

Electromagnetism (C002133)

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

Credits	6.0	Study time	180 h	Contact hrs	45.0 h
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Course offerings and teaching methods in academic year 2018-2019

A (semester 2)	Dutch	seminar: coached	15.0 h
		exercises	30.0 h
		lecture	

Lecturers in academic year 2018-2019

Haegeman, Jutho	WE05	lecturer-in-charge
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Offered in the following programmes in 2018-2019

	crdts	offering
Bachelor of Science in Physics and Astronomy	6	A
Bachelor of Science in Mathematics	6	A
Preparatory Course Master of Science in Physics and Astronomy	6	A

Teaching languages

Dutch

Keywords

Maxwell equations, electromagnetic potentials, electrostatics, magnetostatics, electromagnetic waves, radiation

Position of the course

This course offers a theoretical supplement to the treatment of electromagnetism in the basic course of general physics. The mathematical modeling of the theory thereby plays a central role. Students learn how the more descriptive approach to the subject, encountered in the general physics course, can be put into a more general, abstract setting. By means of the appropriate mathematical formalism they are then stimulated to look for solutions of concrete physical problems and they also learn how to interpret these solutions.

Contents

Basic equations of electromagnetism : Maxwell equations and conservation laws, potentials, gauge transformations, method of retarded potentials.
Electrostatics and magnetostatics.
Electromagnetic waves in isotropic media, anisotropic media, conductors and plasmas.
Fields and radiation of moving charges.
Relation between the microscopic and macroscopic Maxwell theory.

Initial competences

For the electromagnetism course it suffices that the students have a basic knowledge of analysis, vector analysis and of the phenomenological aspects of electromagnetism as presented in the general physics course.

Final competences

- 1 The students are imparted some insight into the general methodology of classical electromagnetism.
- 2 They acquire the necessary basic knowledge that is needed for a more advanced study of the subject on the one hand, and that will enable them to tackle the applications of electromagnetism encountered in other branches of theoretical physics, on the other hand.
- 3 As far as the mathematical formalism is concerned, they acquire some familiarity with the use of certain specific concepts and techniques, such as: Fourier transforms, distributions, Green functions and Legendre polynomials.

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

Lecture, seminar: coached exercises, seminar: practical PC room classes

Extra information on the teaching methods

Exercises: guided tutorials; some of these tutorials may also take place in the computer class, in order to allow the students to make use of the computer algebra package Maple.

Learning materials and price

A syllabus (pdf) is available via the e-learning platform.

References

John D. Jackson: Classical Electrodynamics (3rd edition), John Wiley & Sons (1999)

Course content-related study coaching

Students may always consult the lecturer and assisting staff when they have questions regarding the theory and/or exercises. The use of e-mail and of other electronic means (such as a learning platform) will be encouraged, but the personal contact between lecturer and student will always play an important role.

Evaluation methods

end-of-term evaluation

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

Written examination with open questions, open book examination

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

Written examination with open questions, open book 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: written exam (students may thereby use a list of basic formulas - the main goal is to test their insight into the material).

Exercises: written exam (open book)

Calculation of the examination mark

Periodical examination (100%)

50% Theory

50% Exercises