

## IC Engines: advanced design and research (E037221)

**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 2025-2026**

A (semester 2)	English	Gent	group work
			lecture
			practical

**Lecturers in academic year 2025-2026**

Verhelst, Sebastian	TW08	lecturer-in-charge
Larsson, Tara	TW08	co-lecturer

**Offered in the following programmes in 2025-2026**

	<b>crdts</b>	<b>offering</b>
<a href="#">Bridging Programme Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)</a>	3	A
<a href="#">Master of Science in Electromechanical Engineering(main subject Control Engineering and Automation)</a>	3	A
<a href="#">Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)</a>	3	A
<a href="#">Master of Science in Industrial Engineering and Operations Research(main subject Manufacturing and Supply Chain Engineering)</a>	3	A
<a href="#">Master of Science in Electromechanical Engineering(main subject Maritime Engineering)</a>	3	A
<a href="#">Master of Science in Electromechanical Engineering(main subject Mechanical Construction)</a>	3	A
<a href="#">Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)</a>	3	A
<a href="#">Master of Science in Industrial Engineering and Operations Research(main subject Transport and Mobility Engineering)</a>	3	A
<a href="#">Master of Science in Engineering: Ships and Marine Technology</a>	3	A
<a href="#">Master of Science in Engineering: Ships and Marine Technology</a>	3	A
<a href="#">Master of Science in Materials Engineering</a>	3	A
<a href="#">Master of Science in Sustainable Materials Engineering</a>	3	A

**Teaching languages**

English

**Keywords**

engine combustion, emission formation, gas dynamics, new engine technologies and fuels, engine research

**Position of the course**

Profound study of the thermodynamic and gasdynamic cycle of internal combustion engines, state of the art, development trends, research, new concepts

**Contents**

State of the art and development trends gasoline and diesel engines.  
 Gas dynamics, valve timings, variable systems.  
 Detailed study of turbulent combustion and emission formation in diesel engines.  
 New combustion concepts.  
 Alternative fuels: effect of fuel properties on power, efficiency and emissions.  
 New concepts: focus on increasing efficiency while maintaining or further decreasing emissions.

**Initial competences**

Successfully completed the course 'Displacement Pumps, Compressors and IC Engine Fundamentals' or acquired the competences in another way

**Final competences**

- 1 Synthesize, present and explain scientific literature on internal combustion engines
- 2 Explain trends in internal combustion engine technologies and fuels
- 3 Process and interpret advanced engine measurements

**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**

Group work, Lecture, Practical

**Extra information on the teaching methods**

Theory lessons, presentation in small groups of scientific paper, lab works

**Study material**

Type: Slides

Name: -

Indicative price: Free or paid by faculty

Optional: no

Language : English

Number of Slides : 300

Oldest Usable Edition : 2024

Available on Ufora : Yes

Online Available : Yes

Available in the Library : No

Available through Student Association : No

**References**

Introduction to Internal Combustion Engines, Richard Stone, Palgrave Macmillan

**Course content-related study coaching****Assessment moments**

end-of-term and continuous assessment

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

Oral assessment

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

Oral assessment

**Examination methods in case of permanent assessment**

Skills test, Assignment

**Possibilities of retake in case of permanent assessment**

examination during the second examination period is possible in modified form

**Extra information on the examination methods**

During examination period: oral open-book exam. During semester: graded presentation and lab sessions.

**Calculation of the examination mark**

$(\text{Engine dismantling} * 1 + \text{lab report} * 4 + \text{group presentation} * 7.5 + \text{oral exam} * 7.5) / 20$