

Electricity and Magnetism (C000537)

Course size (nominal values; actual values may depend on programme)
Credits 6.0 Study time 180 h Contact hrs 52.5 h

Course offerings and teaching methods in academic year 2018-2019

Offering	Language	Teaching Method	Hours
A (semester 2)	Dutch	seminar: coached	22.5 h
		exercises	
		lecture	27.5 h
		demonstration	2.5 h

Lecturers in academic year 2018-2019

Van Waeyenberge, Bartel WE04 lecturer-in-charge

Offered in the following programmes in 2018-2019

Programme	crdts	offering
Bachelor of Science in Physics and Astronomy	6	A

Teaching languages

Dutch

Keywords

Electric and magnetic interactions, electromagnetism, equations of Maxwell

Position of the course

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 courses 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 a 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,
- Magnetic field of a moving charge (non-relativistic), relation between electromagnetism and the principle of relativity, the electromagnetic field of a moving

- charge, the electromagnetic interaction between two moving charges.
- Maxwell's law, 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 basic methods and use them on a fitting abstraction level.
- 2 To possess and manage thorough knowledge of classical physics and astronomy.
- 3 To get a broad basic and practical knowledge of mathematics useful to solve physical and astronomical problems.

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

Demonstration, lecture, seminar: coached exercises

Extra information on the teaching methods

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

Learning materials and price

D.C. Giancoli, Natuurkunde, deel II Elektriciteit, magnetisme, optica en moderne fysica
 ISBN 9781447978688, cost € 75.
 Additional lecture notes available online.

References

Course content-related study coaching

During theory courses, fundamental concepts are exposed 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 Minerva.

Evaluation methods

end-of-term evaluation

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

Written examination with open questions, written examination with multiple choice questions, oral examination

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

Written examination with open questions, written examination with multiple choice questions, oral examination

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation

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
- Excersis : written with open questions

Calculation of the examination mark

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