

## 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 2018-2019

Offering	Language	Teaching Methods	Hours
A (semester 1)	Dutch	seminar: coached	25.0 h
		exercises	
		practicum	5.0 h
		guided self-study	30.0 h
B (semester 1)	English	seminar: coached	25.0 h
		exercises	
		practicum	5.0 h
		lecture	30.0 h

### Lecturers in academic year 2018-2019

Degroote, Joris TW03 lecturer-in-charge

### Offered in the following programmes in 2018-2019

Programme	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, diffusers
- 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.