

# Course Specifications

Valid as from the academic year 2024-2025

# **Biophotonics (E030930)**

Course size	(nominal values; actual values may depend on programme)		
Credits 4.0	Study time 120 h		
Course offerings and t	eaching methods in academic y	ear 2024-2025	
A (semester 1)	English	Gent	lecture
0 (semester 1)	English	Gent	

#### Lecturers in academic year 2024-2025

Le Thomas, Nicolas	FW05	lecturer-in-charge	
Van Ginderachter, Jo	GE35	co-lecturer	
Offered in the following programmes in 2024-2025		crdts	offering
Bridging Programme Master of Science in Photonics Engineering		4	Α
Master of Science in Biomedical Engineering		4	Α
Master of Science in Biomedical Engineering		4	Α
Master of Science in Photonics Engineering		4	A, 0

### **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.
- ${\bf 2}~{\bf Acquiring}~{\bf understanding}~{\bf in}~{\bf the}~{\bf principles}~{\bf behind}~{\bf microscopy},~{\bf cytometry},~{\bf PCR}$
- 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

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.

# Study material

None

#### 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 assessment with open-ended questions

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

Written assessment with open-ended 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