GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Technology and Environment (E078010)

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 2025-2026

A (semester 1)	English	Gent	practical lecture	0.0h

Lecturers in academic year 2025-2026

Martens, Luc	TWO5	lecturer-in-charge
De Wagter, Carlos	GE38	co-lecturer

Offered in the following programmes in 2025-2026	crdts	offering
Bachelor of Science in Engineering: Architecture	3	A
Master of Science in Teaching in Science and Technology(main subject Physics and Astronomy)	3	A
Master of Science in Engineering: Architecture(main subject Architectural Design and Construction Techniques)	3	A
Master of Science in Electrical Engineering (main subject Communication and Information Technology)	3	A
Master of Science in Electromechanical Engineering(main subject Control Engineering and Automation)	3	A
Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)	3	A
Master of Science in Electrical Engineering (main subject Electronic Circuits and Systems)	3	A
Master of Science in Industrial Engineering and Operations Research(main subject Manufacturing and Supply Chain Engineering)	3	A
Master of Science in Electromechanical Engineering(main subject Maritime Engineering)	3	A
Master of Science in Electromechanical Engineering(main subject Mechanical Construction)	3	A
Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)	3	A
Master of Science in Industrial Engineering and Operations Research(main subject Transport and Mobility Engineering)	3	A
Master of Science in Engineering: Architecture(main subject Urban Design and Architecture)	3	A
Master of Science in Chemical Engineering	3	A
Master of Science in Chemical Engineering	3	A
Master of Science in Civil Engineering	3	A
Master of Science in Civil Engineering	3	A
Master of Science in Electromechanical Engineering	3	A
Master of Science in Engineering: Architecture	3	A
Master of Science in Engineering Physics	3	A
Master of Science in Engineering Physics	3	A
Master of Science in Fire Safety Engineering	3	A
Master of Science in Industrial Engineering and Operations Research	3	A
Master of Science in Materials Engineering	3	A

Master of Science in Mechanical and Electrical Systems Engineering	3	A
Master of Science in Physics and Astronomy	3	A
Master of Science in Sustainable Materials Engineering	3	A

Teaching languages

English, Dutch

Keywords

technology, environment, natural cycles, pollution, greenhouse effect, climate change, ecosystems, life cycle analysis, circular economy, human health

Position of the course

To provide insights in the impact of technology on the environment, with humans as the third component in the relation triangle. The engineer - as a designer of new technologies - carries particular responsibility for the preservation of delicate equilibria in nature. The relation between humans and the environment is closely studied. Further study involves the design of more sustainable technologies. Essentially is the long term global vision. The student gains the insight that the engineer is here a "problem solver" who helps to sustain the social basis for environmental concern.

Contents

Chapter 1: Introduction
1 What are technology and environment and their relations?
2 Interactions between technology, science, and economy
3 The technological dilemma
4 The global system
5 Element 1 of the global system: the Earth's atmosphere

Chapter 2: Natural cycles and impact of human activity
1 Photosynthesis, carbon, and oxygen cycle
2 Nitrogen cycle
3 Phosphorus cycle
4 Sulphur cycle
5 Hydrogen cycle
6 Water cycle including wastewater treatment

Chapter 3: Greenhouse gases and Climate Change
1 Greenhouse gases
2 Thermal feedback mechanisms
3 Climate change
4 Some examples of the effect of climate change
5 Alternative explanation of climate change

Chapter 4: Ecology
1 From organism to ecosystem
2 Food and energy pyramids
3 Self-organization and ecological dynamics
4 Energy flows and chemical cycles in ecosystems
5 Eutrophication and acidification
6 Ecosystems and environmental pollution
7 Biodiversity
8 Invasive alien species
9 Ecosystem services – what ?
10 Example: role of ecosystems in coastal protection
11 Ecological footprint

Chapter 5: Environment under pressure and effects on living species
1 Some hazardous substances including particulate matter and their bio-effects
2 Ozone and stratospheric ozone depletion
3 Photochemical smog
4 Radioactivity and bio-effects of ionizing radiation
5 Health effects and well-being effects of environmental factors
6 Acid rain
7 Light pollution
8 Sound and vibrations

Chapter 6: Life Cycle Analysis and circular economy

1 The linear economy
2 The increasing use of resources and elements and reduced lifetimes
3 What is the circular economy?
4 Recycling for packaging
5 Aluminium and circular economy
6 Limitations of the circular economy
7 Life Cycle Analysis

Chapter 7: Legal framework and regulations
1 European concern and legislation about pollution and climate change
2 Emission, environmental quality, and exposure standards
3 Standards for total emissions or the 'dome' concept
4 Preventive measures, the precautionary principle and environmental liability

Initial competences

No specific prior knowledge required

Final competences

1 Understand that human technology has a considerable impact on the environment
2 Understand fragile equilibria and cycles in nature
3 Define sustainable technologies
4 Application of a life cycle analysis
5 Understanding of ecocystems and impact of humans
6 Understanding of the complex environmental legislation

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, Practical

Study material

Type: Handouts

Name: Slides with notes of each chapter
Indicative price: Free or paid by faculty
Optional: no
Available on Ufora : Yes
Online Available : No
Available in the Library : No
Available through Student Association : No
Usability and Lifetime within the Course Unit : one-time
Usability and Lifetime within the Study Programme : one-time
Usability and Lifetime after the Study Programme : not

References

- Jesse Ausubel, Hedy Sladovich: Technology and Environment. The National Academies Press, Washington, DC, 1989.
- David Wilkinson: Fundamental Processes in Ecology. An earth systems approach, Oxford University Press, Oxford, 2006.
- Brian Arthur: The Nature of Technology. What it is and how it Evolves. Free Press, New York, 2009.
- http://www.ipcc.ch/

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

Oral assessment open-book

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

Oral assessment open-book

Examination methods in case of permanent assessment

Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible

Extra information on the examination methods

During examination period: oral open-book exam, written preparation (including discussion about the assignment during the exam). During semester: 1 critical analysis and review of a statement about technology and environment

Calculation of the examination mark

During examination period / Throughout semester = 80%/20%.