

Optical Communication Systems (E012420)

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 2)	English	Gent	seminar lecture practical
B (semester 2)	Dutch	Gent	

Lecturers in academic year 2025-2026

Morthier, Geert	TW05	lecturer-in-charge
Van Erps, Jurgen	VUB	co-lecturer

Offered in the following programmes in 2025-2026

	crdts	offering
Bridging Programme Master of Science in Photonics Engineering	6	A
Master of Science in Electrical Engineering (main subject Communication and Information Technology)	6	A
Master of Science in Electrical Engineering (main subject Electronic Circuits and Systems)	6	A
Master of Science in Electrical Engineering	6	B
Master of Science in Photonics Engineering	6	B
Master of Science in Photonics Engineering	6	A

Teaching languages

English, Dutch

Keywords

optical fibre, communication links

Position of the course

To acquire an understanding of the physical layer aspects of optical communication. To get to know the main components and understand their operation. To be able to take into account the component properties in the derivation of the system performance. Understanding of physical layer aspects of optical networks.

Contents

- Optical communication systems: introduction: Historical perspective, Basic concepts, Introduction to noise
- Optical fibers: Geometry, fabrication and wave propagation, Dispersion and losses, Non-linear effects
- Optical transmitters: Basic concepts, LEDs, Semiconductor lasers, Noise and dynamics
- Optical receivers: Photo detectors, Receiver noise, BER and receiver sensitivity
- Optical amplifiers: Basic concepts, Semiconductor optical amplifiers, Raman and Doped Fiber Amplifiers, Noise of optical amplifiers
- Introduction to communication systems: Architectures and limiting factors
- Dispersion management: Pre- and post compensation, Dispersion compensation
- Multi channel systems: Modulation and multiplexing, WDM systems, WDM components, TDM (optical)
- Introduction to access networks: Overview
- Introduction to solitons
- Introduction to coherent communication

Initial competences

Electromagnetism, photonics

Final competences

- 1 Knowing and understanding the main components and system concepts that are used in optical communication.
- 2 Being able to calculate signal to noise ratios for optical links.
- 3 Being able to design simple optical communication links.
- 4 Being able to use CAD tools for designing optical communication links.
- 5 Having acquired measurements skills with respect to optical communication.
- 6 Interpreting the datasheets of the most common optical communication components.

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

Study material

Type: Handbook

Name: Fiber-optic Communication Systems

Indicative price: € 100

Optional: no

Language : English

Author : Govind P. Agrawal

ISBN : 978-1-11973-736-0

Number of Pages : 544

Oldest Usable Edition : 4th

Online Available : Yes

Available in the Library : Yes

Available through Student Association : Yes

Usability and Lifetime within the Course Unit : regularly

Usability and Lifetime within the Study Programme : regularly

Usability and Lifetime after the Study Programme : occasionally

References

- "Fiber-Optic Communication Systems" van G. P. Agrawal, Wiley series in Microwave and Optical Engineering, 2002, 3rd edition (ISBN 0-471-21571-6).

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: written open-book exam complemented with oral examination.
- During semester: graded lab and simulation sessions and project. Frequency: 4 weeks.

Calculation of the examination mark

Exam: 70%, practica, simulations and project: 30%

