GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2025-2026

Biotechnology in Metal Extraction and Recycling (I002924)

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

Credits 4.0 **Study time 120 h**

Course offerings in academic year 2026-2027

A (Year) English Gent

Lecturers in academic year 2026-2027

Hedrich, Sabrina FREIBE01 lecturer-in-charge

Offered in the following programmes in 2026-2027	crdts	offering
International Master of Science in Sustainable and Innovative Natural Resource Management	4	A

Teaching languages

English

Keywords

microbial life, metabolism, biohydrometallurgy, metal recovery

Position of the course

Contents

1. Microbial basics, cell structure, metabolism
2. Energy acquisition, redox reactions, microbial element cycling
3. Microbial habitats and biofilms, extremophiles
4. Biomining microorganisms, iron- and sulfur metabolizing acidophiles
5. Basics of bioleaching and biooxidation, mechanisms
6. Biomining technologies, stirred tank, heap and dump bioleaching, BIOX process
7. Bioleaching of primary and secondary resources, ores, technologies
8. Metal extraction from secondary resources, mine tailings, urban waste, advances in application and technologies
9. Stirred tank bioreactor operation, heap bioleaching, set up and control
10. Biological metal recovery from waste water, iron oxidizing and sulfate reducing microorganism, application examples
11. Biosorption, bioaccumulation, biosynthesis of nanomaterials
12. Analytical methods in biohydrometallurgy

Initial competences

Bachelor degree in natural science, mining- or metallurgy-related engineering.
Basic knowledge in chemistry.

Final competences

1 After successfully completing the module, the students are able to:
- describe basics in microbiology and the general concept of microbial lifestyle and metabolism

2 • balance the advantages and limitations of various biohydrometallurgical process options

3 • identify the role of different types of microorganisms in the process and how they catalyze metal recovery and interact with each other and their environment

4 • apply the taught methods and basics to analyze given case studies and present and discuss the results in a seminar

Conditions for credit contract

This course unit cannot be taken via a credit contract

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Lecture

Study material

None

References

Michael T Madigan; Kelly S Bender; Daniel H Buckley; W Matthew Sattley; David Allan Stahl, Brock biology of microorganisms, Pearson, 2018.
D. R. Lovley (Ed.): Environmental Microbe-Metal Interactions, ASM Press, 2014.
D.B. Johnson, C.G. Bryan, M. Schlömann, F.F. Roberto (Eds.) - Biomining Technologies. Springer. 2022.
E. R. Donati & W. Sand (Eds.) Microbial Processing of Metal Sulfides, Springer, 2007.
L. G. Santos Sobral, D. Monteiro de Oliveira & C. E. Gomes de Souza (Eds.): Biohydrometallurgical Processes: a Practical Approach, CETEM/MCTI, 2011.

Course content-related study coaching

Assessment moments

end-of-term and continuous assessment

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

Presentation, Written assessment

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

Presentation, Written assessment

Examination methods in case of permanent assessment

Presentation

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible in modified form

Calculation of the examination mark