GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2025-2026

General Physics (C003607)

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

Credits 6.0 **Study time 165 h**

Course offerings and teaching methods in academic year 2025-2026

A (semester 2)	Dutch	Gent	seminar
			lecture

Lecturers in academic year 2025-2026

Vrielinck, Henk	WE04	lecturer-in-charge
Filez, Matthias	WE04	co-lecturer

Offered in the following programmes in 2025-2026	**crdts**	**offering**
Bachelor of Science in Mathematics	6	A

Teaching languages

Dutch

Keywords

Basic concepts of mechanics, geometrical optics, relativistic kinematics and dynamics, basic concepts of oscillations and waves, electric and magnetic interactions, electromagnetism, Maxwell equations

Position of the course

The aim of this course is, in parallel with and in mutual consultation with the professor of the course of "Theoretical mechanics", the study of the basic laws of physics with the emphasis on electricity and magnetism. Next to the electromagnetic phenomena, a number of topics are treated which are of particular interest for students in mathematics: basics of mechanics from an experimental viewpoint, geometrical optics, elements of oscillations and waves and relativistic mechanics. This course ends with the Maxwell equations.
The content is in agreement with the general objectives of the Bachelor in Mathematics, i.e., an introduction to areas where mathematics is applied and to develop the abstraction ability in dealing with physico-mathematical models.

Contents

Chapter 1: Mechanics - Kinematics and Dynamics.
Basic concepts of mechanics from an experimental point of view, position, velocity and acceleration vectors, Newton's laws, units, dimensions, dimension checking
Chapter 2: Conservation of linear and angular momentum.
Centre of mass and its motion, conservation of linear momentum, conservation of angular momentum, interaction between particles
Chapter 3: Work and energy.
Work, power, kinetic and potential energy, conservative systems, friction forces
Chapter 4:Dynamics of oscillations
Undamped and damped oscillations, forced oscillation
Chapter 5: Relative motion.
Relative translation and rotation, Galilei and Lorentz transformation, length contraction and time dilatation
Chapter 6: Relativistic mechanics.
Classical relativity principle, special relativity principle, linear momentum, force, energy, transformation of energy and linear momentum, transformation of force

Chapter 7: Electric Interactions.

Charge, Coulomb's law, electric field, quantisation of the electric charge, electrical structure of matter, the atom, electric potential, energy relations in an electric field, electric current, electric dipole, higher order electric multipoles.

Chapter 8: Magnetic Interactions.
Magnetic force on a moving charge, motion of a charge in a magnetic field, magnetic force on a current, magnetic couple for a coil, magnetic field caused by a current through a conducting wire, magnetic field of a narrow, long, and straight conducting string wire, forces exerted between currents, magnetic field of a circular conducting coil, magnetic field of a moving charge (non-relativistic), relation between electromagnetism and the principle of relativity, the electromagnetic field of a moving charge.

Chapter 9: Static Electromagnetic Fields.
Flux of a vector field, Gauss' law for the electric field in vacuum, differential form of Gauss' law, electric capacity, condensators, energy of the electric field, electric conductivity, Ohm's law, electromotoric force, Ampère's law for the magnetic field, Ampère's law in differential form, magnetic flux, review of the laws for static fields.

Chapter 10: Time-dependent Elektromagnetic Fields.
Faraday's law, electromagnetic induction caused by the relative motion of a conductor and a magnetic field, electromagnetic induction and the principle of relativity, electric potential and electromagnetic induction, Faraday's law in differential form, selfinduction, energy of the magnetic field, conservation of charge, Maxwell's law, Maxwell's law in differential form, equations of Maxwell.
Chapter 11:Waves.
Wave propagation, mathematical description of a wave, Fourier-analysis of wave motion, Differential equation of wave motion, Doppler effect
Chapter 12: Geometrical optics.
Laws of reflection and refraction, image formation with mirrors and lenses, microscope and telescope, Fermat's principle

Initial competences

Analysis and vector calculus.

Final competences

1 Knowledge of and insight in certain parts of general physics: geometrical optics, classical mechanics, relativistic kinematics and dynamics, oscillations and waves, and electromagnetism.
2 Being able to analyse and model simple physical problems, and to apply mathematical knowledge in this.

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

Theory: oral presentation supported by demonstrations, applets, Powerpoint and internet.
Exercises: guided.
ICT: Ufora, Powerpoint.

Study material

Type: Syllabus

Name: General Physics
Indicative price: € 7
Optional: no
Language : Dutch
Number of Pages : 220
Oldest Usable Edition : edition 2023-2024
Available on Ufora : Yes

Online Available : No
Available in the Library : No
Available through Student Association : Yes
Additional information: The syllabus contains the theory to be known for the exam and the problems that are solved in the exercises. Students need a copy on paper, because this may be used during the exercises-part of the exam. The syllabus is distributed by WiNA.

Type: Slides

Name: General physics - Slides
Indicative price: Free or paid by faculty
Optional: yes
Language : Dutch
Available on Ufora : Yes
Additional information: Next to the syllabus, slides supporting the lectures are available on UFORA. They contain the same information as the syllabus. These slides cannot be used on the exam, there is no need to print them.

References

"Mechanica", Deel 1, "Fundamentele Natuurkunde", M. Alonso en E.J. Finn, Delta Press, ISBN 90 6674 607 6.
"Elektromagnetisme", Deel 2, "Fundamentele Natuurkunde", M. Alonso en E.J. Finn, Delta Press, ISBN 90 6674 604 1.

Course content-related study coaching

During the theory lessons, fundamental concepts are explained to get insight into this matter. During the exercises, the students' attitudes and aptitudes are developed proper to this course.
The possibility exists to get oral explanations by the teacher, assistant and monitor.
Interaction via Ufora occurs frequently.

Assessment moments

end-of-term assessment

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

Written assessment with open-ended questions

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

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

The theoretical part of the exam is "closed book". For the exercises (open book), only the syllabus can be used.
It is checked whether the students master the content of the course, but also (e.g., via exercises) if they have acquired an operational knowledge (cfr. final objective "to be able to acquire new knowledge and to integrate this in already available knowledge and aptitudes). The quality of the written report is evaluated as one of the objectives for the education.

Calculation of the examination mark

Theoretical part (closed book) : 2/3 of the total
Exercises (open book = syllabus) : 1/3 of the total