

## Antennas and Propagation (E022230)

**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 2025-2026

A (semester 1)	English	Gent	seminar practical lecture independent work	0.0h
B (semester 1)	Dutch	Gent	lecture	0.0h

### Lecturers in academic year 2025-2026

Rogier, Hendrik TW05 lecturer-in-charge

### Offered in the following programmes in 2025-2026

	crdts	offering
Bridging Programme Master of Science in Electrical Engineering(main subject Communication and Information Technology )	6	A
Bridging Programme Master of Science in Electrical Engineering(main subject Electronic Circuits and Systems )	6	A
Master of Science in Electrical Engineering (main subject Communication and Information Technology )	6	A
Master of Science in Electromechanical Engineering(main subject Control Engineering and Automation)	6	A
Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)	6	A
Master of Science in Electrical Engineering (main subject Electronic Circuits and Systems)	6	A
Master of Science in Electromechanical Engineering(main subject Maritime Engineering)	6	A
Master of Science in Electromechanical Engineering(main subject Mechanical Construction)	6	A
Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)	6	A
European Master of Science in Nuclear Fusion and Engineering Physics	6	A
Master of Science in Electrical Engineering	6	B
Master of Science in Photonics Engineering	6	A

### Teaching languages

English, Dutch

### Keywords

antennas, radiowave propagation, smart antenna systems

### Position of the course

This course provides an in-depth treatment of the physics of wireless interconnections, indoor and outdoor radiowave propagation and antennas. Special attention is devoted to mobile communication channels, antenna arrays and smart antenna systems.

### Contents

- Chapter 1: Antennas
- Chapter 2: Radiowave propagation
- Chapter 3: Antenna arrays
- Chapter 4: Multibeam and adaptive antennas

**Initial competences**

Having successfully completed the courses on "Applied Electromagnetics" and "Probability and Statistics", or having acquired the final competences provided by these courses in any other way.

**Final competences**

- 1 Computer-aided design antennas based on the Friis formula
- 2 Analyse full-wave problems based on the integral equation solved by the method of moments
- 3 Have insight into the radiation mechanisms of wire antennas, horn antennas, planar antennas and reflector antennas
- 4 Have insight into radiowave propagation in mobile communications systems, distinguish between path loss, shadowing, and fading, including frequency-selective fading
- 5 Have insight into the radiation mechanisms of antenna arrays, including mutual coupling and phased arrays
- 6 Mitigate fading by means of diversity, including polarisation diversity
- 7 Have insight into intelligent antenna systems, multiple input multiple output systems and beam steering

**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**

Seminar, Lecture, Practical, Independent work

**Extra information on the teaching methods**

Classroom lectures; Classroom problem solving sessions; Flipped classroom with online contact sessions; Project: Computer-aided design of antennas; Lab on antenna measurements

**Study material**

Type: Syllabus

Name: Antennas and Propagation

Indicative price: € 10

Optional: no

Language : English

Number of Pages : 222

Oldest Usable Edition : 2024-2025

Available on Ufora : Yes

Online Available : No

Available in the Library : Yes

Available through Student Association : Yes

Additional information: Official Course Material

Type: Handouts

Name: Antennas and Propagation: Supplementary course material

Indicative price: Free or paid by faculty

Optional: no

Language : English

Number of Pages : 77

Oldest Usable Edition : 2024-2025

Available on Ufora : Yes

Online Available : No

Available in the Library : No

Available through Student Association : No

Usability and Lifetime within the Course Unit : intensive

Usability and Lifetime within the Study Programme : regularly

Usability and Lifetime after the Study Programme : occasionally

Additional information: Slides lectures Available on UFora

Type: Audiovisual Material

Name: Lecture Videos COVID

Indicative price: Free or paid by faculty

Optional: yes

Language : English

Available on Ufora : Yes

Online Available : No

Available in the Library : No

Available through Student Association : No

Usability and Lifetime within the Course Unit : not applicable

Usability and Lifetime within the Study Programme : one-time

Usability and Lifetime after the Study Programme : occasionally

Additional information: Lecture Videos COVID as background and backup material

**References**

C. A. Balanis, *Antenna Theory: Analysis and Design*, 3rd Edition, ISBN: 978-0-471-66782-7, John Wiley & Sons, Inc., Hoboken NJ, USA, May 2005.

Janaswamy, Ramakrishna, *Radiowave propagation and smart antennas for wireless communications*, Boston : Kluwer Academic Publishers, 2001. ISBN: 0-7923-7241-7 Location: TBBS.BESTELD

**Course content-related study coaching**

**Assessment moments**

end-of-term and continuous assessment

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

Oral assessment open-book, Written assessment open-book

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

Oral assessment open-book, Written assessment open-book

**Examination methods in case of permanent assessment**

Skills test, Assignment

**Possibilities of retake in case of permanent assessment**

examination during the second examination period is possible in modified form

**Extra information on the examination methods**

During examination period: oral open-book assessment; written open-book assessment - problems

During semester: graded project reports; graded lab sessions. Second chance:

Possible in adapted form

**Calculation of the examination mark**

Evaluation throughout semester as well as during examination period. Special conditions:  $\frac{1}{3}$  theory (oral exam - use of course material allowed) +  $\frac{1}{3}$  exercises (in writing - use of course material allowed) +  $\frac{1}{3}$  project project and lab reports. Students who eschew one or more parts of the assessment (part theory, part exercises and part project/lab) cannot obtain a pass mark for the course unit. Should the final mark be higher than  $\frac{7}{20}$ , it will be reduced to the highest non-passable mark (i.e.  $\frac{7}{20}$ ). When the student obtains less than  $\frac{8}{20}$  for at least one of the components (part theory, part exercises and part project/lab), they can no longer pass the course unit as a whole. If the total score does turn out to be a mark of ten or more out of twenty, this is reduced to the highest fail mark ( $\frac{9}{20}$ ).