

## Thermal Installations (E028700)

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

**Credits 6.0**

**Study time 180 h**

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

Offering	Language	Location	Teaching Methods	Hours
A (semester 1)	English	Gent	lecture	30.0h
			excursion	8.75h
B (semester 1)	Dutch	Gent	excursion	8.75h

**Lecturers in academic year 2024-2025**

De Paepe, Michel	TW08	lecturer-in-charge
Lecompte, Steven	TW08	co-lecturer

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

Programme	crdts	offering
<a href="#">Bridging Programme Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)</a>	6	A
<a href="#">Bridging Programme Master of Science in Chemical Engineering</a>	6	A
<a href="#">Master of Science in Electromechanical Engineering(main subject Control Engineering and Automation)</a>	6	A
<a href="#">Master of Science in Electromechanical Engineering(main subject Maritime Engineering)</a>	6	A
<a href="#">Master of Science in Electromechanical Engineering(main subject Mechanical Construction)</a>	6	A
<a href="#">Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)</a>	6	B
<a href="#">Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)</a>	6	A
<a href="#">Master of Science in Chemical Engineering</a>	6	B
<a href="#">Master of Science in Chemical Engineering</a>	6	A

**Teaching languages**

English, Dutch

**Keywords**

THERMAL INSTALLATIONS

heat exchangers, two phase gas liquid flow, flow regimes, Heat transfer and pressure drop during evaporation and condensation, Steam technology, combined-heat-and-power, cryogenics

**Position of the course**

Insight in the thermal energy flows in industrial installations  
Design of heat exchangers (single and two phase flow) and installations and steam boilers  
Operational aspects of thermal systems in industry : CHP, steam networks and cryogenics

**Contents**

- Classification of heat exchangers
- Design of recuperators: Logarithmic temperature difference, NTU method, Non constant heat transfer coefficient
- Tubular heat exchangers: constructive aspects
- Shell and tube heat exchangers: constructive aspects
- Plate heat exchangers: constructive aspects
- Compact heat exchangers
- Fouling: Fouling types, Results of fouling
- Heat pipes

- Two phase flows: Flow regimes and pressure drop
- Condensation: Condensation modes, Condensers
- Boiling: Critical heat flux, pool boiling, flow boiling
- Steam boilers: Boiler classification, Circulation and construction
- Steam distribution: constructive aspects, steam traps
- Cryogenics
- Decentralised energy production: Combined heat and power

### Initial competences

Engineering Thermodynamics, Heat and combustion technique, Transport phenomena

### Final competences

- 1 Pointing out heat exchanger types and their properties
- 2 Designing heat exchangers
- 3 Using software for energy calculations
- 4 Understanding the physics of two phase gas liquid flow
- 5 Analysing complex thermal processes and cycles
- 6 Approaching energy use in an industrial context in a critical way both in a company and in society

### 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, Seminar, Excursion, Lecture

### Extra information on the teaching methods

Lecturing theory, guided exercises on heat exchangers design Excursions to companies  
Group work on two-phase flow and on design with software, report to be handed in  
2.14.0.0

### Study material

Type: Handbook

Name: Heat Exchangers: Selection, Rating, and Thermal Design, Third Edition 2012 by S CRC press

Indicative price: € 50

Optional: no

Author : Sadik Kakaç Hongtan Liu, Anchasa Pramuanjaroenkij

Online Available : No

Available in the Library : Yes

Available through Student Association : Yes

Usability and Lifetime within the Course Unit : regularly

Usability and Lifetime within the Study Programme : one-time

Usability and Lifetime after the Study Programme : regularly

Type: Syllabus

Name: Pdfs of chapters of books which are provided on Ufora

Indicative price: Free or paid by faculty

Optional: no

Available on Ufora : Yes

Online Available : No

Available in the Library : No

Available through Student Association : No

### References

- Fundamentals of heat exchanger design, Shah, Sekulic, Wiley.
- Heat exchanger design handbook, Kuppan, Marcel Dekker.
- Int Journal of Applied Thermal Engineering
- Heat transfer Engineering
- ASME Heat Transfer
- Int Journal of Heat and Mass Transfer

### 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, Written assessment

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

Written 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 not possible

**Extra information on the examination methods**

During examination period: written theory closed-book exam, ;exercices exam open book  
reports on projects: 1 on heat exchanger design, 1 on two phase flow design

**Calculation of the examination mark**

PE1 reports 4/20 oral theory exam 4/20 exercises exam 12/20

PE2 exercises exam 20/20