

## Thermal Physics (C000104)

**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**

A (semester 2)

Dutch

Gent

seminar

lecture

**Lecturers in academic year 2024-2025**

Jachowicz, Natalie

WE05

lecturer-in-charge

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

[Bachelor of Science in Physics and Astronomy](#)

**crdts**

6

**offering**

A

**Teaching languages**

Dutch

**Keywords**

Thermal Physics, Thermodynamics, Statistical Mechanics, General Physics

**Position of the course**

This course unit belongs to the learning pathway "General physics" in the Bachelor program Physics and Astronomy.

The objective of this course is the derivation of the laws of thermodynamics starting from observed phenomena, via a rigorous mathematical formulation of the laws of thermal physics, and is supported by numerous examples and problems. Further, a microscopic approach of thermal physics is presented based on introductory statistical mechanics. The importance of this course resides in initiating the student in building up a logical development of the thermodynamics and getting acquainted with a statistical microscopic approach. The global basic physics also aims at stimulating the student to physical thinking.

**Contents**

Part I. Macroscopic description : Thermal equilibrium and temperature - some simple thermodynamic systems - work - heat and the first law of thermodynamics - thermal engines and second law of thermodynamics - reversibility, Kelvin temperature and the third law of thermodynamics - entropy - some important thermodynamic functions and equations.

Part II. Microscopic description : Kinetic gas theory - statistical mechanics and thermal properties of gases - quantum statistics and thermal properties of solids - non-equilibrium states and transport phenomena

**Initial competences**

This course builds on the Mechanics courses, but requires also an elementary knowledge of Electricity and Magnetism and Quantum Mechanics.

**Final competences**

- 1 The student knows the concepts of thermodynamics and thermal physics and is able to describe them.
- 2 The student masters the techniques of thermodynamics and thermal physics and is able to apply them.
- 3 The student is able to indicate and describe the connection between the macroscopic and microscopic description of a system.
- 4 The student shows insight in the microscopic-statistical description of thermodynamic systems.
- 5 The student is able to develop a microscopic model for simple systems.
- 6 Being able to use the terminology in an appropriate way.

- 7 Showing accuracy, physical intuition, creativity and a critical attitude in problem solving.  
Being able to work in a team to solve problems.
- 8 Showing insight in social aspects of the energy problem.

### 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, Lecture, Independent work

### Extra information on the teaching methods

- Theory: oral class - Electronic Applets and real demonstrations
- Problem sessions: student presentation of solved problems under guidance
- Electronic interaction via Ufora

### Study material

Type: Syllabus

Name: Thermische Fysica  
Indicative price: Free or paid by faculty  
Optional: no  
Language : Dutch  
Oldest Usable Edition : nvt  
Available on Ufora : Yes  
Online Available : Yes  
Available in the Library : No

Type: Slides

Name: Thermische Fysica  
Indicative price: Free or paid by faculty  
Optional: yes  
Available on Ufora : Yes

### References

(recommended)

- M.W. Zemansky and Dittman, Heat and Thermodynamics, Mc Graw-Hill, New York (1981)
- M. Alonso and E.J. Finn, Fundamentele natuurkunde - deel 6 : Statistische fysica,
- Douglas C. Giancoli, Natuurkunde deel 1 Pearson, ISBN 90-430-1324-6
- H. Gould and J. Tobochnik, Thermal and Statistical Physics, <http://stp.clarku.edu/notes/>

### Course content-related study coaching

Students can test their knowledge and problem solving skills in thermal physics during the problem sessions. Extra explanation can be obtained by e-mail or by personal contact after each class or by appointment. Interaction with teaching staff or among the students is possible via Ufora.

### Assessment moments

end-of-term assessment

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

Oral assessment, Written assessment with open-ended questions

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

Oral assessment, Written assessment with open-ended questions

### Examination methods in case of permanent assessment

### Possibilities of retake in case of permanent assessment

not applicable

### Extra information on the examination methods

- Written examination to evaluate the knowledge and insight,
- and oral examination to evaluate insight in the matter.
- Open book written examination : problems

### Calculation of the examination mark

Periodic evaluation: 100%