# Biophotonics (E030930)

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

Valid as from the academic year 2015-2016

### Course size

<table>
<thead>
<tr>
<th>Credits</th>
<th>Study time</th>
<th>Contact hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>120 h</td>
<td>30.0 h</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Offered in the following programmes in 2021-2022</th>
<th>crdts</th>
<th>offering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridging Programme Master of Science in Photonics Engineering</td>
<td>4</td>
<td>A</td>
</tr>
<tr>
<td>Master of Science in Biomedical Engineering</td>
<td>4</td>
<td>A</td>
</tr>
<tr>
<td>International Master of Science in Biomedical Engineering</td>
<td>4</td>
<td>A</td>
</tr>
<tr>
<td>Master of Science in Biomedical Engineering</td>
<td>4</td>
<td>A</td>
</tr>
<tr>
<td>European Master of Science in Photonics</td>
<td>4</td>
<td>A</td>
</tr>
<tr>
<td>Master of Science in Photonics Engineering</td>
<td>4</td>
<td>A, O</td>
</tr>
</tbody>
</table>

### Lecturers in academic year 2021-2022

- Le Thomas, Nicolas (TWOS) lecturer-in-charge
- Muyldermans, Serge (VUB) co-lecturer

### Teaching languages

- English

### Keywords

- biophotonics

### Position of the course

Exposing the student to various basic concepts in the field of biophotonics, positioning them in an interdisciplinary context

### Contents

1. Introduction: necessity of biophotonics, public health, eco preservation, maritime, industrial, domestic, medical, biotechnology, aquatic environments
2. Micro-organisms: bacteria, viruses, protozoa, algae, phylogeny, structure and function
3. Fundamental biomolecules: nucleic acids, amino acids, DNA/RNA replication, transcription, translation, antibodies, antigens, enzymes, fatty acids, carbohydrates
4. Physiology: immune system, nervous system
5. Flow cytometry: principle and applications, cell enumeration, discrimination, heterotrophic, fluorescent in-situ, hybridisation, DNA probes, cell sorting advantages and disadvantages
6. PCR techniques: DNA amplification, molecular probes, real time PCR, DNA hybridisation
7. Microscopy: bright field microscopy, phase contrast microscopy, dark field microscopy, differential interference contrast microscopy, fluorescence microscopy, confocal microscopy, atomic force microscopy, electron microscopy
8. Optical coherence tomography: principles, time-domain OCT, fourier domain OCT, swept-source OCT, optical properties of tissues, system aspects, applications
9. Labeled sensors: sensor requirements, ELISA tests, gold nanoparticle labels, quantum dot labels, bead-based assays, padlock probes
10. Label-free sensors: advantages, surface plasmon sensors, evanescent wave sensors, Mach-Zehnder interferometers, resonant cavities
11. Lab-on-a-chip: principles, DNA microarrays, introduction to microfluidics

(Approved)
Initial competences
   bachelor level physics

Final competences
   1 Getting insight in the basics of biology.
   2 Acquiring understanding in the principles behind microscopy, cytometry, PCR techniques,
      imaging techniques, labeled and label-free sensors, lab-on-a-chip.

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
   Demonstration, lecture

Extra information on the teaching methods
   Classroom lectures: part of the lectures will be given in UGent, part of the lectures in the VUB,
   but there is the option of teleclassing.

Learning materials and price
   Course notes, copies of slides

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 with open questions

Examination methods in case of periodic evaluation during the second examination period
   Written examination with open questions

Examination methods in case of permanent evaluation
   Participation

Possibilities of retake in case of permanent evaluation
   examination during the second examination period is possible

Calculation of the examination mark
   100% exams