GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2024-2025

Technology for the Circular Economy (F000896)

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

Credits 5.0 **Study time 150 h**

Course offerings and teaching methods in academic year 2024-2025

A (semester 2)	English	Gent	seminar
			independent work
			lecture
			group work

Lecturers in academic year 2024-2025

Ganigué, Ramon	LA25	lecturer-in-charge
Van de Wiele, Tom	LA25	co-lecturer

Offered in the following programmes in 2024-2025	crdts	offering
Master of Science in Business Engineering(main subject Data Analytics)	5	A
Master of Science in Business Engineering (Double Degree)(main subject Data Analytics)	5	A
Master of Science in Business Engineering (Double Degree)(main subject Finance)	5	A
Master of Science in Business Engineering(main subject Finance)	5	A
Master of Science in Business Engineering (Double Degree)(main subject Operations Management)	5	A
Master of Science in Business Engineering(main subject Operations Management)	5	A
Exchange programme in Economics and Business Administration	5	A

Teaching languages

English

Keywords

Technology for a circular economy, drinking water production, water reuse, purification of water, soil and air, energy recovery, nutrient recovery, recovery of rare-earth-elements and urban mining

Position of the course

The 21st century economy has to embrace the aspect of sustainability. The transition of a linear to a circular economy already originates from the end of the 20th century. It requires novel technologies, novel ideas to cope with resources, products and wastestreams and, importantly, energy. A new mindset is required for both the producer as consumer, where the application of renewable energy and renewable resource are maximized if costs from environmental damage, climate change and other disadvantages from a linear economy are taken into account. Striving for novel sustainable technologies also accelerates economic growth and job creation.
The objective of the course is to gain insight in the application of technology to make this transition to a circular economy. From the perspective that "waste does not exist" a paradigm shift is applied in which contaminated water, air, soil or solid waste as such are regarded as resources of water, carbon, nutrients and energy. This course will prepare the student for an employment in industrial sectors that are active in this domain.

Contents

1. Wastewater: parameters, autopurification by surface waters, activated sludge process and reactortechnology
2. New technologies of activated sludge: membrane bioreactors, aerobic

granulation
3. Drinking water: production from groundwater, surface water
4. Resource recovery: anaerobic digestion and water reuse
5. Air contamination: parameters, technology, combustion technology and energy recovery
6. Solid waste: composting, anaerobic composting and material and energy recovery
7. Soil contamination: regulatory aspects, remediation techniques
8. Urban mining, biometallurgy
9. Life cycle analysis

Initial competences

Basic chemistry

Final competences

1 Embrace the concept of circularity as instrument to obtain several of the global sustainability development goals (SDGs)
2 Consciously deal with the balance between providing basic requirements and the boundaries and carrying capacity of ecosystems
3 Understand the use of life cycle analysis in the achievement of sustainable production schemes
4 OBtain insight in the application of urban mining to obtain rare earth elements for green energy technology, transport and electronics
5 Insight in the basic principles of environmental technology with respect to wastewater treatment, drinking water production and water reuse
6 Insight in resource and energy recovery from dense waste streams such as industrial wastewater, sludge, solid waste and energy crops
7 Understand the concept of ecosystem services and obtain insight in the protection, remediation and revaluation of (contaminated) soils
8 The student can apply engineering skills to perform calculations with waste streams from different orders of magnitude to assess what are operational and capital expenditures and what are possible benefits from resource and energy recovery.
9 The student independently and quantitatively describes a case study on circular technology within a company of interest
10 Use activated learning to obtain more knowledge on topics of interest within the European Green Deal

Conditions for credit contract

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

Conditions for exam contract

Access to this course unit via an exam contract is unrestricted

Teaching methods

Group work, Seminar, Lecture, Independent work

Extra information on the teaching methods

Lectures: theory
Guided calculation exercises: industrial cases
Guest lectures from policy and industry
Guided self study: active learning sessions for guiding the groupwork
group work: applying engineering skills and calculations on an industrial case+ company visit per 4 students

Study material

Type: Syllabus

Name: Technology for a circular economy-lecture slides - Syllabus
Indicative price: Free or paid by faculty
Optional: no
Language : English
Available on Ufora : Yes
Online Available : No
Available in the Library : No
Available through Student Association : No

Type: Slides

Name: Technology for a circular economy-lecture slides
Indicative price: Free or paid by faculty
Optional: no
Language : English
Available on Ufora : Yes
Online Available : No
Available in the Library : No
Available through Student Association : No

References

Course content-related study coaching

Guidance from lecturers and/or (doctor) assistant

Assessment moments

end-of-term and continuous assessment

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

Written assessment

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

Written assessment

Examination methods in case of permanent assessment

Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Extra information on the examination methods

Periodic evalaution
- Theory: closed book
- Exercises: Open book

Non period-bound evaluation. case study: Individual company visit and term paper
At least 10/20 must be obtained for the exam prior to taking the score from the termpaper into account for calculation of the final exam score.

Calculation of the examination mark

Periodic evaluation: 75%
Permanent evaluation: 25%
At least 10/20 must be obtained for the exam (periodic evaluation) prior to taking the score from the termpaper (permanent evaluation) into account for calculation of the final exam score.