GHENT UNIVERSITY

Course Specifications

From the academic year 2024-2025 up to and including the academic year

Displacement Pumps, Compressors and IC Engine Fundamentals (E037121)

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 2025-2026

A (semester 1)	English	Gent	lecture seminar practical	
B (semester 1)	Dutch	Gent	seminar	20.0h

Lecturers in academic year 2025-2026

Verhelst, Sebastian	TW08	lecturer-in-charge
Lecompte, Steven	TW08	co-lecturer

Offered in the following programmes in 2025-2026	**crdts**	**offering**
Bridging Programme Master of Science in Electromechanical Engineering(main subject Control Engineering and Automation)	6	A
Bridging Programme Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)	6	A
Bridging Programme Master of Science in Electromechanical Engineering(main subject Maritime Engineering)	6	A
Bridging Programme Master of Science in Electromechanical Engineering(main subject Mechanical Construction)	6	A
Bridging Programme Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)	6	A
Master of Science in Electromechanical Engineering(main subject Control Engineering and Automation)	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	B
Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)	6	A
Master of Science in Industrial Engineering and Operations Research(main subject Manufacturing and Supply Chain Engineering)	6	A
Master of Science in Electromechanical Engineering(main subject Maritime Engineering)	6	B
Master of Science in Electromechanical Engineering(main subject Maritime Engineering)	6	A
Master of Science in Electromechanical Engineering(main subject Mechanical Construction)	6	B
Master of Science in Electromechanical Engineering(main subject Mechanical Construction)	6	A
Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)	6	B
Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)	6	A
Master of Science in Industrial Engineering and Operations Research(main subject Transport and Mobility Engineering)	6	A
Master of Science in Materials Engineering	6	A
Master of Science in Sustainable Materials Engineering	6	A

Teaching languages

English, Dutch

Keywords

Positive displacement machines, positive displacement pumps, positive displacement compressors, internal combustion engines

Position of the course

Basic principles of positive displacement machines: pumps, compressors and internal combustion engines.

Contents

- Working principle and terminology positive displacement (PD) machines
- PD Pumps: working principle, properties and applications, volumetric and efficiency study, cavitation, valve design, construction, classification, discussion of different types of pumps, capacity control
- PD Compressors: applications and designs, working principle, single and multiple stage compression, volumetric and efficiency study, parts, classification, discussion of different types of compressors, capacity control
- Internal Combustion Engines: two-stroke and four-stroke cycles, construction and parts, ideal cycles, combustion, present and future fuels, normal and abnormal combustion in spark ignition and compression ignition engines, emission formation, basics of emission aftertreatment systems, ignition systems, injection systems, basics of engine control, basics of supercharging, introduction on alternative fuels and sustainability
- In general: energy efficiency of these machines, in full and part load

Initial competences

Completed the courses 'Transport Phenomena', 'Applied Thermodynamics' and 'Heat and Combustion Engineering', or having acquired these competences in another way.

Final competences

1 Choose a suitable pump, compressor or internal combustion engine type depending on the application and determine its basic dimensions.
2 Calculate the margin to cavitation for a pump installation and if necessary propose the required adaptations.
3 Explain trends in engine design, fuel choice and emission legislation and explain why a specific engine design would be chosen according to the needs of the application.
4 Execute thermodynamic analyses of displacement machines and calculate performance parameters.
5 Analyse and interpret measurements on positive displacement machinery.

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

Seminar, Lecture, Practical, Independent work

Study material

Type: Syllabus

Name: Displacement Pumps and Compressors
Indicative price: Free or paid by faculty
Optional: no
Language : English
Number of Pages : 189
Oldest Usable Edition : 2017
Available on Ufora : Yes
Online Available : Yes
Available in the Library : Yes
Available through Student Association : Yes

Type: Slides

Name: Internal Combustion Engines: Fundamentals
Indicative price: Free or paid by faculty
Optional: no
Language : English
Number of Slides : 600
Oldest Usable Edition : 2023
Available on Ufora : Yes
Online Available : Yes
Available in the Library : No
Available through Student Association : No

References

- Küttner Kolbenmaschinen, Vieweg+Teubner
- Pump handbook, McGraw-Hill
- Compressor Handbook, McGraw-Hill
- Introduction to Internal Combustion Engines, Richard Stone, Palgrave Macmillan

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, Written assessment with open-ended questions

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

Oral assessment, Written assessment with open-ended questions

Examination methods in case of permanent assessment

Skills test, 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 (theory); written open-book exam (exercises).
- During semester: graded lab sessions.

Calculation of the examination mark

Weighting to determine final score: project reports 15%, theory exam 50% and exercises exam 35%.
Special condition: If one scores less than 8/20 for at least one component of the assessment, a pass mark for the course unit in question is not possible. If the final mark does turn out to be a 10/20 or more, this will be reduced to the highest non-deliberative mark, i.e. 7/20.