GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2024-2025

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	**crdts**	**offering**
Bachelor of Science in Physics and Astronomy	6	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%