

## 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 2024-2025**

A (semester 2)	Dutch	Gent	seminar lecture
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**Lecturers in academic year 2024-2025**

Van Waeyenberge, Bartel	WE04	lecturer-in-charge
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**Offered in the following programmes in 2024-2025**

<a href="#">Bachelor of Science in Physics and Astronomy</a>	5	A
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**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 quizzes to enhance the interactivity
- Excercises: 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%