

Course Specifications

Valid as from the academic year 2025-2026

High-speed Electronics (E033640)

Cours	se size	(nominal values; ac	tual values may d	lepend on programi	me)		
	Credits 6.0 Study time 180 h						
Course offerings and teaching methods in academic year 2025-2026							
	A (semester 2)	English		Gent	lect	ure	
		prac				tical	
	B (semester 2)	Dutch		Gent			
Lecturers in academic year 2025-2026							
	Bauwelinck, Johan				TW05	lecturer-in-ch	arge
	Torfs, Guy				TW05	co-lecturer	
Offered in the following programmes in 2025-2026					crdts	offering	
Bridging Programme Master of Science in Electrical Engineering(main subject					6	А	
	Communication and Information Technology) Prinding Programme Master of Science in Electrical Engineering(main subject Electropic					C	٨
	Bridging Programme Master of Science in Electrical Engineering(main subject Electronic Circuits and Systems) Master of Science in Electrical Engineering (main subject Communication and Information					6	A
						6	А
	Technology)						
	Master of Science in Electromechanical Engineering(main subject Control Engineering an Automation)				1 6	A	
		Electromechanical E	ngineering(main	subject Electrical P	ower	6	А
	Engineering)						
		Electrical Engineerin				6	Α
	Master of Science in	Electromechanical E	ngineering(main	subject Maritime Er	ngineering)	6	А
	Master of Science in Electromechanical Engineering(main subject Mechanical				6	А	
	Construction)	Electromechanical E		cubiect Mechanical	Eporav	6	٨
	Engineering)		nymeenny(man		Ellergy	0	A
		Electrical Engineerir	g			6	В
	Master of Science in	Photonics Engineeri	ng			6	А

Teaching languages

English, Dutch

Keywords

High-speed electronics, RF electronics, broadband analog electronics.

Position of the course

Second semester, first year of the master. High-speed Electronics deals with the design and modeling of microwave circuits and building blocks to create for example transmitters and receivers for mobile communication, wireless networks, high-speed interconnects and optical links. The course builds on the acquired basic knowledge of electronic circuit analysis and analog electronics, but it confronts the designer with the challenges that originate from the high frequency at which the circuit elements and their interconnections work. This course provides insight in the underlying theory and presents practical hands-on approaches using professional design software and laboratory equipment.

Contents

- Concepts and definitions in time and frequency domain.
- Circuit analysis: matrix representations, S-parameters, power gain and stability.

- From lumped to distributed elements: high-frequency models of passive components, transmission lines, broadband components, matching networks.
- Modeling of active components: parasitic elements, non-linear models, speed limitations.
- Low noise amplifiers: statistical properties of noise, physical noise sources, circuit representation, noise in linear circuits, LNA design.
- Power amplifiers: linear power amplifiers (A,B), tuned class C, high-efficiency power amplifiers D,E,F.
- Oscillators: oscillation conditions, phase noise, basic oscillator circuits, resonators and dielectric resonator oscillators
- Frequency conversion: mixing basics, non-linear systems as mixers, multiplying mixers, diode mixers.
- Recent research: circuit examples for wireless networks, broadband wired networks, fast interconnects and instrumentation applications,

Initial competences

Advanced analog electronics, small signal analysis of transistor circuits, notions on electromagnetism.

Final competences

- 1 Understand and apply high-frequency models, transmission lines, S-parameters, noise parameters and impedance matching.
- 2 Analyze and design of active and passive high-speed circuits

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, Practical, Independent work

Study material

Type: Syllabus

Name: High-speed electronics Indicative price: € 7 Optional: no Language : English Available on Ufora : Yes Available through Student Association : Yes

Type: Slides

Name: High-speed electronics Indicative price: € 8 Optional: no Language : English Available on Ufora : Yes Available through Student Association : Yes

Type: Software

Name: Keysight ADS Indicative price: Free or paid by faculty Optional: no Available on Athena : No Online Available : Yes Available in the Library : No Available through Student Association : No Usability and Lifetime within the Course Unit : regularly Usability and Lifetime within the Study Programme : regularly

Type: Other

Name: Lab assignments Indicative price: Free or paid by faculty Optional: no Language : English Available on Ufora : Yes

References

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

Written assessment

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

Written assessment

Examination methods in case of permanent assessment

Participation, Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Extra information on the examination methods

During examination period: written closed-book exam During semester: graded lab sessions, for which a second chance is not possible. The lab scores obtained will also count for the second chance exam if any.

Calculation of the examination mark

Continuous assessment 30%, end-of-term assessment 70%. If the score of the end-of-term assessment turns out to be a mark of less than 8/20, the weighted average is reduced to 7/20 (if it happens to be higher than this).