Module: Biomechanics and Biophysics

<table>
<thead>
<tr>
<th>Level</th>
<th>Master</th>
<th>Short Name</th>
<th>Bio</th>
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</table>

**Responsible Lecturers**

Prof. Dr. Nestler, Bodo

**Department, Facility**

Mechanical Engineering and Business Administration

**Course of Studies**

Mechanical Engineering, Bachelor

**Compulsory/elective**

Compulsory elective

**ECTS Credit Points**

5

**Semester of Studies**

2

**Semester Hours per Week**

4

**Length (semesters)**

1

**Workload (hours)**

150

**Frequency**

WiSe

**Presence Hours**

60

**Teaching Language**

English

**Self-Study Hours**

90

The following section is filled only if there is **exactly one** module-concluding exam.

**Exam Type**

Written Exam

**Exam Language**

English

**Exam Length (minutes)**

60

**Exam Grading System**

One-third Grades

**Learning Outcomes**

- The students shall acquire consolidated knowledge of physical, electrical, and mechanical principles of medical products.
- The students shall be enabled to contribute to the development of medical products according to relevant standards.
- The students shall understand the basics of the application of physical/technical models to biological/medical systems.

**Participation Prerequisites**

The previous section is filled only if there is **exactly one** module-concluding exam.

**Consideration of Gender and Diversity Issues**

✔ Use of gender-neutral language (THL standard)

✘ Target group specific adjustment of didactic methods

✘ Making subject diversity visible (female researchers, cultures etc.)

**Applicability**

**Remarks**
Module Course: Biomechanics and Biophysics (lecture)
(of Module: Biomechanics and Biophysics)

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture</th>
<th>Form of Learning</th>
<th>Presence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory Attendance</td>
<td>no</td>
<td>ECTS Credit Points</td>
<td>5</td>
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<tr>
<td>Participation Limit</td>
<td></td>
<td>Semester Hours per Week</td>
<td>4</td>
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<tr>
<td>Group Size</td>
<td></td>
<td>Workload (hours)</td>
<td>150</td>
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<tr>
<td>Teaching Language</td>
<td>English</td>
<td>Presence Hours</td>
<td>60</td>
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<tr>
<td>Study Achievements (&quot;Studienleistung&quot;, SL)</td>
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<td>Self-Study Hours</td>
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<tr>
<td>SL Length (minutes)</td>
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<td>SL Grading System</td>
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The following section is filled only if there is a course-specific exam.

<table>
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<tr>
<th>Exam Type</th>
<th>Exam Language</th>
<th>Exam Gradining System</th>
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<tbody>
<tr>
<td>Learning Outcomes</td>
<td></td>
<td></td>
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<tr>
<td>Participation Prerequisites</td>
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</table>

The previous section is filled only if there is a course-specific exam.

Contents
- Basic static mechanics
- Deformation behaviour of viscoelastic materials
- Biomechanics of the human locomotive system:
  - Mechanical behaviour of biological tissues (bone, tendons/ligaments, cartilage, synovial fluid)
    - Loads acting in the locomotive system (forces/moments, stress/strain): hip joint, femur, knee joint, foot, spine
    - Biomaterials:
      - Artificial joints (endoprostheses):
        - types, chemical composition, biocompatibility, corrosion resistance, mechanical properties
      - Bone fractures (healing and fixation):
        - types of fracture healing, internal fixation, external fixation
        - Physical principles and their application in:
      - Liquid and gas flow in the human body
        - Electrical and magnetic interactions with biological systems (cells)
        - HF surgery
        - EEG
        - EMG
        - MRI
        - Knowledge about lecturer’s current research projects
<table>
<thead>
<tr>
<th>Literature</th>
<th>Remarks</th>
</tr>
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<tbody>
<tr>
<td>• P. Brinckmann, W. Frobin, G. Leivseth, (Hrsg.): Orthopedic Biomechanics, Thieme, 2015</td>
<td></td>
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<tr>
<td>• Thews et al.: Human Physiology. Springer (1989)</td>
<td></td>
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<tr>
<td>• Webster: Medical Instrumentation, 3rd edition, Wiley and Sons.</td>
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<tr>
<td>• Tritthart, H.: Medizinische Physik und Biophysik. Schattauer (2001)</td>
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<tr>
<td>• Kresse, H.: Kompendium Elektromedizin. Siemens (1978)</td>
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