

## Fluid Mechanics (E040560)

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 3.0**

**Study time 90 h**

**Course offerings and teaching methods in academic year 2024-2025**

A (semester 1)

English

Gent

excursion

lecture

seminar

practical

**Lecturers in academic year 2024-2025**

Degroote, Joris

TW08

lecturer-in-charge

**Offered in the following programmes in 2024-2025**

**crdts**

**offering**

[Bridging Programme Master of Science in Electromechanical Engineering\(main subject Mechanical Energy Engineering\)](#)

3

A

[Master of Science in Electromechanical Engineering\(main subject Control Engineering and Automation\)](#)

3

A

[Master of Science in Electromechanical Engineering\(main subject Electrical Power Engineering\)](#)

3

A

[Master of Science in Electromechanical Engineering\(main subject Maritime Engineering\)](#)

3

A

[Master of Science in Electromechanical Engineering\(main subject Mechanical Construction\)](#)

3

A

[Master of Science in Electromechanical Engineering\(main subject Mechanical Energy Engineering\)](#)

3

A

**Teaching languages**

English

**Keywords**

Lift, compressible fluid, shock wave, unsteady flow

**Position of the course**

Introductory course on internal and external aerodynamics. Analysis of lift, effects of compressibility and viscosity, analysis of running waves in unsteady flows.

**Contents**

- One-dimensional applications: compressible flow equations, sound wave, shock wave, compressible flow in tube with variable section, friction, heat transfer
- Unsteady flow: linearized Euler equations, acoustic and convective waves, Sod problem, waves of incompressible fluid in an elastic tube, fluid-structure interaction
- General equations for an ideal fluid: Euler equations, transport of vorticity, vortex, force on an object, wind tunnel measurement of force on aerofoil
- Steady incompressible potential flow: flow around a cylinder, Magnus effect, flow around flat plate with incidence, lift force of aerofoil, induced drag of a finite wing
- Steady compressible flow: perturbation potential for subsonic and supersonic flow, supersonic flow: two dimensional expansion waves and oblique shock waves, transonic flow
- Aerofoils: experimentally and computationally developed aerofoils, laminar and turbulent aerofoils
- Experimental methods in fluid mechanics: Pitot tubes, hot wire, optical flow measurement techniques

**Initial competences**

Transport Phenomena

### Final competences

- 1 Explain the influence of compressibility of the fluid on a flow
- 2 Explain running waves in unsteady flows
- 3 Compute one-dimensional and two-dimensional flow with a compressible fluid

### 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, Excursion, Lecture, Practical

### Study material

Type: Syllabus

Name: Fluid Mechanics

Indicative price: Free or paid by faculty

Optional: no

Language : English

Available on Ufora : Yes

Type: Slides

Name: Slides

Indicative price: Free or paid by faculty

Optional: no

Language : English

Available on Ufora : Yes

### References

- J. Anderson. Modern compressible flow, with historical perspective. McGraw-Hill. ISBN 0070016747.
- F. White. Viscous fluid flow. McGraw-Hill. ISBN 0070697124.

### Course content-related study coaching

#### Assessment moments

end-of-term assessment

#### Examination methods in case of periodic assessment during the first examination period

Oral assessment, Written assessment

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

Oral assessment, Written assessment

#### Examination methods in case of permanent assessment

#### Possibilities of retake in case of permanent assessment

not applicable

#### Extra information on the examination methods

end-of-term evaluation: written open book examination on exercises, oral closed book examination with written preparation on theory

#### Calculation of the examination mark

- Exam on theory 50% and exam on exercises 50%.
- Special condition: If the student 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.