

Course Specifications

From the academic year 2017-2018 up to and including the

Sustainable Chemical Production Processes (E071131)

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

Credits 6.0 Study time 180 h Contact hrs 60.0 h

Course offerings and teaching methods in academic year 2018-2019

Offering	Language	Teaching Method	Hours
A (semester 1)	English	excursion	15.0 h
		group work	15.0 h
		lecture	30.0 h
B (semester 1)	Dutch	guided self-study	30.0 h
		excursion	15.0 h
		group work	15.0 h

Lecturers in academic year 2018-2019

Van Geem, Kevin TW11 lecturer-in-charge

Offered in the following programmes in 2018-2019

Programme	crdts	offering
Bridging Programme Master of Science in Chemical Engineering	6	A
Bridging Programme Master of Science in Chemical Engineering	6	B
Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	6	A
Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	6	A
Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	6	A
Master of Science in Chemical Engineering	6	A
Master of Science in Sustainable Materials Engineering	6	A
Master of Science in Chemical Engineering	6	B

Teaching languages

Dutch, English

Keywords

Sustainability, petroleum refining, Petro chemical processes, biotechnology, oil, coal, natural gas, biomass, lifecycle analysis, cleantech, process economics

Position of the course

Introduction to the most important chemical and petrochemical processes for the production of fuels, base and bulk chemicals. Particular attention is paid to technical, economical and environmental aspects. Getting insight into the technical-scientific basis for these processes and in the structure of the chemical industry, petroleum refining industry, the petrochemical industry, biotechnology, biorefinery.

Contents

- Structure of the chemical industry
- Resources, process efficiency, waste, life cycle analysis, exergy
- Conversion of oil, biomass and coal. Production of fossil and renewable fuels. Overview of the final products
- Sustainable production of Base Chemicals: hydrogen; carbon monoxide, ethene; propene; butenes; butadiene, Benzene; toluene; sustainable xylenes, acetic acid,

sulfuric acid, ammonia, methanol, etc.

- Sustainable production of second generation chemicals: Styrene, Hetero-atom: vinylchloride, Ethylene Oxide, Adipic Acid, Caprolactam, Maleic Anhydride
- Important sustainable Processes: capita selecta: Steamreforming of natural gas; partial oxidation to synthesis gas or ethyne, Steam Cracking, Catalytic cracking; Catalytic reforming, High-Pressure Polyethylene, bioethanol
- Plant visits: unit operations, sustainability, economics, continuous versus batch processes

Initial competences

Physical & Organic Chemistry, Heat and Material Transport, Unit Operations in the Chemical Industry

Final competences

- 1 Understanding the following concepts: crude oil, distillate, residue, bulk chemicals, sustainability, life cycle analysis, biomass, process simulation.
- 2 Obtain insight in the structure of chemical industry.
- 3 Obtain insight in the structure of a refinery.
- 4 Obtain insight in production methods of important chemicals.
- 5 Obtain insight in production of selected second generation chemicals.
- 6 Obtain insight in implementation of large-scale processes.
- 7 Evaluation of process efficiency and sustainability.
- 8 Identification of the most important streams in a refinery and treatment processes.
- 9 Process simulation.
- 10 Process economics.

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

Guided self-study, excursion, group work, lecture

Learning materials and price

Syllabus in English (electronically available on the following web-site: <https://minerva.ugent.be>). Slides in English available on <https://minerva.ugent.be>

References

Chemical Process Technology, Jacob A. Moulijn, Michiel Makkee, Annelies van Diepen, ISBN: 978-0-471-63062-3, 2001 ULLMANN'S Encyclopedia of Industrial Chemistry: <http://www.wiley-vch.de/vch/software/ullmann>

Course content-related study coaching

Begeleiding door assistent

Evaluation methods

end-of-term evaluation and continuous assessment

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

Oral examination

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

Oral examination

Examination methods in case of permanent evaluation

Report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is not possible

Extra information on the examination methods

During examination period: oral closed-book exam, written preparation
During semester: graded project reports. Second chance: Not possible

Calculation of the examination mark

Evaluation throughout semester as well as during examination period. Special conditions: none; project reports: 6/20; exam: 14/20