GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2023-2024

Modelling of Physiological Systems (E092623)

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

Credits 5.0 **Study time 150 h**

Course offerings in academic year 2023-2024

A (semester 2)	English	Gent

Lecturers in academic year 2023-2024

Glorieux, Griet	GE35	staff member
Segers, Patrick	TWO6	lecturer-in-charge
D'Herde, Katharina	GE38	co-lecturer
Eloot, Sunny	GE35	co-lecturer
Ghysels, An	TWO6	co-lecturer
JACQUES, PEGGY	GE35	co-lecturer
Spyropoulos, Georgios	TWO5	co-lecturer

Offered in the following programmes in 2023-2024	crdts	offering
Bachelor of Science in Engineering(main subject Biomedical Engineering)	5	A
Bridging Programme Master of Science in Bioinformatics(main subject Engineering)	5	A
Master of Science in Electrical Engineering (main subject Communication and Information Technology)	5	A
Master of Science in Electromechanical Engineering(main subject Control Engineering and Automation)	5	A
Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)	5	A
Master of Science in Electrical Engineering (main subject Electronic Circuits and Systems)	5	A
Master of Science in Bioinformatics(main subject Engineering)	5	A
Master of Science in Electromechanical Engineering(main subject Maritime Engineering)	5	A
Master of Science in Electromechanical Engineering(main subject Mechanical Construction)	5	A
Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)	5	A
Master of Science in Chemical Engineering	5	A
Master of Science in Chemical Engineering	5	A
Master of Science in Civil Engineering	5	A
Master of Science in Computer Science Engineering	5	A
Master of Science in Photonics Engineering	5	A
Preparatory Course Master of Science in Biomedical Engineering	5	A

Teaching languages

English

Keywords

physiology, organ systems, mathematical modelling

Position of the course

The aim of the course is to familiarize the student with human physiology in general and physiological systems in particular, with attention to physiologcal control and regulation. The organism is studied on cellular and organ level, as well as on an integrated level. There is attention for transport physics and modelling techniques applied to physiological systems.

Contents

- Introduction: The human body on a macroscopic scale
- Anatomy and physiology of the heart; pressure-volume relation and ventricular elastance
- The cardiovascular system: Heart-arterial coupling
- Physiology of the musculo-skeletal system
- Lungs and exercise physiology
- Anatomy and physiology of the central nervous system
- Electrophysiology and communication between (nerve)cells, Hodgkin-Huxley model
- Anatomy and physiology of the kidney
- Kinetic modelling on a macroscale - compartment models
- Kinetics on a microscale - biotransport across the cell membrane
- Arterial impedance: the arterial systeem as a lumped parameter model or as a wave system
- Dissection of the heart and brain
- Computer exercises

Initial competences

no specific prior knowledge required

Final competences

1 Acquire basic knowledge of the anatomy and physiology of organ systems and the organism and insight into physiological processes.
2 Analysis, schematizing and mathematical modelling of physiological processes.
3 Use and development of code (Python) for the analysis and processing of physiological data and the implementation of mathematical models.

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

Seminar, Lecture, Practical

Extra information on the teaching methods

Classes and practical sessions take, by default, place on-campus. The default organization of PC exercises is online, with the students using his/her own laptop.

Learning materials and price

syllabus and handouts of powerpoint presentations made available to the students via the electronic learning environment

References

"Anatomy & Physiology", Elaine Marieb & Katja Hoehn, Pearson International Edition, ISBN-13: 987-0-321-48816-9

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 multiple-choice questions, Written assessment with open-ended questions

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

Written assessment with multiple-choice questions, Written assessment with open-ended questions

Examination methods in case of permanent assessment

Written assessment with open-ended questions, Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Extra information on the examination methods

During examination period: written closed-book exam with open questions, multiple-choice questions and exercises and applications. This part accounts for 15

out of 20 points.
Non period-bound assessment: assessment of answers on open questions related to PC classes. This part accounts for 5 out of 20 points.

Calculation of the examination mark

Combination of permanent evaluation (25% of the final grade) and written exam (75% of the final grade).