GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2017-2018

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	Contact hrs	60.0 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 1)	English	seminar	20.0 h
		practicum	10.0 h
		lecture	30.0 h
B (semester 1)	Dutch	practicum	10.0 h
		seminar	20.0 h
		guided self-study	30.0 h

Lecturers in academic year 2018-2019

Verhelst, Sebastian	TW03	lecturer-in-charge

Offered in the following programmes in 2018-2019	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
Bridging Programme Master of Science in Industrial Engineering and Operations Research	6	A
Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	6	A
Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	6	B
Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	6	B
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	B
Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	6	A
Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	6	B
Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	6	B
Master of Science in Industrial Engineering and Operations Research	6	A
Master of Science in Sustainable Materials Engineering	6	A

Teaching languages

Dutch, English

Keywords

Positive displacement pumps and 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 and present 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 and emission legislation and explain why a specific engine design would be chosen.
4 Determine the effect of fuel properties on engine combustion.
5 Execute measurements on positive displacement machinery and interpret them and perform thermodynamic analyses.

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, lecture, practicum, seminar

Learning materials and price

English syllabus, English book

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

Evaluation methods

end-of-term evaluation and continuous assessment

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

Written examination with open questions, open book examination

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

Written examination with open questions, open book examination

Examination methods in case of permanent evaluation

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

Calculation of the examination mark

Final score = (score written exam (closed-book) * 10 + score written exam (open booK) * 7 + score project reports * 3) : 20