GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2015-2016

Materials and Fields (E021110)

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

Credits	6.0	Study time	180 h
Contact hrs	60.0 h		

Course offerings and teaching methods in academic year 2016-2017

A (semester 1)	Dutch	lecture	30.0 h
		seminar: coached	25.0 h
		self-reliant study	5.0 h

Lecturers in academic year 2016-2017

Beeckman, Jeroen	TW06	lecturer-in-charge

Offered in the following programmes in 2016-2017	crdts	offering
Bachelor of Science in Engineering Physics	6	A
Bridging Programme Master of Science in Engineering Physics	6	A

Teaching languages

Dutch

Keywords

Maxwells equations, electromagnetic fields and forces, polarization, magnetization

Position of the course

The student will learn classical electromagnetic field theory and its engineering applications. Starting from the microscopic equations in vacuum, Maxwell's macroscopic equations in moving material media are formulated. The student will learn how these equations can be transformed into boundary value problems. During the problem solving sessions the student will learn to solve simple field problems, in particular by solving these boundary value problems.

Contents

- Maxwell's equations: microscopic fields, macroscopic fields
- Solving field problems: static field problems, general solution methods, quasistatic field problems
- Forces and energy: electromagnetic forces, energy
- Polarization: local field, microscopic theory of polarisation
- Magnetization: dia- and para-magnetism, ferro-magnetism

Initial competences

Good knowledge of the fundamental concepts of electric and magnetic fields (terminology and simple field patterns). Basic knowledge of the laws of mechanics. Good knowledge of calculus (vectorcalculus, nablacalculus, differential equations, volume integral, surface integral, line integral, delta-function). Practice with Maple.

Final competences

1 Good knowledge of the fundamentals of quasi-stationary electromagnetic fields.
2 Good knowledge of elementary models for modeling mechanisms of polarization and magnetization in materials.
3 Insight into the relation between microscopic and macroscopic fields and forces.
4 Turning a quasi-stationary electromagnetic field problem into a boundary value problem.
5 Solving elementary electromagnetic field 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

Lecture, self-reliant study activities, seminar: coached exercises

Learning materials and price

Syllabus, dutch, tentative price 7.5 euro (late orders 10 euro).

References

- Jackson, John David, Classical electrodynamics., New York (N.Y.) : Wiley, 1999. ISBN: 0-471-30932-X Location: T56.VO054

Course content-related study coaching

The teacher is availabe before and after the lectures or an appointment can be made.

Evaluation methods

end-of-term evaluation and continuous assessment

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

Written examination with open questions

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

Written examination with open questions

Examination methods in case of permanent evaluation

Assignment

Possibilities of retake in case of permanent evaluation

examination during the second examination period is not possible

Extra information on the examination methods

During examination period: theory: written closed-book exam; problems: written open-book exam.
During semester: a single homework report, during second halve of semester.

Calculation of the examination mark

1 homework assignment to be solved on computer (10% of the marks). Theory exam (50% of the marks). Problems exam (40% of the marks).