

Course Specifications

Valid as from the academic year 2024-2025

Technology and Environment (E078010)

Course size	(nominal values; actual values may depend on programme) Study time 90 h				
Credits 3.0					
Course offerings and	teaching methods in academic ye	ar 2024-2025			
A (semester 1)	English	Gent	practical	0.0h	
			lecture		

Lecturers in academic year 2024-2025

Martens, Luc		TW05	lecturer-in-ch	arge
De Wagter, Carlos		GE38	co-lecturer	
Offered in the following prog	grammes in 2024-2025		crdts	offering
Bachelor of Science in E	Ingineering: Architecture		3	А
Master of Science in Tea Astronomy)	aching in Science and Technology(main subject Physics	and	3	А
Master of Science in Eng Construction Techniques	gineering: Architecture(main subject Architectural Desi s)	ign and	3	А
Master of Science in Ele Technology)	ectrical Engineering (main subject Communication and	Information	3	A
Master of Science in Ele Automation)	ectromechanical Engineering(main subject Control Eng	ineering and	3	A
Master of Science in Ele Engineering)	ectromechanical Engineering(main subject Electrical Po)wer	3	A
Master of Science in Ind	lustrial Engineering and Operations Research(main sub lustrial Engineering and Operations Research(main sub	bject	3	A
Master of Science in Ele	ectromechanical Engineering(main subject Maritime Er	igineering)	3	А
Master of Science in Ele Construction)	ctromechanical Engineering(main subject Mechanical		3	А
Master of Science in Ele Engineering)	ectromechanical Engineering(main subject Mechanical	Energy	3	А
Master of Science in Ind Transport and Mobility I	lustrial Engineering and Operations Research(main sul Engineering)	bject	3	А
Master of Science in Eng Architecture)	gineering: Architecture(main subject Urban Design and	I	3	A
Master of Science in Che	emical Engineering		3	А
Master of Science in Che	emical Engineering		3	А
Master of Science in Civi	il Engineering		3	А
Master of Science in Civi	il Engineering		3	А
Master of Science in Eng	gineering Physics		3	А
Master of Science in Eng	gineering Physics		3	А
Master of Science in Fire	e Safety Engineering		3	А
Master of Science in Ind	lustrial Engineering and Operations Research		3	А
Master of Science in Ma	terials Engineering		3	А
Master of Science in Phy	ysics and Astronomy		3	А
Master of Science in Sus	stainable Materials Engineering		3	А

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

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- 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%.