

Fluid machines (E741050)

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

Course size	<i>(nominal values; actual values may depend on programme)</i>		
Credits 3.0	Study time 90 h	Contact hrs	26.0 h

Course offerings and teaching methods in academic year 2022-2023

A (semester 2)	Dutch	Gent	lecture	18.0 h
			lecture: plenary exercises	6.0 h

Lecturers in academic year 2022-2023

Degroote, Joris	TW08	lecturer-in-charge
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Offered in the following programmes in 2022-2023

	crdts	offering
Bachelor of Science in Engineering Technology (main subject Electromechanical Engineering Technology)	3	A
Preparatory Course Master of Science in Electrical Engineering Technology (main subject Automation)	3	A
Preparatory Course Master of Science in Electrical Engineering Technology (main subject Electrical Engineering)	3	A
Preparatory Course Master of Science in Electromechanical Engineering Technology	3	A

Teaching languages

Dutch

Keywords

Pumps, compressors, fans, turbines.

Position of the course

This course deals with technologies for mechanical energy conversion. Sufficient knowledge and insight is passed on to understand the operation of these technologies, to be able to select the right technology for the right application, and to be able to integrate the technologies in relevant processes. The course deals specifically with pumps, compressors, fans and (gas) turbines.

Contents

Pumps

- Pump performance: power, efficiency, suction head, cavitation and NPSH, characteristics (curves) and operating point
- Resistance in straight pipes, Moody diagram, resistance of fittings, system curve
- Volumetric pumps: overview of types, positive displacement pumps, plunger pumps, operation, indicator diagram, accumulators, other types of volumetric pumps
- Impeller Pumps: operation and types, velocity triangles, Euler head pressure, pump characteristic, determination of characteristics on a test stand, operating point, flow control, serial and parallel connection, pump diagrams, efficiency, NPSH, specific speed

Compressors

- Performance of compressors: compression work, cooling, power, efficiency
- Volumetric compressors: overview, positive displacement compressors, volumetric efficiency and filling factor, screw compressors, scroll compressors, applications
- Impeller compressors: advantages and disadvantages compared to volumetric compressors, radial compressors, determination of the number of stages compressor characteristics, surge and stonewall, axial compressors, flow control

Fans

- Application, power, noise

- Radial fans: forward curved and backward curved blades, characteristics, flow control
- Axial fans: characteristics, bypass, flow control, noise

Turbines

- Law of momentum and angular momentum (Euler)
- Steam turbines: impulse turbines, reaction turbines
- Hydraulic turbines: Pelton, Kaplan, Francis

Gas turbines

- Applications, pros and cons related to other options for mechanical energy generation
- Control and security
- Classification: Heavy duty and aero derivatives
- Short description of turbines for planes
- Description of main parts: compressor, combustion chamber and turbine
- Losses in relationship to the theoretical cycle
- Calculation of power, efficiency, specific air need
- Optimisation possibilities
- Calculation examples

Initial competences

Uses and extends some final competences of Thermodynamics and Fluid Mechanics.

Final competences

- 1 Select an appropriate energy converter for a particular industrial application.
- 2 Know the operating principles of the energy converters addressed in the course.
- 3 Assess, interpret, and process characteristics and performance factors of energy converters.
- 4 Apply principles and laws relevant to energy converters to solve concrete problems.

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

Lecture, lecture: plenary exercises

Extra information on the teaching methods

Lectures, guest lecture(s), plenary and guided exercises during lectures.

Learning materials and price

- "Toegepaste Energietechniek", J. Ouwehand et al., 5th ed., Boom uitgeverij (63,50 EUR)
- Powerpoint lectures on the electronic learning platform
- Background material and multimedia on the electronic learning platform

References

- Pump Handbook, I. Karassik, J. Messina, P. Cooper, C. Heald.
- Compressors: Selection and Sizing, R.N. Brown.

Course content-related study coaching

Counseling after appointment, communication via email or the electronic learning environment.

Evaluation methods

end-of-term evaluation

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

Written examination

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

Written examination

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation

not applicable

Extra information on the examination methods

Written examination closed book.

Calculation of the examination mark