

## 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 2023-2024**

Offering	Language	Location	Teaching Methods
A (semester 2)	English	Gent	lecture seminar practical
B (semester 2)	Dutch	Gent	
O (semester 2)	English	Gent	

**Lecturers in academic year 2023-2024**

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

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

Programme	crdts	offering
<a href="#">Bridging Programme Master of Science in Photonics Engineering</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 Electrical Engineering (main subject Electronic Circuits and Systems)</a>	6	A
<a href="#">Master of Science in Electrical Engineering</a>	6	B
<a href="#">Master of Science in Photonics Engineering</a>	6	B
<a href="#">Master of Science in Photonics Engineering</a>	6	A, O

**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

### **Learning materials and price**

"Fiber-Optic Communication Systems" van G. P. Agrawal, Wiley series in Microwave and Optical Engineering, 2010, 4th edition (ISBN 0-471-21571-6, target price 100 euros).

### **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%