Biomaterials (E063670)

Valid in the academic year 2016-2017

Course Specifications

Course size

<table>
<thead>
<tr>
<th>Credits</th>
<th>Study time</th>
<th>Contact hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td>180 h</td>
<td>60.0 h</td>
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</tbody>
</table>

Course offerings and teaching methods in academic year 2016-2017

A (semester 1)

- lecture: 26.25 h
- practicum: 33.75 h

Lecturers in academic year 2016-2017

- Dubrueil, Peter WE07 lecturer-in-charge
- Declercq, Heidi GE05 co-lecturer
- De Graeve, Iris VUB co-lecturer

Offered in the following programmes in 2016-2017

<table>
<thead>
<tr>
<th>Programme</th>
<th>crdts</th>
<th>offering</th>
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</thead>
<tbody>
<tr>
<td>Bridging Programme Master of Science in Biomedical Engineering</td>
<td>6</td>
<td>A</td>
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<tr>
<td>Bridging Programme Master of Science in Biomedical Engineering</td>
<td>6</td>
<td>A</td>
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<tr>
<td>Master of Science in Electrical Engineering (main subject Communication and Information Technology)</td>
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<td>A</td>
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<tr>
<td>Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)</td>
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<tr>
<td>Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)</td>
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<tr>
<td>Master of Science in Electrical Engineering (main subject Electronic Circuits and Systems)</td>
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<tr>
<td>Master of Science in Electromechanical Engineering (main subject Maritime Engineering)</td>
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<tr>
<td>Master of Science in Electromechanical Engineering (main subject Mechanical Construction)</td>
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<tr>
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<tr>
<td>Master of Science in Biomedical Engineering</td>
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<td>A</td>
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<tr>
<td>International Master of Science in Biomedical Engineering</td>
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<tr>
<td>Master of Science in Biomedical Engineering</td>
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<tr>
<td>Master of Science in Chemical Engineering</td>
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<tr>
<td>Master of Science in Civil Engineering</td>
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<td>A</td>
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<tr>
<td>Master of Science in Computer Science Engineering</td>
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<td>Master of Science in Computer Science Engineering</td>
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<td>A</td>
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<tr>
<td>Master of Science in Photonics Engineering</td>
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<td>A</td>
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<tr>
<td>Master of Science in Sustainable Materials Engineering</td>
<td>6</td>
<td>A</td>
</tr>
<tr>
<td>Master of Science in Chemical Engineering</td>
<td>6</td>
<td>A</td>
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</table>

Teaching languages

- English

Keywords

- Biomaterials, Polymers, Ceramics, Biomedical Applications, Metals, Biomedical Engineering

Position of the course

The student is provided with knowledge and insights about the development, the properties, the design and the possibilities/limitations of polymers, ceramic and metallic

(Approved) 1
materials and combinations which are being applied for the preservation, restoration and/or replacement of affected or damaged tissues or organs.

Contents
1. Properties of biological tissue: Concepts of polymer synthesis, Characterisation of polymers, Surface modification, Surface analysis, Biomedical applications, Scaffolds for tissue engineering
2. Partim Bioceramics: Chemical, physical and mechanical properties of ceramic materials. Properties, possibilities/limitations and use of calcium phosphates and cements, bioactive glass, aluminium oxide, zirconium oxide, pyrolytic carbon and composite ceramic materials. Traditional and new processing techniques. Correlation with in vitro and in vivo applications in medicine (regenerative medicine, tissue engineering, cancer therapy,...).
3. Partim Metals: Properties of metals, Relevant features, specific properties, possible applications, Mechanical properties, Corrosion properties, Classification of biometals

Initial competences
Basic knowledge of chemistry and physics, basics of materials science, introduction to materials science

Final competences
1 Knowledge of the different biomaterial classes and combinations thereof applied in medicine (regenerative medicine, tissue engineering, cancer therapy,...)
2 Knowledge of the development and processing technologies of the different types of biomaterials.
3 Master the knowledge on the possibilities and limitations of the different biomaterial classes.
4 Knowledge of the different methods for the in-vitro characterization of biomaterials.
5 Knowledge on the practicalities for the development of biomaterials.

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, practicum

Extra information on the teaching methods
Classroom lectures; Lab sessions

Learning materials and price
Course material offered via online learning platform.

References
• Biomaterials: An Introduction; J. Park & R. Lakes, Plenum Press

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
Oral examination

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

Examination methods in case of permanent evaluation
Participation, report

Possibilities of retake in case of permanent evaluation
examination during the second examination period is possible in modified form

Extra information on the examination methods
During examination period: oral closed-book exam, written preparation for the theory.
Out of the examination period: evaluation of practical courses.

Calculation of the examination mark
The final score is the combination of the evaluation during the examination period (80%) and during the practical courses (20%).
Special conditions:
1) Participation to the exam is only possible if the student has participated to the practical course of all partims.
2) Students that obtain a 7/20 or less for one of the partims fail for the entire course.