

## 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 2024-2025**

A (semester 1)	English	Gent	practical lecture	0.0h
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**Lecturers in academic year 2024-2025**

Martens, Luc	TW05	lecturer-in-charge
De Wagter, Carlos	GE38	co-lecturer

**Offered in the following programmes in 2024-2025**

	<b>crdts</b>	<b>offering</b>
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 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 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 ecosystems 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%.