GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Electricity and Magnetism (C004207)

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

Credits 5.0 **Study time 150 h**

Course offerings and teaching methods in academic year 2026-2027

A (semester 2)	Dutch	Gent	seminar
			lecture

Lecturers in academic year 2026-2027

Van Waeyenberge, Bartel	WE04	lecturer-in-charge

Offered in the following programmes in 2026-2027	**crdts**	**offering**
Bachelor of Science in Physics and Astronomy	5	A

Teaching languages

Dutch

Keywords

Electric and magnetic interactions, electromagnetism, equations of Maxwell.

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 study of the static and dynamic electric and magnetic fields, of the physical phenomena causing them and of the equations of Maxwell which describe them. This is to be seen in the context of the objectives of the bachelor physics and astronomy, i.e. to lead to the knowledge of the basic physical concepts and to the capacity to develop abstract physico-mathematical models for the experimental observations.

Contents

- Charge, Coulomb's law, electric field, quantisation of the electric charge, electrical structure of matter, the atom, electric dipole, higher order electric multipoles.
- Flux of a vector field, Gauss' law for the electric field in vacuum, differential form of Gauss' law
- Electric potential, energy relations in an electric field, electric current
- Polarisation of matter, dielectric displacement, electric susceptibility, electric capacity, condensators, energy of the electric field, electric conductivity
- Ohm's law, electromotoric force
- Magnetic force on an moving charge, motion of a charge in a magnetic field, equipment in which charged particles move 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 wire, forces exerted between currents, magnetic field of a circular conducting coil
- Ampère's law for the magnetic field, Ampère's law in differential form, magnetic flux, magnetisation of matter, magnetic field, magnetic susceptibility
- 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, Farady's law in differential form, energy of the magnetic field
- Mutual and self induction, electrical oscillations, alternating currents in circuits-complex representation, mean and effective values of alternating currents, mean

power, coupled circuits
- Maxwell's law, Ampère-Maxwell's law in differential form, Maxwell's equations.

Initial competences

Classical and relativistic kinematics and dynamics, analysis.

Final competences

1 To found the core concepts and methods in physics and use them on a fitting level of abstraction.
2 To possess and manage thorough knowledge of classical physics and astronomy.
3 To get a broad basic and practical knowledge of mathematics useful for solving problems in physics and astronomy.

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: lectures with live demonstrations and quizes to enhance the interactivity
- Excersis: interactive session under guidance of a teaching assistant

Study material

Type: Handbook

Name: Physics, part 2, Electricity, magnetism, optics and modern physics, 5e edition
Indicative price: € 90
Optional: no
Language : Dutch
Author : Douglas C. Giancoli
ISBN : 978-9-04303-872-0
Number of Pages : 940
Available through Student Association : Yes

Type: Syllabus

Name: Additional notes on auxillary fields.
Indicative price: Free or paid by faculty
Optional: no
Language : Dutch
Number of Pages : 12
Available on Ufora : Yes

Type: Slides

Name: Lectures
Indicative price: Free or paid by faculty
Optional: yes
Language : Dutch
Number of Slides : 500
Available on Ufora : Yes

References

Course content-related study coaching

During theory lectures, fundamental concepts are introduced to get insight in this matter. During the exercises, the student's attitudes and aptitudes are developed proper to this course. Interactive feedback is enhanced by Ufora.

Assessment moments

end-of-term assessment

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

Written assessment with multiple-choice questions, Written assessment with open-ended questions

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

Written assessment with multiple-choice questions, 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

- Theory : a combination of multiple choice questions to test the fundamental insight and scientific thinking and open questions to test the knowledge; possibility to give oral elucidation
- Exercises : written with open questions

Calculation of the examination mark

- Theory: 50% (35% open questions, 15% MC)
- Exercises: 50%