# Optical Communication Systems (E012420)

Valid in the academic year 2021-2022

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

**Course Specifications**

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<table>
<thead>
<tr>
<th>Course size</th>
<th>(nominal values; actual values may depend on programme)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits</td>
<td>Study time 180 h</td>
</tr>
<tr>
<td></td>
<td>Contact hrs 60.0 h</td>
</tr>
</tbody>
</table>

## Course offerings and teaching methods in academic year 2021-2022

<table>
<thead>
<tr>
<th>Semester</th>
<th>Language</th>
<th>Location</th>
<th>Lecture</th>
<th>Practicum</th>
<th>Seminar: coached exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (2)</td>
<td>English</td>
<td>Gent</td>
<td>30.0 h</td>
<td>15.0 h</td>
<td>15.0 h</td>
</tr>
<tr>
<td>B (2)</td>
<td>Dutch</td>
<td>Gent</td>
<td>Guided self-study</td>
<td>30.0 h</td>
<td>15.0 h</td>
</tr>
<tr>
<td>O (2)</td>
<td>English</td>
<td>Gent</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Lecturers in academic year 2021-2022

- Morthier, Geert (TWOS) lecturer-in-charge
- Van Erps, Jurgen (VUB) co-lecturer

## Offered in the following programmes in 2021-2022

<table>
<thead>
<tr>
<th>Programme</th>
<th>Credits</th>
<th>Offering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridging Programme Master of Science in Photonics Engineering</td>
<td>6</td>
<td>A</td>
</tr>
<tr>
<td>Master of Science in Electrical Engineering (main subject Communication and Information Technology)</td>
<td>6</td>
<td>A</td>
</tr>
<tr>
<td>Master of Science in Electrical Engineering (main subject Electronic Circuits and Systems)</td>
<td>6</td>
<td>A</td>
</tr>
<tr>
<td>European Master of Science in Photonics</td>
<td>6</td>
<td>A</td>
</tr>
<tr>
<td>Master of Science in Electrical Engineering</td>
<td>6</td>
<td>B</td>
</tr>
<tr>
<td>Master of Science in Photonics Engineering</td>
<td>6</td>
<td>B</td>
</tr>
<tr>
<td>Master of Science in Photonics Engineering</td>
<td>6</td>
<td>A, O</td>
</tr>
</tbody>
</table>

## Teaching languages

- Dutch
- English

## 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.

(Approved)
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
Guided self-study, lecture, practicum, seminar: coached exercises

Learning materials and price

References

Course content-related study coaching

Evaluation methods
end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period
Written examination, open book examination, oral examination

Examination methods in case of periodic evaluation during the second examination period
Open book examination

Examination methods in case of permanent evaluation
Skills test

Possibilities of retake in case of permanent evaluation
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 sessions. Frequency: 3 weeks.

(Approved)
Calculation of the examination mark