

Clean Technology (I002700)

Wegens Covid19 kan mogelijk afgeweken worden van de onderwijs- en evaluatievormen. Dergelijke afwijkingen zullen via Ufora worden gecommuniceerd.

Cursusomvang *(nominale waarden; effectieve waarden kunnen verschillen per opleiding)*

Studiepunten 5.0 **Studietijd** 150 u **Contacturen** 50.0 u

Aanbodsessies en werkvormen in academiejaar 2021-2022

A (semester 1)	Engels	Gent	werkcollege: geleide oefeningen	5.0 u
			werkcollege: PC-klasoefeningen	5.0 u
			microteaching	3.75 u
			groepswerk	1.25 u
			hoorcollege	35.0 u

Lesgevers in academiejaar 2021-2022

Nachtergaele, Pieter	LA24	Verantwoordelijk lesgever
Cadena Martinez, Erasmo	LA24	Medelesgever
Huysveld, Sophie	LA24	Medelesgever

Aangeboden in onderstaande opleidingen in 2021-2022

	stptn	aanbodssessie
Master of Science in Electromechanical Engineering (afstudeerrichting Control Engineering and Automation)	5	A
Master of Science in Business Engineering (afstudeerrichting Data Analytics)	5	A
Master of Science in Electromechanical Engineering (afstudeerrichting Electrical Power Engineering)	5	A
Master of Science in Electromechanical Engineering (afstudeerrichting Maritime Engineering)	5	A
Master of Science in Electromechanical Engineering (afstudeerrichting Mechanical Construction)	5	A
Master of Science in Electromechanical Engineering (afstudeerrichting Mechanical Energy Engineering)	5	A
Master of Science in Business Engineering (afstudeerrichting Operations Management)	5	A
International Master of Science in Sustainable and Innovative Natural Resource Management	5	A
Master of Science in Chemical Engineering	5	A
Master of Science in de bio-ingenieurswetenschappen: chemie en bioprocestechnologie	5	A
Master of Science in de ingenieurswetenschappen: chemische technologie	5	A
Master of Science in Sustainable Materials Engineering	5	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: chemie en bioprocestechnologie (niveau master-na-bachelor)	5	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: Food Science and Nutrition (niveau master-na-bachelor)	5	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: milieutechnologie (niveau master-na-bachelor)	5	A

Onderwijstalen

Engels

Trefwoorden

Clean technology, sustainable technology, industrial ecology, green chemistry, process integration, environmental performance tools, sustainability assessment, life cycle assessment,

exergy, exergy analysis

Situering

This course focuses on the sustainability (assessment) of technological operations and how to make them more sustainable. Attention is paid in how far the choice of resources, process efficiency and avoidance of waste streams all contribute to sustainable technology. Concepts of clean technology, industrial ecology and green chemistry/chemical engineering are discussed. Pollution prevention at the unit operations is covered, as well as process integration, which is taught how to apply it. Management approaches that improve sustainability, more specifically, design for sustainability (D4S) and ecomanagement and audit scheme (EMAS) are explained. Regarding assessment methods, environmental performance tools at tier 1 and tier 2 levels are covered. The widely used method life cycle assessment is well elaborated on and taught how to conduct it. Additionally, the concept of exergy is explained and exergy analysis is applied.

Inhoud

Chapter 1: Technology and Sustainability
Chapter 2: The Natural Environment: Resource Base and Sink for Emissions
Chapter 3: Changing Technology through New Concepts
Chapter 4: Changing Technology at the Process
Chapter 5: Changing Technology through Proper Management
Chapter 6: Assessing Technology through Input/Output Analysis
Chapter 7: Assessing Technology through Life Cycle Assessment
Chapter 8: Assessing Technology through Exergy Analysis

Begincompetenties

Natural sciences at the university level

Eindcompetenties

- 1 Understand how resource consumption and selection, process efficiency and emission patterns affect the contribution of technology to environmental sustainability. Also the importance of technology within industrial society has to be understood.
- 2 Have a knowledge of the nowadays (global) relevant environmental issues.
- 3 Comprehend the concepts: industrial ecology, green chemistry (and its principles), green (chemical) engineering and clean technology.
- 4 Comprehend and being able to apply approaches for energy integration and mass integration (source-sink mapping and mass exchange network synthesis).
- 5 Comprehend management approaches that improve sustainability, more specifically: design for sustainability (D4S) and, ecomanagement and audit scheme (EMAS).
- 6 Grasp tier 1 and tier 2 environmental performance tools and release quantification methods.
- 7 Grasp the concept of life cycle assessment and all its aspects.
- 8 Being able to conduct a life cycle assessment to a certain extent (this with the aid of software).
- 9 Grasp the concept of exergy and exergy analysis. Being able to quantify the exergy amount of a flow to the extent defined by presented data and formulae.

Creditcontractvoorwaarde

Toelating tot dit opleidingsonderdeel via creditcontract is mogelijk mits gunstige beoordeling van de competenties

Examencontractvoorwaarde

Dit opleidingsonderdeel kan niet via examencontract gevolgd worden

Didactische werkvormen

Groepswerk, hoorcollege, microteaching, werkcollege: geleide oefeningen, werkcollege: PC-klasoefeningen

Toelichtingen bij de didactische werkvormen

Lectures: theory and guestspeakers from industry. Dates will be announced in the first theory lecture and through the student platform.

Seminar - coached exercises: 2 exercise sessions to solve exercises on process integration and exergy in group. Dates will be announced in the first theory lecture and through the student platform.

Seminar - practical PC room classes: 2 coached PC sessions to prepare for the LCA assignment (groupwork). Dates will be announced in the first theory lecture and through the student platform.

Groupwork: feedback moment with lecturers for the LCA assignment.

Microteaching: presentation assignment to other students in week 13.

Leermateriaal

A syllabus is available and can be purchased from the student organization of the faculty (www.boerekot.be and vlk.cursus@gmail.com). Slides of the lectures will be uploaded (partially) to the student platform.

Referenties

Anastas P.T. and Warner J.C. (1998) Green Chemistry: Theory and Practice. Oxford University Press, New York, 135p
Graedel T.E. and Allenby B.R. (1996) Design for Environment. Prentice Hall, New Jersey, 175p
Johansson A. (1992) Clean technology. Lewis Publishers, Boca Raton, 196p
Lowe E.A., Warren J.L. and Moran S.R. (1997) Discovering industrial ecology - An executive briefing and sourcebook. Battelle Press, Columbus, 191p
Kotas T.J., The exergy method of thermal plant analysis, Butterwoods, London, 1985, 296p
Moran M.J., Availability analysis, a guide to efficient energy use, corrected edition, The American Society of Mechanical Engineers, New York, 1989, 260p

Vakinhoudelijke studiebegeleiding

Contact hours with the lecturers for individual guidance.

Evaluatiemomenten

periodegebonden en niet-periodegebonden evaluatie

Evaluatievormen bij periodegebonden evaluatie in de eerste examenperiode

Schriftelijk examen met open vragen, openboekexamen

Evaluatievormen bij periodegebonden evaluatie in de tweede examenperiode

Schriftelijk examen met open vragen, openboekexamen

Evaluatievormen bij niet-periodegebonden evaluatie

Participatie, werkstuk

Tweede examenkans in geval van niet-periodegebonden evaluatie

Examen in de tweede examenperiode is enkel mogelijk in gewijzigde vorm

Toelichtingen bij de evaluatievormen

Periodic evaluation:

- written open book exam
- study material: theory lectures + guest lectures + exercise sessions

Non-periodic evaluation:

- Presence/participation at 2 exercise sessions, 2 coached PC sessions and 2 guest lectures
- Report and presentation of assignment (groupwork): The assignment is to perform an LCA (compare 2 product alternatives or evaluate the ecodesign of a product) with the aid of software. Students can start the assignment after the first coached PC session to prepare for the assignment (around week 4). Deadline for submission of the assignment (around week 11) and the date of the presentation (week 13) will be provided through the student platform.
- Presence/participation at assignment presentations of other students (a half day)

Eindscoreberekening

Periodic evaluation (written exam): 65% or 13/20

Non-periodic evaluation (assignment, and participation at 2 exercise sessions, participation at 2 coached PC sessions, participation at 2 guest lectures and participation at the task presentations): 35% or 7/20

Students who eschew one or more parts of the evaluation may be failed by the examiner. Final scores of 10/20 and above may be reduced to the highest failing mark (9/20).

If there is clearly a different input from the different students in the assignment, then the final mark per student belonging to the same group may differ. The deadlines for the assignment must be respected. If not, the final mark may be reduced. If the student obtains a total mark lower than 10/20, the mark obtained for the non-periodic evaluation during the first examination period can be transferred to the second examination period only if the student did not fail, i.e. he/she did not have a mark lower than 3.5/7.