GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2023-2024

Electromagnetism I (E022110)

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

Credits 6.0 **Study time 180 h**

Course offerings and teaching methods in academic year 2023-2024

Lecturers in academic year 2023-2024

Vande Ginste, Dries	TW05	lecturer-in-charge

Offered in the following programmes in 2023-2024	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

Group work, lecture, seminar, independent work

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

Assessment moments

end-of-term and continuous assessment

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

Written assessment, written assessment with open-ended questions

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

Written assessment, written assessment with open-ended questions

Examination methods in case of permanent assessment

Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible

Extra information on the examination methods

During examination period: written closed-book exam - theory; written open-book exam - exercises
During semester: graded project reports + code.

Calculation of the examination mark

The project counts for 20% of the total score. The project score can be carried over to second examination period but if wanted, the student can submit a new project. The exam counts for 80% of the total score. The total score will be a weighted average of the two partial scores.
For the project (during the semester) and for both aspects of the exam (during the examination period), i.e. the theory part and the exercise part, a minimum score of 40% must be obtained. When the score of one of these three parts is less than 40%, the maximum total score cannot exceed 8/20.