jeffrey	WE13	co-lecturer

Offered in the following programmes in 2024-2025	crdts	offering
Master of Science in Teaching in Science and Technology(main subject Geology)	6	A
Master of Science in Geology	6	A
Master of Science in Geology	6	A
Exchange programme in Geology (master's level)	6	A

Teaching languages

English

Keywords

Sedimentary basins, basin formation, basin evolution, burial history of sedimentary basins, subsidence, compaction, basin analysis, basin modelling

Position of the course

The aim of the course genesis and evolution of sedimentary basins is to provide the students with an overview of the different types of sedimentary basins in their plate-tectonic context and of the characteristics of these basins. Mechanisms of basin formation are discussed in detail, as well as the processes that determine the subsidence of basins and their thermal history. Attention is also given to the way in which the characteristics and parameters of the sedimentary basin fill can be used to reconstruct the basin history. These concepts will be illustrated by a number of case studies during the guided exercises. The course provides a general overview of the concepts and processes relevant to understand the origin and evolution of sedimentary basins. In a second part of the course, attention is given to the techniques that are used to mathematically analyze and model the formation and evolution of sedimentary basins.

Contents

Types of sedimentary basins in their plate-tectonic context
Stress and strain, heat conduction, gravity field, isostasy, rheology of rocks (refresher lecture)
Mechanisms of basin formation (lithospheric stretching, flexure, "strike-slip)
Subsidence and subsidence analysis
Thermal history
Mathematical modeling and modeling tools
Application of Finite Element Modeling (FEM) and Finite Difference Modeling (FDM) to basin analysis

Initial competences

Bachelor geology: the student has a basic knowledge in geology, sedimentology, stratigraphy and facies-analysis, physics and geophysics, mathematics.

Final competences

1 Comparison of the processes and concepts that lead to the origin of sedimentary basins.

2 Understanding the processes and concepts that determine the evolution of a sedimentary basin.
3 Independently performing a complete sedimentary basin analysis.
4 Distinguishing the formation history of different types of sedimentary basins.
5 Analysis of the evolution of different types of sedimentary basins.
6 Demonstrating the possibilities and limitations of basin modeling as a practical cost-effective exploration tool.

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

Seminar, Lecture

Extra information on the teaching methods

Seminar: guided excercise on different aspects of basin analysis and basin modelling

Study material

Type: Handouts

Name: Lecture material'
Indicative price: € 20
Optional: no
Additional information: Course notes and documantation, photocopies of relevant study material, references to text books and literature, software and data sets are made available for exercises.

References

P.A. Allen & J.R. Allen: Basin Analysis – Principles and Applications, Blackwell Publishing, 549 p., Second Edition, 2005, ISBN 0-632-05207-4
C.J. Busby & R.V. Ingersoll: Tectonics of Sedimentary Basins, Blackwell Science, 579 p., 1995, ISBN 0-86542-245-1
G. Einsele: Sedimentary Basins, Springer Verlag, 792 p., Second Edition, 2000, ISBN 3-540-66193-X
A.D. Miall: Principles of Sedimentary Basin Analysis, Springer Verlag, 490 p., 1984, ISBN 0-387-90941-9
A.B. Watts: Isostasy and flexure of the lithosphere. Cambridge University Press, 480 p., 2001, ISBN 0-521-00600-7
S.J. Farlow; Partial Differential Equations for Scientists and Engineers. Dover Publications, 414 p., 1993, ISBN 0-486-67620-X

K. McGuffie & A. Henderson-Sellers: A climate modelling primer. John Wiley and Sons Ltd, 296 p., 1996, ISBN 0-470-85751-X

Course content-related study coaching

Supervision of guided excercise by instructor or assistent.
Contact with instructor via Ufora. Personal contact with instructor on appointment.

Assessment moments

end-of-term assessment

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

Written assessment with open-ended questions

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

Written assessment with open-ended questions

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

PE: Questions testing both knowledge and insight in material presented in lectures and guided excercises.
Examination in the second examination period is possible.

Calculation of the examination mark

100 % PE