GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Thermal Energy: Sustainable Application in Industry and Buildings (E741070)

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 2025-2026

A (semester 2)	Dutch	Gent	lecture
			seminar

Lecturers in academic year 2025-2026

Lecompte, Steven	TW08	lecturer-in-charge
Verhelst, Sebastian	TW08	co-lecturer

Offered in the following programmes in 2025-2026	**crdts**	**offering**
Master of Science in Electromechanical Engineering Technology	6	A

Teaching languages

Dutch

Keywords

Thermal machines; Organic Rankine Cycles; Carnot batteries; active cooling; passive cooling; partial load operation; low-grade heat; residual heat; trigeneration; techno-economic analysis; thermal storage

Position of the course

To provide the student with insight into the design and operation of thermal installations with an emphasis on integrated solutions. This course is part of the learning line thermal energy.

Contents

- Thermal storage
- Using low-quality heat
  - Organic Rankine cycles (ORC)
  - Heat pumps
  - Absorption and adsorption cooling
- Passive and active cooling
- Part load operation of thermal machines
- Carnot batteries
- Fuel cells
- Trigeneration
- E-fuels
- Techno-economic analysis
- Cases in industry and buildings

Initial competences

This course makes use of a number of competences from the courses: heat and fluid dynamics, flow machines and thermal energy: installation components.

Final competences

1 To recognize different types of thermal storage and to be able to name and evaluate their characteristics.
2 Being able to perform a techno-economic analysis of thermal machines.
3 To be able to describe part-load operation of thermal machines and to correctly interpret the influence on the design.
4 To be able to develop an integrated design of thermal systems to meet the thermal energy needs in industrial processes and buildings.

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, Lecture

Extra information on the teaching methods

Lectures are provided explaining the theory and introducing the group assignment. In the seminar, a number of cases will be discussed that are used as examples for the group assignment.
The group assignment consists of making an extended abstract and giving a presentation on the topic of a novel sustainable thermal technology. There is also a practical assignment on a heat pump test-rig.

Study material

None

References

- Principles of Heating, Ventilation, and Air Conditioning in Buildings, Mitchell and J.E. Braun
- The Thermoeconomics of Energy Conversions, Yehia, M. El-Sayed
- Industrial Refrigeration Handbook, W. Stoecker

Course content-related study coaching

Appointment or through communication via email or Ufora.

Assessment moments

continuous assessment

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

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

Examination methods in case of permanent assessment

Presentation, 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

- Report and presentation of group assignmen.

Calculation of the examination mark

- 10/20 group assignment (extended abstract & practicum)
- 5/10 yearly work
- 5/20 presentation group assignment

Second examination period: 20/20 group assignment report