GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2022-2023

Electromagnetism I (E022110)

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

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 2022-2023

A (semester 1)	Dutch	Gent	seminar	60.0 h

Lecturers in academic year 2022-2023

Vande Ginste, Dries	TW05	lecturer-in-charge

Offered in the following programmes in 2022-2023	**crdts**	**offering**
Bachelor of Science in Engineering (main subject Biomedical Engineering)	6	A
Bachelor of Science in Engineering (main subject Engineering Physics)	6	A
Bridging Programme Master of Science in Engineering Physics	6	A
Preparatory Course Master of Science in Biomedical Engineering	6	A

Teaching languages

Dutch

Keywords

Maxwell's equations, plane waves, multiconductor lines and waveguides, 2D phenomena, Green's function.

Position of the course

Providing insight in electromagnetic wave phenomena. Providing a number of basic electromagnetic principles and theorems. One- and two-dimensional analytic solutions of Maxwell's equations. Basic concepts and study of closed electromagnetic waveguides and transmission line representation. Transmission lines: reflection, loading, input impedance, Smith chart, pulses. To introduce some numerical solutions of Maxwell's equations and to use one of these techniques through a project exercise.

Contents

- General 3D problems: Potentials, reciprocity, constitutive equations, ...
- Plane waves
- Two-dimensional phenomena
- Electromagnetic waveguides and multiconductor lines
- Transmission lines: load impedance, input impedance, reflection, Smith chart, standing waves, pulse reflection
- Numerical electromagnetism: Numerical project

Initial competences

Physics II

Final competences

1 To be able to describe, understand and discuss wave propagation in free space and in waveguides.
2 To understand and to be able to obtain Green's functions for general free space current sources and for 2D problems.
3 To understand, calculate and determine voltage and current behaviour on transmission lines.

4 To be able to program a numerical technique as applied to a "simple" wave problem.

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, project, seminar, self-reliant study activities, lecture: plenary exercises, seminar: coached exercises

Extra information on the teaching methods

The course consists of lectures about theory and exercises, without making a strict, traditional distinction between them. All lectures are seminars which require interaction with and input from the students. During the semester a numerical problem must be tackled and programmed in Python. The results of this project are written down in a report.

Learning materials and price

course notes: hardcopy via VTK (approx. 10 EUR) / electronic version via Ufora for free

References

- geen

Course content-related study coaching

Questions can be asked, e.g., after each lecture, via email, or by making an appointment

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, written examination

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

Written examination with open questions, written examination

Examination methods in case of permanent evaluation

Report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

During examination period: written closed-book exam; written open-book exam - problems
During semester: graded project reports.

Calculation of the examination mark

Project counts for 20% of the total score. Project score can be carried over to second examination period but if wanted, the student can submit a new project. For both parts (project during semester and exam during examination period), a minimum score of 40% must be obtained. The total score is the weighted average of both parts, but the total score cannot exceed 8/20 if the previously formulated condition is not met.