Course Specifications

Valid as from the academic year 2020-2021

Biomaterials and Tissue Engineering (E063671)

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

Credits 5.0	Study time 150 h	Contact hrs	60.0 h

Course offerings and teaching methods in academic year 2020-2021

A (semester 1)	English	Gent	practicum	0.0 h
			lecture	0.0 h
			group work	0.0 h
B (semester 1)	Dutch			

Lecturers in academic year 2020-2021

Dubruel, Peter	WE07	lecturer-in-charge
De Graeve, Iris	VUB	co-lecturer
Dmitriev, Ruslan	GE38	co-lecturer

Offered in the following programmes in 2020-2021	crdts	offering
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 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 Biomedical Engineering	5	A
International Master of Science in Biomedical Engineering	5	A
Master of Science in Biomedical Engineering	5	B
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 Computer Science Engineering	5	A
European Master of Science in Photonics	5	A
Master of Science in Sustainable Materials Engineering	5	A
Master of Science in Chemical Engineering	5	A
Master of Science in Bioscience Engineering: Cell and Gene Biotechnology	5	A

Teaching languages

Dutch, English

Keywords

biomaterials, tissue engineering, biometals, bioceramics, (bio)polymers

Position of the course

The main objective of this course is to provide insight in the potential and limitations of

polymeric, ceramic and metallic materials for biomedical applications. In this context, both biomedical applications in general and applications aiming at the preservation, repair or replacement of diseased or damaged hard and soft tissues or organs will be discussed.

Contents

1 Part on (Bio)polymers: Advanced applications of polymers for medical applications including scaffolds for tissue engineering, polymers for celencapsulation, thermo-responsive materials, Biocompatibility of biomaterials; cell viability, cell adhesion, ...
2 Part of Bioceramics: chemical, physical and mechanical properties of bioceramics. Potential and limitations of calcium phosphate and cements, bioactive glass, aluminium oxide, zirconium oxide, carbon and composite ceramic materials. Forming techniques. Correlation between in vitro and in vivo applications in medicine (regeneration, tissue engineering, cancer therapy…).
3 Part on Biometals: chemical, physical and mechanical properties of biometals, corrosion and applications in the biomedical sector. The basic biometals will be explained, but the main focus will be on the advanced processing including 3D printing technology and advanced biometals such as shape-memory alloys, bio-resorbable metals etc.

Initial competences

General chemistry, basic material science and properties of materials.

Final competences

1 Knowledge on the various biomaterials and their applied combinations in the medical sector.
2 Knowledge on the newer developments and forming methods of the various biomaterials.
3 Insights in the potential and limitations of the various biomaterials.
4 Knowledge on methods for in vitro characterization of biomaterials.
5 Knowledge on how biomaterials are developed and improved.

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

Group work, lecture, practicum

Learning materials and price

The course is distributed via UFORA and the online VUB platform.

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

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

Written examination

Examination methods in case of permanent evaluation

Participation, report

Possibilities of retake in case of permanent evaluation

not applicable

Calculation of the examination mark

The exam is composed of three equal partims (1/3 of the final score each):
Biopolymers [written exam (80%) and practical course (20%)]
Bioceramics [written exam (80%) and practical course (20%)]

Biometals [written exam (80%) and group work (20%)]. On the exam, a question from the group work will be asked so that the group work counts for 40% of the total Bioceramics score.
To be allowed to the exam you need to participate in all practical sessions of each part of the course. Students that fail with 7/20 or less on one of the parts, will automatically not pass for the entire course. In that case, during the retake exam session, the students need to retake each part where their scores were less than 12/20. The practical sessions and assignments cannot be retaken. The score obtained during the practical sessions thus remain valid for the retake exam.