

## 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 2023-2024**

Offering	Language	Location	Teaching Methods	Hours
A (semester 1)	English	Gent	lecture	
			practical	
			seminar	
			independent work	0.0h
B (semester 1)	Dutch	Gent	seminar: coached exercises	7.5h
			guided self-study	37.5h
			lecture	0.0h
			practicum	2.5h
			project	20.0h

**Lecturers in academic year 2023-2024**

Rogier, Hendrik

TW05

lecturer-in-charge

**Offered in the following programmes in 2023-2024**

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

### Learning materials and price

course notes (10EUR in print, free electronic version on UFora), english

### 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: 1/3 theory (oral exam - use of course material allowed) + 1/3 exercises (in writing - use of course material allowed) + 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 7/20, it will be reduced to the highest non-passable mark (i.e. 7/20). When the student obtains less than 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 (9/20).