GHENT UNIVERSITY

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 teaching methods in academic year 2025-2026

A (semester 1)	English	Gent	lecture

Lecturers in academic year 2025-2026

Le Thomas, Nicolas	TW05	lecturer-in-charge
Van Ginderachter, Jo	GE35	co-lecturer

Offered in the following programmes in 2025-2026	**crdts**	**offering**
Bridging Programme Master of Science in Photonics Engineering	4	A
Master of Science in Biomedical Engineering	4	A
Master of Science in Biomedical Engineering	4	A
Master of Science in Photonics Engineering	4	A

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

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