

## Turbomachines (E037321)

**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 2017-2018**

A (semester 1)	seminar: coached exercises	25.0 h
	practicum	5.0 h
	guided self-study	30.0 h
B (semester 1)	seminar: coached exercises	25.0 h
	practicum	5.0 h
	lecture	30.0 h

**Lecturers in academic year 2017-2018**

Degroote, Joris      TW03      lecturer-in-charge

**Offered in the following programmes in 2017-2018**

	crdts	offering
Bridging Programme Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	6	B
Bridging Programme Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	6	B
Bridging Programme Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	B
Bridging Programme Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	6	B
Bridging Programme Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	6	B
Bridging Programme Master of Science in Fire Safety Engineering	6	B
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 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
International Master of Science in Fire Safety Engineering	6	B
Master of Science in Fire Safety Engineering	6	B

**Teaching languages**

Dutch, English

**Keywords**

Turbomachines, fans, pumps, steam turbines, hydraulic turbines, wind turbines

**Position of the course**

Principles of turbomachines in general and elementary analysis of different types of machines

**Contents**

- Principles: axial machines (examples), flow analysis, work transfer, energy analysis, degree of reaction, radial machines, characteristics
- Components: foils, cascades, channels, diffusors
- Fans: types, flow analysis, characteristics
- Compressible fluid: flow in nozzles
- Measurement: measurement of pressure, flow rate, rotational speed, torque
- Steam turbines: application, basic principles, impulse turbines, reaction turbines, design
- Dynamic similitude: nondimensional groups, characteristic numbers, design diagrams
- Pumps: cavitation, design, constructive aspects, self priming, unstable operation, special pumps
- Hydraulic turbines: application, types
- Wind turbines: application, types, performance, matching to a wind regime

**Initial competences**

Transport Phenomena, Technical Thermodynamics

**Final competences**

- 1 Derive basic functioning of turbomachines and the flow in their components
- 2 Derive parameter choice and layout of fans, steam turbines, pumps, hydraulic turbines and wind turbines
- 3 Calculate the flow in a turbomachine using one-dimensional analysis

**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: coached exercises

**Extra information on the teaching methods**

Practical on pump, fan and Pelton turbine

**Learning materials and price**

English course material for sale at VTK

**References**

[1] Erik Dick, Fundamentals of Turbomachines: Fluid Mechanics and Its Applications, Springer, 2015.

**Course content-related study coaching****Evaluation methods**

end-of-term evaluation

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

Written examination, oral examination

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

Written examination, oral examination

**Examination methods in case of permanent evaluation****Possibilities of retake in case of permanent evaluation**

not applicable

**Extra information on the examination methods**

During examination period: oral closed-book exam on theory, written preparation; written open-book exam on exercises.

**Calculation of the examination mark**

- Exam on theory 50% and exam on exercises 50%.
- Special condition: the student needs a pass for the theory as well as for the exercises to get a pass for the course. If the student fails either the theory or the exercises, the total mark is the lowest of the two.