GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Cosmochemistry (C004162)

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

Credits 3.0 **Study time 90 h**

Course offerings and teaching methods in academic year 2024-2025

A (semester 2)	English	Gent	lecture

Lecturers in academic year 2024-2025

Goderis, Steven	WE06	lecturer-in-charge

Offered in the following programmes in 2024-2025	**crdts**	**offering**
Master of Science in Teaching in Science and Technology(main subject Chemistry)	3	A
Master of Science in Chemistry(main subject Analytical and Environmental Chemistry)	3	A

Teaching languages

English

Keywords

Solar System, extraterrestrial materials, isotopes and nuclear physics, space exploration, stellar nucleosynthesis, nebular and planetary processes, asteroids and comets, impact events, condensation and fractionation, planetary differentiation, radiometric dating, chronology, planet formation.

Position of the course

Elective course from the supplied list.

Contents

1. Introduction to cosmochemistry: definition, meteorites, stars, solar system abundances, isotopes and nuclear physics, space exploration, extraterrestrial life, relationship to other disciplines.
2. The Solar System and cosmic abundances: nuclides and elements as the building blocks of matter and life, origin of the elements, the Big Bang model, nucleosynthesis in stars, origin of the galaxy and galactic chemical evolution, elemental abundances in the Sun and in meteorites.
3. Meteorites as records of nebular and planetary processes: formation of the solar system, accretion (dust to planetary embryos), classification of meteorites, link to asteroids and comets, impact events and chronology of planetary surfaces.
4. Cosmochemical and geochemical fractionation: condensation, volatile element depletion, igneous processes, physical fractionation, oxidation/reduction, planetary differentiation, isotopic fractionation.
5. Chronology of the Solar System: Early Solar system, age of the Earth, the Moon and Mars, shock ages and impact histories, cosmic-ray exposure ages, terrestrial ages.

Initial competences

Accessible for students with a Bachelor of Science in Chemistry or Geology, with notions of analytical chemistry, isotope fractionation and nuclear physics, and basic geological knowledge.

Final competences

1 The students are capable of situating the research field of cosmochemistry, within its current-day interdisciplinary context.
2 The students are familiar with the materials studied and the current state-of-the-art analytical techniques applied in cosmochemistry,
3 The students can identify relevant research questions related to the field of

cosmochemistry and have notions of the present-day possibilities and limitations of cosmochemistry,

4 The students are aware of the relevance of cosmochemistry and space exploration to the society and can situate Earth within a dynamic Solar System and galaxy.

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

Extra information on the teaching methods

Lectures complemented with presentations by invited speakers, seminars/group discussions focusing on hot topics using relevant literature. The thematic can vary from year to year.

Study material

None

References

- McSween H. Y. and Huss G. R. Cosmochemistry. 2010. Cambridge University Press, Cambridge, UK. ISBN-13 978-0-521-87862-3.

A reference list is present in the lecture notes.

Course content-related study coaching

Assessment moments

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

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

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

Student participation/preparation during group discussion (25%) and oral examination after student presentation of a selected research topic (75%).

Calculation of the examination mark

Participation in group discussion 25%, oral examination after presentation by student 75%. In the case of the latter, the content and format (structure, lay-out, timing, presentation skills, etc.) of the presentation as well as the quality of the answers and relevance to the course material will be taken into account. Following the presentation, specific questions on topics seen during the theoretical classes need to be answered in an adequate manner by referring to the basic concepts of the course material and applying these to concrete scientific problems/questions.