

# Course Specifications

From the academic year 2015-2016 up to and including the academic year

## Biophotonics (E030930)

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

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 4.0**

**Study time 120 h**

**Contact hrs**

**30.0h**

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

A (semester 1)	English	Gent	lecture	25.0h
			demonstration	5.0h
O (semester 1)	English	Gent		

### Lecturers in academic year 2021-2022

Le Thomas, Nicolas	TW05	lecturer-in-charge
Muyldermans, Serge	VUB	co-lecturer

### Offered in the following programmes in 2021-2022

	crdts	offering
<a href="#">Bridging Programme Master of Science in Photonics Engineering</a>	4	A
<a href="#">European Master of Science in Photonics</a>	4	A
<a href="#">International Master of Science in Biomedical Engineering</a>	4	A
<a href="#">Master of Science in Biomedical Engineering</a>	4	A
<a href="#">Master of Science in Biomedical Engineering</a>	4	A
<a href="#">Master of Science in Photonics Engineering</a>	4	A, O

### 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

### 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**

### **Assessment moments**

end-of-term and continuous assessment

### **Examination methods in case of periodic assessment during the first examination period**

Written examination with open questions

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

Written examination with open questions

### **Examination methods in case of permanent assessment**

Participation

### **Possibilities of retake in case of permanent assessment**

examination during the second examination period is possible

### **Calculation of the examination mark**

100% exams