GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Sustainable Chemical Production Processes (E071131)

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

Credits 6.0 **Study time 180 h**

Course offerings and teaching methods in academic year 2024-2025

A (semester 1)	English	Gent	lecture	
			excursion	
			group work	
B (semester 1)	Dutch	Gent	excursion	15.0h
			group work	15.0h

Lecturers in academic year 2024-2025

Van Geem, Kevin	TW11	lecturer-in-charge
Reyniers, Pieter	TW11	co-lecturer

Offered in the following programmes in 2024-2025	crdts	offering
Bridging Programme Master of Science in Chemical Engineering	6	A
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
International Master of Science in Sustainable and Innovative Natural Resource Management	6	A
Master of Science in Chemical Engineering	6	B
Master of Science in Chemical Engineering	6	A

Teaching languages

English, Dutch

Keywords

Sustainability, petroleum refining, Petro chemical processes, biotechnology, oil, coal, natural gas, biomass, lifecycle analysis, cleantech, process economics, CO2 storage, CO2 utilisation

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; sustainablexylenes , 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, CO2 emissions
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

Group work, Excursion, Lecture, Independent work

Extra information on the teaching methods

- Hoorcollege: 20u
- Groepswerk: 10u
- Practicum: 20u
- Project: 10u

Study material

None

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

Assessment moments

end-of-term and continuous assessment

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

Oral assessment

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

Oral assessment

Examination methods in case of permanent assessment

Assignment

Possibilities of retake in case of permanent assessment

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