GHENT UNIVERSITY

# Course Specifications

Valid as from the academic year 2025-2026

## Thermal Cycles: Sustainable Energy Conversion, Heating and Cooling (E032720)

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

**Credits 3.0** **Study time 90 h**

**Course offerings in academic year 2027-2028**

A (semester 1) English Gent

**Lecturers in academic year 2027-2028**

| | | |
|---|---|---|
| Lecompte, Steven | TW08 | lecturer-in-charge |

| **Offered in the following programmes in 2027-2028** | **crdts** | **offering** |
|---|---|---|
| Master of Science in Electromechanical Engineering | 3 | A |
| Master of Science in Mechanical and Electrical Systems Engineering | 3 | A |

**Teaching languages**

English

**Keywords**

Heat pumps, organic Rankine cycles (ORC), refrigeration technology, refrigerants, renewable residential heating, renewable industrial process heating

**Position of the course**

This is an advanced academic elective course in the learning line thermo-fluids

**Contents**

- Heat pumps for industrial and residential heating and cooling
- Chillers: compression, absorption, part load behaviour, shut down
- Organic Rankine cycle technology
- Principles of comfort and indoor air quality in buildings
- Energy balance of a building, introduction to building physics
- Overview of thermal energy use in industry
- Introduction to performing dynamic simulations of thermal cycles in Dymola

**Initial competences**

- Transport Phenomena
- Technical Thermodynamics
- Heat and Flow Engineering

**Final competences**

1 Understanding and describing components of a thermal system (heat pump, chillers, ORC)
2 Describing part load and off-design behaviour of thermal systems (heat pump, chillers, ORC)
3 Understanding Energy performance of building, building systems and components
4 Having a grasp of the overall thermal energy needs in industry
5 Being able to perform dynamic simulations and energy performance calculations in Dymola
6 Reporting on design and energy performance

**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**

- The theory is taught in lectures.
- In the seminar the software package Dymola is introduced.
- The students will individual report on an assignment following on the seminar.

**Study material**

None

**References**

- The Thermoeconomics of Energy Conversions, Yehia, M. El-Sayed
- Industrial Refrigeration Handbook, W. Stoecker

**Course content-related study coaching**

- Interactive support through the electronic learning platform (forums, e-mail), in person: after agreement on date, fixed contact hour: immediately before and after lectures.
- Additional guidance by assistant for exercise classes.

**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**

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**

- Theory: oral exam (closed book

**Calculation of the examination mark**

* The end score (S) is determined as: S = 0.9*T + 0.1*E, with T the score for the theory exam and E the score for the assignment during the year.