Module Description
Master of Science in Biomedical Technologies

(09_10_2018)
The program for *Biomedical Technologies* with Specialization in Implantology, Nanoanalytics/Interfaces and Bioimaging consists of the following modules:

<table>
<thead>
<tr>
<th>Module No.</th>
<th>Module Name</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mandatory courses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM1</td>
<td><em>Biomedical Technologies in Diagnostic and Therapy</em> I and II</td>
<td>6</td>
</tr>
<tr>
<td>AM2</td>
<td><em>Laboratory Techniques and Medical Device Approvals</em> I and II</td>
<td>6</td>
</tr>
<tr>
<td>AM3</td>
<td><em>Clinical cases and Consequences for Medical Devices</em> I and II</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td><strong>Specialization areas</strong> (2 out of 3 specializations: Implantology, Nanoanalytics/Interfaces, and Bioimaging including for each specialization Lecture, Seminar and Labwork (15 ECTS in total) have to be chosen). Practical work experiences and master thesis can also be completed in industry or abroad and have to be performed within the selected specialization areas.</td>
<td></td>
</tr>
<tr>
<td>AS4</td>
<td>Bioimaging</td>
<td>15</td>
</tr>
<tr>
<td>AS4.1</td>
<td>Bioimaging – Lecture and Seminar</td>
<td>6</td>
</tr>
<tr>
<td>AS4.2</td>
<td>Bioimaging – Labwork</td>
<td>9</td>
</tr>
<tr>
<td>AS5</td>
<td>Bioimaging – Practical work experience</td>
<td>15</td>
</tr>
<tr>
<td>AS6</td>
<td>Nanoanalytics/Interfaces I</td>
<td>15</td>
</tr>
<tr>
<td>AS6.1</td>
<td>Nanoanalytics/Interfaces I – Lecture and Seminar</td>
<td>6</td>
</tr>
<tr>
<td>AS6.2</td>
<td>Nanoanalytics/Interfaces I – Labwork</td>
<td>9</td>
</tr>
<tr>
<td>AS7</td>
<td>Implantology</td>
<td>15</td>
</tr>
<tr>
<td>AS7.1</td>
<td>Implantology – Lecture and Seminar</td>
<td>6</td>
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<tr>
<td>AS7.2</td>
<td>Implantology – Labwork</td>
<td>9</td>
</tr>
<tr>
<td>AS8</td>
<td>Implantology – Practical work experience</td>
<td>15</td>
</tr>
<tr>
<td>AS9</td>
<td>Nanoanalytics/Interfaces II</td>
<td>15</td>
</tr>
<tr>
<td>AS9.1</td>
<td>Nanoanalytics/Interfaces II – Lecture and Seminar</td>
<td>6</td>
</tr>
<tr>
<td>AS9.2</td>
<td>Nanoanalytics/Interfaces II – Labwork</td>
<td>9</td>
</tr>
<tr>
<td>AS10</td>
<td>Nanoanalytics/Interfaces – Practical work experience</td>
<td>15</td>
</tr>
</tbody>
</table>
Elective courses (Lectures and Seminars comprising 12 ECTS in total have to be chosen: either from another specialization area, from the Master program Medical Radiation Sciences or from the Master program Medical engineering at the University of Stuttgart.)

<table>
<thead>
<tr>
<th>Module Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS4.1</td>
<td>Bioimaging – Lecture and Seminar</td>
<td>6</td>
</tr>
<tr>
<td>AS6.1</td>
<td>Nanoanalytics/Interfaces I – Lecture and Seminar</td>
<td>6</td>
</tr>
<tr>
<td>AS7.1</td>
<td>Implantology – Lecture and Seminar</td>
<td>6</td>
</tr>
<tr>
<td>AS9.1</td>
<td>Nanoanalytics/Interfaces II – Lecture and Seminar</td>
<td>6</td>
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</tbody>
</table>

**Modules University of Stuttgart**

<table>
<thead>
<tr>
<th>Module Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>AE11</td>
<td>Aktorik in der Gerätetechnik</td>
<td>6</td>
</tr>
<tr>
<td>AE12</td>
<td>Technologien der medizinischen Bildgebung und Labordiagnostik</td>
<td>3</td>
</tr>
<tr>
<td>AE13</td>
<td>Interface-Design</td>
<td>6</td>
</tr>
<tr>
<td>AE14</td>
<td>Grundlagen der Keramik und Verbundwerkstoffe</td>
<td>6</td>
</tr>
<tr>
<td>AE15</td>
<td>Nanotechnologie I – Chemie und Physik der Nanomaterialien</td>
<td>3</td>
</tr>
<tr>
<td>AE16</td>
<td>Nanotechnologie II – Technische Prozesse und Anwendungen</td>
<td>3</td>
</tr>
<tr>
<td>AE17</td>
<td>Optische Systeme in der Medizintechnik</td>
<td>6</td>
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</tbody>
</table>

**Modules University of Tübingen**

<table>
<thead>
<tr>
<th>Module Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BM5.1</td>
<td>Physik und Technologie der medizinischen Strahlenanwendung – Vorlesung</td>
<td>3</td>
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<tr>
<td>BM8</td>
<td>Biostatistik/Biostatistics</td>
<td>6</td>
</tr>
<tr>
<td>BM12.1</td>
<td>Nuklearmedizin, diagnostische und interventionelle Radiologie, Strahlentherapie – Vorlesung</td>
<td>3</td>
</tr>
<tr>
<td>BM 15</td>
<td>NanoBioPhysics and scanning probe microscopy</td>
<td>3</td>
</tr>
<tr>
<td>BM17</td>
<td>Ethical Technology Assessment and Sustainable Development</td>
<td>3</td>
</tr>
<tr>
<td>BM18</td>
<td>MEDTEC Innovation</td>
<td>9</td>
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<tr>
<td>BM19</td>
<td>Medical Ultrasound – Theory and Application</td>
<td>3</td>
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<tr>
<td>AMT12</td>
<td>Master Thesis</td>
<td>30</td>
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<tr>
<td><strong>Module Number:</strong></td>
<td><strong>Title of the Module:</strong></td>
<td><strong>Nature of the Module:</strong></td>
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<td>-------------------</td>
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</tr>
<tr>
<td>AM1 (Veranstaltungsnummer wird zugeteilt)</td>
<td>Biomedical Technologies in Diagnostic and Therapy I and II</td>
<td>compulsory</td>
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<table>
<thead>
<tr>
<th><strong>Credit Points:</strong></th>
<th><strong>Work Load:</strong></th>
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<tbody>
<tr>
<td>6 CP</td>
<td>Total: 180 h</td>
</tr>
<tr>
<td></td>
<td>contact hours: 60 h (2 SWS per semester)</td>
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<tr>
<td></td>
<td>self study: preparation for exams included: 120 h</td>
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<table>
<thead>
<tr>
<th><strong>Duration of the Module:</strong></th>
<th><strong>Time Schedule (Winter/Summer Term):</strong></th>
</tr>
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<tbody>
<tr>
<td>2 semesters</td>
<td>The module is offered once per year starting with lecture I in the winter term.</td>
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<table>
<thead>
<tr>
<th><strong>Language:</strong></th>
<th><strong>Maximum/Minimum Number of Participants:</strong></th>
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</thead>
<tbody>
<tr>
<td>English</td>
<td>Maximum: 60 Minimum: 5</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Module Structure/Teaching Methods:</strong></th>
<th><strong>Contents:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>lecture (4 SWS)</td>
<td>Thematic focus:</td>
</tr>
<tr>
<td></td>
<td>Heart-lung machine, artificial respiration, anaesthetic technique, computer-assisted surgery, electromedical technique, electronic implants, rehabilitation technology, biocompatible prosthesis, biomedical laser applications</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Objectives:</strong></th>
<th><strong>Requirements for Credit Points/Exams and Grading Scheme (Where Appropriate, Weighting):</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The course provides important and up-to-date knowledge of different biomedical technologies. After completion of this module, students will be able to understand the state-of-the-art technologies, modern methodologies and open questions in selected fields of biomedical technologies.</td>
<td>Biomedical Technologies in Diagnostic and Therapy I and II</td>
</tr>
<tr>
<td>Written exam</td>
<td>1-5</td>
</tr>
<tr>
<td>Written exam</td>
<td>1-5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Applicability:</strong></th>
<th><strong>Recommended Semester:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>M.Sc. in Biomedical Technologies (mandatory course) and M.Sc. in Medizinische Strahlenwissenschaften/Medical Radiation Sciences (elective course)</td>
<td>1st and 2nd semester</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Participation Requirements:</strong></th>
<th><strong>Person Responsible for the Module:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>B.Sc. degree</td>
<td>PD Dr. Martin Schenk</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Teaching Staff:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Liese, Jan, Prof. Dr. rer. nat.</td>
</tr>
<tr>
<td>literature / teaching materials</td>
</tr>
<tr>
<td>module number:</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>AM2 (Veranstaltungsnummer wird zugeteilt)</td>
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</tbody>
</table>

| credit points | 6 CP |
| work load | Total: 180 h  
- contact hours (SWS): 60 h (2 SWS per semester)  
- self study (preparation for exams included): 120 h |
| duration of the module | 2 semesters |
| time schedule | The module is offered once per year starting with lecture I in the winter term. |
| language | English |
| maximum/minimum number of participants | Maximum: 60  
Minimum: 5 |
| module structure/teaching methods | lecture (4 SWS) |
| contents | Thematic focus:  
- Molecular biology, cell culture, DNA, RNA and protein isolation, molecular interactions, surface refinement, opt. spectroscopy, Microsystems engineering, lab-on-a-chip, live cell imaging, FACS, electron microscopy  
- research methodologies, experimental design  
- regulatory affairs and patents |
| objectives | The course provides important and up-to-date knowledge of different laboratory techniques and medical device approvals in biomedical technologies. After completion of this module, students will be able to understand the state-of-the-art technologies, modern methodologies and open questions in selected fields of regulatory affairs. |

<table>
<thead>
<tr>
<th>Requirements for credit points / exams and grading scheme (where appropriate, weighting)</th>
<th>course</th>
<th>exam</th>
<th>Grading scheme</th>
<th>weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory Techniques and Medical Device Approvals I</td>
<td>Written exam</td>
<td>1-5</td>
<td>3 ECTS</td>
<td></td>
</tr>
<tr>
<td>Laboratory Techniques and Medical Device Approvals II</td>
<td>Written exam</td>
<td>1-5</td>
<td>3 ECTS</td>
<td></td>
</tr>
</tbody>
</table>

<p>| applicability | M.Sc. in Biomedical Technologies (mandatory course) and M.Sc. in Medizinische Strahlenwissenschaften/Medical Radiation Sciences (elective course) |
| recommended semester | 1st and 2nd semester |
| participation requirements | B.Sc. degree |</p>
<table>
<thead>
<tr>
<th>person responsible for the module</th>
<th>Prof. Dr. Katja Schenke-Layland</th>
</tr>
</thead>
<tbody>
<tr>
<td>teaching staff</td>
<td>Gauglitz, Günter, Prof. Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Weimar, Udo, Prof. Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Huhn, Carolin, Prof. Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Zeck, Anne, Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Pötz, Oliver, Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Autenrieth, Stella, Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Schäffer, Tilman, Prof. Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Wagner, Samuel, Prof. Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Bohn, Erwin, PD Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Fallier-Becker, Petra, Dr. rer. nat.</td>
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<tr>
<td></td>
<td>Rolauffs, Bernd, PD Dr. med.</td>
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<tr>
<td></td>
<td>Hansmann, Jan, Dr. rer. nat.</td>
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<tr>
<td></td>
<td>Schenk, Martin, PD Dr. rer. nat.</td>
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<tr>
<td></td>
<td>Martin, Norman</td>
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<tr>
<td></td>
<td>Schenke-Layland, Katja, Prof., Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Wendel, Hans-Peter, Prof., Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Schnurr, Marc, Prof. Dr. rer. nat.</td>
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<tr>
<td>literature / teaching materials</td>
<td>Texts and books will be announced at the beginning of term.</td>
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</table>
| module number: AM3  
    (Veranstaltungsnummer wird zugeteilt) | title of the module:  
    Clinical cases and Consequences for Medical Devices I and II | nature of the module: compulsory |
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>credit points</td>
<td>6 CP</td>
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<tr>
<td>work load</td>
<td>Total: 180 h</td>
<td></td>
</tr>
<tr>
<td>- contact hours (SWS)</td>
<td>contact hours: 60 h (2 SWS per semester)</td>
<td></td>
</tr>
<tr>
<td>- self study</td>
<td>self study (preparation for exams included): 120 h</td>
<td></td>
</tr>
<tr>
<td>duration of the module</td>
<td>2 semesters</td>
<td></td>
</tr>
<tr>
<td>time schedule (winter/summer term)</td>
<td>The module is offered once per year starting with lecture I in the winter term.</td>
<td></td>
</tr>
<tr>
<td>language (English/German)</td>
<td>English</td>
<td></td>
</tr>
<tr>
<td>maximum/minimum number of participants</td>
<td>Maximum: 60</td>
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<tr>
<td></td>
<td>Minimum: 5</td>
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</tr>
<tr>
<td>module structure /teaching methods</td>
<td>lecture (4 SWS)</td>
<td></td>
</tr>
<tr>
<td>contents</td>
<td>Thematic focus:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One important clinical case (patient) / lecture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- necessary therapy, e.g. necessary medical device</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- consequences for the medical device</td>
<td></td>
</tr>
<tr>
<td>objectives</td>
<td>The course provides important and up-to-date knowledge of different clinical cases, the medical indications and the application of medical devices.</td>
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<tr>
<td></td>
<td>After completion of this module, students will be able to understand the most important clinical cases and evaluate the consequences, limitations and chances for medical devices.</td>
<td></td>
</tr>
<tr>
<td>Requirements for credit points / exams and grading scheme (where appropriate, weighting)</td>
<td>course</td>
<td>Exam</td>
</tr>
<tr>
<td>Clinical Cases and Consequences for Medical Devices I</td>
<td>Written exam</td>
<td>1-5</td>
</tr>
<tr>
<td>Clinical Cases and Consequences for Medical Devices II</td>
<td>Written exam</td>
<td>1-5</td>
</tr>
<tr>
<td>applicability</td>
<td>M.Sc. in Biomedical Technologies (mandatory course) and M.Sc. in Medizinische Strahlenwissenschaften/Medical Radiation Sciences (elective course)</td>
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<tr>
<td>recommended semester</td>
<td>1\textsuperscript{st} and 2\textsuperscript{nd} semester</td>
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<td>participation requirements</td>
<td>B.Sc. degree</td>
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<tr>
<td>person responsible for the module</td>
<td>Kirschniak, Andreas, Dr. med.</td>
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<td>teaching staff</td>
<td>Kirschniak, Andreas, Dr. med.</td>
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<td>Kirschniak, Andreas, Dr. med.</td>
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<tr>
<td>Enderle, Markus, Prof., Dr. med.</td>
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<td>Müller, Sven, Dr. med.</td>
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<td>Falch, Claudius, Dr. med</td>
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<tr>
<td>Johannink, Jonas</td>
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<td>Wilhelm, Peter</td>
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<td>Axt, Steffen</td>
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<tr>
<td>Amend, Bastian, Dr. med.</td>
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<tr>
<td>Müller, Martin, Dr. med., Dr. rer. nat.</td>
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| literature / teaching materials | Texts and books will be announced at the beginning of term. There is no general script. |
| module number: | AS4.1  
(Veranstaltungsnummer wird zugeteilt) |
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>title of the module:</td>
<td>Bioimaging – Lecture and Seminar</td>
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<tr>
<td>nature of the module:</td>
<td>specialization</td>
</tr>
<tr>
<td>credit points</td>
<td>6 CP</td>
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</table>
| work load |  Total: 180 h  
- contact hours (SWS): 56 h  
- self study (preparation for exams included): 124 h |
| duration of the module | 1 semester |
| time schedule |  The module is offered once per year in the first half of the winter term as block course |
| language |  English |
| maximum/minimum number of participants |  
- Lecture: max.: 50  
- Seminar: max.: 20 |
| module structure /teaching methods |  lecture and seminar (4 SWS) |
| contents |  Thematic focus:  
- Image Correction  
- Functional MRI  
- Hyperpolarized MRI  
- Principles of Combined PET/MR Imaging  
- Basics of Image Reconstruction  
- Imaging and Metabolomics (MRI, NMR)  
- Advanced Tracer development and production  
- MR Angiography  
- Research in Radiochemistry  
- Pharmacological Modelling |
| objectives |  Students  
- get functional and methodical based competences  
- get theoretical knowledge about setup of experiments concerning special topics in Neurology, oncology, immunology and other diseases  
- learn about preparation of patients and rodents before the measurements, setup of measurements for certain needs and topics  
- gain insights into the image analysis tools in preclinical and clinical implementation |
| Requirements for credit points / exams and grading scheme (where appropriate, weighting) |  
| course | Exam | Grading scheme | weighting |
| Lecture | Written/oral exam  
Oral presentation (30 min presentation + 15 min discussion) |  
70-100%, <70% failed  
1-5 |  
3 ECTS  
3 ECTS |
| Seminar |  |
| applicability |  M.Sc. in Biomedical Technologies (specialization and elective course) and M.Sc. in Medizinische Strahlenwissenschaften/Medical Radiation Sciences |
(elective course) and elective course for students of M.Sc. Medical Engineering Univ. of Stuttgart), required for modules AS4.2 and AS5

<table>
<thead>
<tr>
<th><strong>recommended semester</strong></th>
<th>1st semester</th>
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<tbody>
<tr>
<td><strong>participation requirements</strong></td>
<td>B.Sc. degree</td>
</tr>
<tr>
<td><strong>person responsible for the module</strong></td>
<td>Pichler, Bernd, Prof., Dr. rer. nat. / Dr. Carsten Calaminus</td>
</tr>
</tbody>
</table>
| **teaching staff** | Pichler, Bernd, Prof., Dr. rer. nat.  
Schick, Fritz, Prof., Dr. med. Dr. rer. nat.  
Scheffler, Klaus, Prof., Dr. phil.  
Ia Fougère, Christian, Prof., Dr. med.  
Bares, Roland, Prof., Dr. med.  
Nikolaou, Konstantin, Prof., Dr. med.  
Ernemann, Ulrike, Prof., Dr. med.  
Schmidt, Holger, PD Dr. rer. nat.  
Wiesinger, Benjamin, Dr. med.  
Angelovski, Goran, Dr. rer. nat.  
Reischl, Gerald, Dr. rer. nat.  
Pohmann, Rolf, Dr. rer. nat.  
Klose, Uwe Prof., Dr. rer. nat.  
Wehrl, Dr.  
Disselhorst, Dr.  
Maurer, Dr.  
Fischer, Dr.  
etc. |
<p>| <strong>literature / teaching materials</strong> | Texts and books will be announced at the beginning of term. |</p>
<table>
<thead>
<tr>
<th>module number:</th>
<th>title of the module:</th>
<th>nature of the module:</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS4.2 (Veranstaltungsnummer wird zugeteilt)</td>
<td>Bioimaging – Labwork</td>
<td>specialization</td>
</tr>
</tbody>
</table>

| credit points | 9 CP |
| work load | Total: 270 h  
- contact hours: 90 h  
- self study (preparation for exams included): 180 h |
| duration of the module | 1 semester |
| time schedule (winter/summer term) | The module is offered once per year in the winter term as block course. |
| language (English/German) | English |
| maximum/minimum number of participants | Maximum: 16  
Minimum: 3 |
| module structure /teaching methods | Practical Training and Seminar (6 SWS) |
| contents | Thematic focus:  
- Clinical application of PET and MRI, PET/MR application, imaging of special diseases  
- Clinical application of CT and US, deeper insight into clinical topics  
- Physics and technologies used in the nuclear medicine  
- Image acquisition methods in preclinical imaging (MRI, OI, PET, SPECT/CT): design for special experiments in clinic and preclinical setup and scanning of rodents  
- Clinical and Preclinical Application and Drawbacks of different MRI sequences  
- Research in Radiochemistry  
- Advanced Tracer development and production |
| objectives | Students  
- Gain functional and practical competences of the application of the imaging methods  
- are part of practical demonstrations in preclinical imaging including hands-on experiences  
- learn animal handling procedures in preclinical imaging according to the animal protection laws  
- Gain practical competences in detector physics  
- Learn the analysis of images in clinical and preclinical studies  
- Gain competences to work on the clinical setup of the scanners |
<p>| Requirements for credit points / exams and grading scheme (where appropriate, weighting) | course | exam | Grading scheme | weighting |
| Labwork | 4 Experimental protocols | 1-5 | 9 ECTS |
| applicability | M.Sc. in Biomedical Technologies (specialization course), required for module AS5 |
| recommended semester | 1st semester |
| participation | B.Sc. degree and successful completion of module AS4.1 |</p>
<table>
<thead>
<tr>
<th>requirements</th>
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<tbody>
<tr>
<td>person responsible for the module</td>
<td>Pichler, Bernd, Prof., Dr. rer. nat. / Dr. Carsten Calaminus</td>
</tr>
<tr>
<td>teaching staff</td>
<td>Pichler, Bernd, Prof., Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Schick, Fritz, Prof., Dr. med. Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Scheffler, Klaus, Prof., Dr. phil.</td>
</tr>
<tr>
<td></td>
<td>Bares, Roland, Prof., Dr. med.</td>
</tr>
<tr>
<td></td>
<td>Claussen, Claus, Prof., Dr. med.</td>
</tr>
<tr>
<td></td>
<td>Ernemann, Ulrike, Prof., Dr. med.</td>
</tr>
<tr>
<td></td>
<td>Honndorf, Valerie, Dr. rer. nat.</td>
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<tr>
<td></td>
<td>Schmidt, Holger, PD Dr. rer. nat.</td>
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<td>Wiesinger, Benjamin, Dr. med.</td>
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<tr>
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<td>Angelovski, Goran, Dr. rer. nat.</td>
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<td>Reischl, Gerald, Dr. rer. nat.</td>
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<td>Pohmann, Rolf, Dr. rer. nat.</td>
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<td>Klose, Uwe Prof., Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Wehrl, Dr.</td>
</tr>
<tr>
<td></td>
<td>Disselhorst, Dr.</td>
</tr>
<tr>
<td></td>
<td>Maurer, Dr.</td>
</tr>
<tr>
<td></td>
<td>Fischer, Dr.</td>
</tr>
<tr>
<td></td>
<td>etc.</td>
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<td>literature / teaching materials</td>
<td>Texts and books will be announced at the beginning of term.</td>
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<td>title of the module:</td>
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<tr>
<td>AS5 (Veranstaltungsnummer wird zugeteilt)</td>
<td>Bioimaging – Practical work experience</td>
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</table>

<table>
<thead>
<tr>
<th>credit points</th>
<th>15 CP</th>
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</table>
| work load     | Total: 450 h  
- contact hours (SWS): 300 h  
- self study: 150 h |
| duration of the module | 1 semester, min. 6 weeks full-time and max. 10 weeks full-time |
| time schedule (winter/summer term) | The module is offered once per year in the winter term as block course |
| language (English/German) | English |
| maximum/minimum number of participants | Maximum: 8  
Minimum: 1 |
| module structure/teaching methods | Practical Training |
| contents | The Labwork contains a special topic which the student has to work on in theory and practice under the supervision of a scientist or medical doctor. |
| objectives | The aim of the labwork is that the student develops his research skills to an independent level. After the student has learned the skills for setting up experiments and analysing the data the student should work on his own under the supervision of the scientist/medical doctor in charge. Based on this research the student should finish his/her project and write a protocol as well as give a talk. The idea of the labwork is to give the student the best preparation he/she can get for his/her master’s thesis as well as to provide the student a deeper insight into the bioimaging field. |

<table>
<thead>
<tr>
<th>Requirements for credit points / exams and grading scheme (where appropriate, weighting)</th>
<th>course</th>
<th>exam</th>
<th>Grading scheme</th>
<th>weighting</th>
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<tbody>
<tr>
<td>Practical Training</td>
<td>Written report about the internship (10-15 pages, Arial 12, single-spaced)</td>
<td>1-5</td>
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<table>
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<tr>
<th>applicability</th>
<th>M.Sc. in Biomedical Technologies (specialization course), recommended for master’s thesis in bioimaging</th>
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<tbody>
<tr>
<td>recommended semester</td>
<td>3rd semester</td>
</tr>
<tr>
<td>participation requirements</td>
<td>B.Sc. degree, passed semester 1 and 2, and successful completion of module AS4.1 and AS4.2</td>
</tr>
<tr>
<td>person responsible for the module</td>
<td>Pichler, Bernd, Prof., Dr. rer. nat. / Dr. Carsten Calaminus</td>
</tr>
</tbody>
</table>
| teaching staff | Pichler, Bernd, Prof., Dr. rer. nat.  
Schick, Fritz, Prof., Dr. med. Dr. rer. nat.  
Scheffler, Klaus, Prof., Dr. phil.  
Bares, Roland, Prof., Dr. med.  
Claussen, Claus, Prof., Dr. med. |
<p>| literature / teaching materials | Texts and books will be announced at the beginning of term. |
| module number: AS6.1 (Veranstaltungsnummer wird zugeteilt) |
| title of the module: Nanoanalytics/Interfaces I – Lecture and Seminar |
| nature of the module: specialization |
| credit points | 6 CP |
| work load - contact hours (SWS) | Total: 180 h |
| - self study | contact hours: 60 h |
| | self study (preparation for exams included): 120 h |
| duration of the module | 1 semester |
| time schedule (winter/summer term) | The module is offered once per year in the winter term |
| language (English/German) | English |
| maximum/minimum number of participants | Lecture: Maximum: 24; Minimum: 3 |
| | Seminar: Maximum: 8; Minimum: 3 |
| module structure /teaching methods | Lecture: Nanoanalytics and Biophysics (2 SWS) and Seminar: Nanotechnology for Medical Application (2 SWS) |
| contents | Thematic focus: |
| | - Introduction to statistical physics, soft matter and polymer physics, mechanics of cells and tissues, physics of the cytoskeleton, cellular forces, motor proteins, methods in nanobiophysics, high resolution microscopy techniques, micro- and nanofluidics, lab-on-a-chip technology |
| | - Discussion of current research topics in the field of nanotechnology for medical applications |
| objectives | Students |
| | - are familiar with the basics of nanoanalytics and biophysics. |
| | - Independently study a scientific research topic and present it in the form of an oral seminar talk. |
| Requirements for credit points / exams and grading scheme (where appropriate, weighting) | course | exam | Grading scheme | weighting |
| | Nanoanalytics and Biophysics | Written/oral exam | 1-5 | 3 ECTS |
| | Nanotechnology for medical Applications | Oral presentation (30 min presentation + 15 min discussion) | 1-5 | 3 ECTS |
| applicability | M.Sc. in Biomedical Technologies (specialization and elective course) and M.Sc. in Medizinische Strahlenwissenschaften/Medical Radiation Sciences (elective course) and elective course for students of M.Sc. Medical Engineering Univ. of Stuttgart), required for module AS10. For elective courses only the lecture is applicable. |
| recommended semester | 1st semester |
| participation | B.Sc. degree |</p>
<table>
<thead>
<tr>
<th>requirements</th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>person responsible for the module</strong></td>
<td>Schäffer, Tilman, Prof., Dr. rer. nat.</td>
</tr>
<tr>
<td><strong>teaching staff</strong></td>
<td>Rheinländer, Johannes, Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Schäffer, Tilman, Prof., Dr. rer. nat.</td>
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<td><strong>literature / teaching materials</strong></td>
<td>Literature will be announced at the beginning of term.</td>
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<td>module number: AS6.2 (Veranstaltungsnummer wird zugeteilt)</td>
<td>title of the module: Nanoanalytics/Interfaces I – Labwork</td>
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<tr>
<td>credit points</td>
<td>9 CP</td>
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<tr>
<td>work load</td>
<td>Total: 270 h</td>
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<tr>
<td>- contact hours (SWS)</td>
<td>contact hours: 90 h</td>
</tr>
<tr>
<td>- self study</td>
<td>self study (preparation for exams included): 180 h</td>
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<td>1 semester</td>
</tr>
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<td>time schedule (winter/summer term)</td>
<td>The module is offered once per year in the winter term</td>
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<td>maximum/minimum number of participants</td>
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<td>Practical Training (6 SWS)</td>
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<tr>
<td>contents</td>
<td>Thematic focus: Planning, execution, analysis and discussion of practical experiments:</td>
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<tr>
<td>- optical lithography</td>
<td>- light microscopy</td>
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<tr>
<td>- electron microscopy</td>
<td>- scanning probe microscopy</td>
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<tr>
<td>- neurotransmitter detection</td>
<td>- scattering techniques</td>
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<td>- protein crystallization</td>
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<tr>
<td>objectives</td>
<td>Students</td>
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<tr>
<td>- are familiar with independent practical work with selected experimental methods in nanoanalytics / interfaces</td>
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<tr>
<td>Requirements for credit points / exams and grading scheme (where appropriate, weighting)</td>
<td>course</td>
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<tr>
<td>Practical Training</td>
<td>4 Experimental protocols</td>
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<tr>
<td>applicability</td>
<td>M.Sc. in Biomedical Technologies (specialization course), required for module AS10</td>
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<tr>
<td>recommended semester</td>
<td>1st semester</td>
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<tr>
<td>participation requirements</td>
<td>B.Sc. degree</td>
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<tr>
<td>person responsible for the module</td>
<td>Schäffer, Tilman, Prof., Dr. rer. nat.</td>
</tr>
<tr>
<td>teaching staff</td>
<td>Fleischer, Monika, Prof., Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Rheinländer, Johannes, Dr. rer. nat.</td>
</tr>
<tr>
<td></td>
<td>Schäffer, Tilman, Prof., Dr. rer. nat.</td>
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<td></td>
<td>Schreiber, Frank, Prof., Dr. rer. nat.</td>
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<tr>
<td>literature / teaching materials</td>
<td>Literature will be announced at the beginning of term.</td>
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<tr>
<td>module number:</td>
<td>title of the module:</td>
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<tr>
<td>AS7.1 (Veranstaltungsnummer wird zugeteilt)</td>
<td>Implantology – Lecture and Seminar</td>
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<table>
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<table>
<thead>
<tr>
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<tbody>
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<td>contact hours (SWS)</td>
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<td>self study</td>
<td>specialization</td>
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<tr>
<td>Total: 180 h</td>
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<tr>
<td>contact hours: 60 h</td>
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<tr>
<td>self study (preparation for exams included): 120 h</td>
<td>specialization</td>
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<th>1 semester</th>
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<tr>
<th>time schedule (winter/summer term)</th>
<th>The module is offered once per year in the summer term as block course</th>
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<th>language (English/German)</th>
<th>English</th>
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<table>
<thead>
<tr>
<th>maximum/minimum number of participants</th>
<th>lectures and seminars (4 SWS)</th>
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<tbody>
<tr>
<td>Lecture: max.: 50</td>
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</tr>
<tr>
<td>Seminar: max.: 20</td>
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</table>

| module structure /teaching methods | Thematic focus: |
|------------------------------------|-----------------
| lectures and seminars (4 SWS) | - Vital implants: Tissue engineering, cell biology, biomaterials, reactor technology |
| | - Avital implants: Interface between tissue and man-made materials, signal acquisition and processing, biostability, biocompatibility, operational procedures, design and use in clinical trials |

<table>
<thead>
<tr>
<th>contents</th>
<th>objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>- Vital implants: Detailed knowledge of extracellular matrix components (focus on collagen and elastic fibres), properties of biomaterials, reading and review of current literature, presentation and documentation of own data</td>
</tr>
<tr>
<td></td>
<td>- Avital implants: An understanding of the coupling and interaction between technical implants and tissue, material and bio-compatibility, rejection, knowledge about the transmission of electrical signals and the passivation of surfaces and technical body parts of all kinds, principles of sensory and motor function</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Requirements for credit points / exams and grading scheme (where appropriate, weighting)</th>
<th>course</th>
<th>exam</th>
<th>Grading scheme</th>
<th>weighting</th>
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<tbody>
<tr>
<td>Lecture</td>
<td>Written/oral exam</td>
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<td>3 ECTS</td>
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<tr>
<td>Seminar</td>
<td>Oral presentation (30 min presentation + 15 min discussion)</td>
<td>1-5</td>
<td>3 ECTS</td>
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</table>

<p>| applicability | M.Sc. in Biomedical Technologies (specialization and elective course) and M.Sc. in Medizinische Strahlenwissenschaften/Medical Radiation Sciences (elective course) and elective course for students of M.Sc. Medical Engineering Univ. of Stuttgart), required for modules AS7.2 and AS8 |</p>
<table>
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<tr>
<th><strong>recommended semester</strong></th>
<th>2nd semester</th>
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</thead>
<tbody>
<tr>
<td><strong>participation requirements</strong></td>
<td>Successful completion of a Bachelor degree in Medical Technologies, or equivalent</td>
</tr>
</tbody>
</table>
| **person responsible for the module** | Geis-Gerstorfer, Jürgen, Prof., Dr. rer. nat.  
Schenke-Layland, Katja, Prof., Dr. rer. nat. |
| **teaching staff** | Stenzl, Arnulf, Prof., Dr. med.  
Wendel, Hans-Peter, Prof., Dr. rer. nat.  
Schenk, Martin, Dr. rer. nat  
Alexander-Friedrich, Dorothea, Prof. Dr. rer. nat.  
Löwenheim, Hubert, Prof., Dr. med  
Höntzsch, Dankward, Prof., Dr. med.  
Gharabaghi, Alireza, Prof., Dr. med.  
Tatagiba, Marcos, Prof., Dr. med.  
Bauer, Axel, Prof., Dr. med.  
Kluba, Torsten, Prof., Dr. med  
Gall, Christian, Dr. med.  
Birbaumer, Niels, Prof., Dr. phil.  
Zeck, Günther, Dr. rer. nat.  
Lembert, Nicolas, Dr. rer. nat.  
Kurtenbach, Anne, Dr. rer. nat and further lecturers. |
<p>| <strong>literature / teaching materials</strong> | Texts and books will be announced at the beginning of term. |</p>
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<th>AS7.2 (Veranstaltungsnummer wird zugeteilt)</th>
<th>title of the module:</th>
<th>Implantology – Labwork</th>
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<th>specialization</th>
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<td>work load</td>
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<td>- contact hours (SWS)</td>
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<td>- self study</td>
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<td>(winter/summer term)</td>
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<td>language (English/German)</td>
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<td>maximum/minimum number of participants</td>
<td>Maximum: 16</td>
<td>Minimum: 3</td>
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<td>Practical Training</td>
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<tr>
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<td>Thematic focus:</td>
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<tr>
<td></td>
<td>- Vital implants: Tissue engineering, cell biology, biomaterials, reactor technology</td>
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<td>- Avital implants: Interface between tissue and man-made materials, signal acquisition and processing, biostability, biocompatibility, operational procedures, design and use in clinical trials</td>
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<td>objectives</td>
<td>Students</td>
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</tr>
<tr>
<td></td>
<td>- Vital implants: Cell and tissue culture techniques, properties of biomaterials, cell and tissue analysis for characterization, bioreactor technology, creating reports</td>
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<tr>
<td></td>
<td>- Avital implants: Design and use of electronic implants (e.g. hearing implants, visual implants, brain stimulation) and endoprosthetic construction (e.g. femoral heads) for mechanics and movement, structural substitutes (breast implants, stents), surgical procedures</td>
<td></td>
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<tr>
<td>Requirements for credit points / exams and grading scheme (where appropriate, weighting)</td>
<td>Practical Training</td>
<td>4 Experimental protocols</td>
<td>1-5</td>
<td>9 ECTS</td>
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<tr>
<td>applicability</td>
<td>M.Sc. in Biomedical Technologies (specialization course), required for module AS8</td>
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<td>recommended semester</td>
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<td></td>
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<tr>
<td>participation requirements</td>
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<td></td>
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<tr>
<td>person responsible for the module</td>
<td>Geis-Gerstorfer, Jürgen, Prof., Dr. rer. nat.</td>
<td>Schenke-Layland, Katja, Prof., Dr. rer. nat.</td>
<td></td>
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<tr>
<td>teaching staff</td>
<td>Stenzl, Arnulf, Prof., Dr. med.</td>
<td>Wendel, Hans-Peter, Prof., Dr. rer. nat.</td>
<td>Schenk, Martin, Dr. rer. nat</td>
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<tr>
<td>literature / teaching materials</td>
<td>Texts and books will be announced at the beginning of term</td>
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Alexander-Friedrich, Dorothea, Prof. Dr. rer. nat.
Löwenheim, Hubert, Prof., Dr. med
Höntzsch, Dankward, Prof., Dr. med.
Gharabaghi, Alireza, Prof., Dr. med.
Tatagiba, Marcos, Prof., Dr. med.
Bauer, Axel, Prof., Dr. med.
Kluba, Torsten, Prof., Dr. med
Gall, Christian, Dr. med.
Birbaumer, Niels, Prof., Dr. phil.
Zeck, Günther, Dr. rer. nat.
Lembert, Nicolas, Dr. rer. nat.
Kurtenbach, Anne, Dr. rer. nat and further lecturers.
<table>
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<tr>
<th>module number: AS8 (Veranstaltungsnummer wird zugeteilt)</th>
<th>title of the module: Implantology – Practical work experience</th>
<th>nature of the module: specialization</th>
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<tr>
<td>credit points</td>
<td>15 CP</td>
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</tbody>
</table>
| work load - contact hours (SWS) - self study            | Total: 450 h  
contact hours: 300 h  
self study (preparation for exams included): 150 h |                                    |
| duration of the module                                  | 1 semester, min. 6 weeks full-time and max. 10 weeks full-time |                                    |
| time schedule (winter/summer term)                      | The module is offered once per year in the summer and winter term as block course |                                    |
| language (English/German)                               | English                                                      |                                    |
| maximum/minimum number of participants                  | Maximum: 16  
Minimum: 1                                                   |                                    |
| module structure /teaching methods                      | Practical Training (10 SWS)                                  |                                    |
| contents                                                 | Vital implants: Tissue engineering, cell biology, biomaterials, reactor technology  
Avital implants: Interface between tissue and man-made materials, signal acquisition and processing, biostability, biocompatibility, operational procedures, design and use in clinical trials |                                    |
| objectives                                               | Vitale implants: Cell and tissue culture techniques, properties of biomaterials, cell and tissue analysis for characterization, bioreactor technology, creating reports  
Avital implants: Design and use of electronic implants (e.g. hearing implants, visual implants, brain stimulation) and endoprosthetic construction (e.g. femoral heads) for mechanics and movement, structural substitutes (breast implants, stents), surgical procedures |                                    |
| Requirements for credit points / exams and grading scheme (where appropriate, weighting) | course | exam | Grading scheme | weighting |
| Practical Training                                      | Written report about the internship (10-15 pages, Arial 12, single-spaced) | 1-5 | 15 ECTS |
| applicability                                           | M.Sc. in Biomedical Technologies (specialization course), recommended for master’s thesis in implantology |                                    |
| recommended semester                                     | 3rd semester                                                 |                                    |
| participation requirements                               | Successful completion of a Bachelor degree in medical technologies, or equivalent, 2 passed specialization blocks and successful completion of module AS7.1 and AS7.2 |                                    |
| person responsible for the module                       | Geis-Gerstorfer, Jürgen, Prof., Dr. rer. nat.  
Schenke-Layland, Katja, Prof., Dr. rer. nat. |                                    |
| teaching staff                                          | Stenzl, Arnulf, Prof., Dr. med.  
Sievert, Karl-Dietrich, Prof. Dr. med. |                                    |
<table>
<thead>
<tr>
<th>literature / teaching materials</th>
<th>Texts and books will be announced at the beginning of term</th>
</tr>
</thead>
</table>

Wendel, Hans-Peter, Prof., Dr. rer. nat.
Schenk, Martin, Dr. rer. nat.
Vaegler, Martin, Dr. rer. nat.
Alexander-Friedrich, Dorothea, Dr. rer. nat.
Löwenheim, Hubert, Prof., Dr. med
Höntzsch, Dankward, Prof., Dr. med.
Gharabaghi, Alireza, Prof., Dr. med.
Tatagiba, Marcos, Prof., Dr. med.
Bauer, Axel, Prof., Dr. med.
Kluba, Torsten, Prof., Dr. med.
Gall, Christian, Dr. med.
Birbaumer, Niels, Prof., Dr. phil.
Zeck, Günther, Dr. rer. nat.
Lembert, Nicolas, PD, Dr. rer. nat.
Kurtenbach, Anne, PD, Dr. rer. nat and further lecturers.
<table>
<thead>
<tr>
<th>module number: AS9.1 (Veranstaltungsnummer wird zugeteilt)</th>
<th>title of the module: Nanoanalytics/Interfaces II – Lecture and Seminar</th>
<th>nature of the module: specialization</th>
</tr>
</thead>
<tbody>
<tr>
<td>credit points</td>
<td>6 CP</td>
<td>specialization</td>
</tr>
<tr>
<td>work load</td>
<td>Total: 180 h contact hours: 60 h self study (preparation for exams included): 120 h</td>
<td></td>
</tr>
<tr>
<td>duration of the module</td>
<td>1 semester</td>
<td></td>
</tr>
<tr>
<td>time schedule (winter/summer term)</td>
<td>The module is offered once per year in the summer term</td>
<td></td>
</tr>
<tr>
<td>language (English/German)</td>
<td>English</td>
<td></td>
</tr>
<tr>
<td>maximum/minimum number of participants</td>
<td>Lecture: Maximum: 24; Minimum: 3 Seminar: Maximum: 8; Minimum: 3</td>
<td></td>
</tr>
<tr>
<td>module structure /teaching methods</td>
<td>Lecture: Nanoanalytics and Biophysics (2 SWS) and Seminar: Nanotechnology for Medical Applications (2 SWS)</td>
<td></td>
</tr>
<tr>
<td>contents</td>
<td>Thematic focus: - Introduction to statistical physics, soft matter and polymer physics, mechanics of cells and tissues, physics of the cytoskeleton, cellular forces, motor proteins, methods in nanobiophysics, high resolution microscopy techniques, lab-on-a-chip technology - Discussion of current research topics in the field of nanotechnology for medical applications</td>
<td></td>
</tr>
<tr>
<td>objectives</td>
<td>Students - are familiar with the fundamentals of nanoanalytics and biophysics. - study independently a scientific research topic and present it in the form of an oral seminar talk.</td>
<td></td>
</tr>
<tr>
<td>Requirements for credit points / exams and grading scheme (where appropriate, weighting)</td>
<td>course exam Grading scheme weighting</td>
<td></td>
</tr>
<tr>
<td>Nanoanalytics and Biophysics</td>
<td>Written/oral exam 1-5</td>
<td>3 ECTS</td>
</tr>
<tr>
<td>Nanoanalytics Nanotechnology for medical Applications</td>
<td>Oral presentation (30 min presentation + 15 min discussion) 1-5</td>
<td>3 ECTS</td>
</tr>
<tr>
<td>applicability</td>
<td>M.Sc. in Biomedical Technologies (specialization and elective course) and M.Sc. in Medizinische Strahlenwissenschaften/Medical Radiation Sciences (elective course) and elective course for students of M.Sc. Medical Engineering Univ. of Stuttgart), required for module AS10. For elective courses only the lecture is applicable.</td>
<td></td>
</tr>
<tr>
<td>recommended semester</td>
<td>2nd semester</td>
<td></td>
</tr>
<tr>
<td>participation requirements</td>
<td>B.Sc. degree</td>
<td></td>
</tr>
<tr>
<td><strong>person responsible for the module</strong></td>
<td>Schäffer, Tilman, Prof., Dr. rer. nat.</td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------------</td>
<td></td>
</tr>
</tbody>
</table>
| **teaching staff** | Rheinlaender, Johannes, Dr. rer. nat.  
Schäffer, Tilman, Prof., Dr. rer. nat. |
| **literature / teaching materials** | Literature will be announced at the beginning of term. |

<table>
<thead>
<tr>
<th><strong>module number:</strong></th>
<th><strong>AS9.2</strong></th>
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<td>(Veranstaltungsnummer wird zugeteilt)</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>title of the module:</strong></th>
<th><strong>Nanoanalytics/Interfaces II – Labwork</strong></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>nature of the module:</strong></th>
<th>specialization</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>credit points</strong></th>
<th>9 CP</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>work load</strong></th>
<th><strong>Total: 270 h</strong></th>
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</thead>
<tbody>
<tr>
<td>- contact hours (SWS)</td>
<td>contact hours: 90 h</td>
</tr>
<tr>
<td>- self study</td>
<td>self study (preparation for exams included): 180 h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>duration of the module</strong></th>
<th>1 semester</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>time schedule (winter/summer term)</strong></th>
<th>The module is offered once per year in the summer term</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th><strong>language (English/German)</strong></th>
<th>English</th>
</tr>
</thead>
</table>

| **maximum/minimum number of participants** | Maximum: 8  
Minimum: 3 |
|-----------------------------------------------|------------|

<table>
<thead>
<tr>
<th><strong>module structure / teaching methods</strong></th>
<th>Practical Training (6 SWS)</th>
</tr>
</thead>
</table>

| **contents** | Thematic focus:  
Planning, execution, analysis and discussion of practical experiments:  
- optical lithography  
- light microscopy  
- electron microscopy  
- scanning probe microscopy  
- neurotransmitter detection |
|----------------|------------------------------------------------|

| **objectives** | Students  
- Independent practical familiarization with selected experimental methods in nanoanalytics / interfaces |
|----------------|------------------------------------------------|

<table>
<thead>
<tr>
<th><strong>Requirements for credit points / exams and grading scheme (where appropriate, weighting)</strong></th>
<th>course</th>
<th>exam</th>
<th>Grading scheme</th>
<th>weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical Training</td>
<td>4 Experimental protocols</td>
<td>1-5</td>
<td>9 ECTS</td>
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<table>
<thead>
<tr>
<th><strong>applicability</strong></th>
<th>M.Sc. in Biomedical Technologies (specialization course), required for module AS10</th>
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<table>
<thead>
<tr>
<th><strong>recommended semester</strong></th>
<th>2nd semester</th>
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<table>
<thead>
<tr>
<th><strong>participation requirements</strong></th>
<th>B.Sc. degree</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>person responsible</strong></th>
<th>Schäffer, Tilman, Prof., Dr. rer. nat.</th>
</tr>
</thead>
<tbody>
<tr>
<td>for the module</td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>teaching staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleischer, Monika, Prof., Dr. rer. nat.</td>
</tr>
<tr>
<td>Rheinlaender, Johannes, Dr. rer. nat.</td>
</tr>
<tr>
<td>Schäffer, Tilman, Prof., Dr. rer. nat.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>literature / teaching materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literature will be announced at the beginning of term.</td>
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<thead>
<tr>
<th>module number:</th>
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<tbody>
<tr>
<td>AS10</td>
</tr>
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<td>(Veranstaltungsnummer wird zugeteilt)</td>
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<table>
<thead>
<tr>
<th>title of the module:</th>
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<tbody>
<tr>
<td>Nanoanalytics/Interfaces – Practical work experience in Nanotechnology for Medical Applications</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>nature of the module:</th>
</tr>
</thead>
<tbody>
<tr>
<td>specialization</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>credit points</th>
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</thead>
<tbody>
<tr>
<td>15 CP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>work load</th>
</tr>
</thead>
<tbody>
<tr>
<td>- contact hours (SWS)</td>
</tr>
<tr>
<td>- self study</td>
</tr>
<tr>
<td>Total: 450 h</td>
</tr>
<tr>
<td>contact hours: 300 h</td>
</tr>
<tr>
<td>self study (preparation for exams included): 150 h</td>
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<table>
<thead>
<tr>
<th>duration of the module</th>
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<tbody>
<tr>
<td>1 semester, min. 6 weeks full-time and max. 10 weeks full-time</td>
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</table>

<table>
<thead>
<tr>
<th>time schedule (winter/summer term)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The module is offered once per year in the summer and winter term as block course.</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>language (English/German)</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>maximum/minimum number of participants</th>
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</thead>
<tbody>
<tr>
<td>Maximum: 8</td>
</tr>
<tr>
<td>Minimum: 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>module structure /teaching methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical Training</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Labwork contains a special topic that the student has to work on in theory and practice under the supervision of a scientist or medical doctor.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent practical familiarization with experimental methods in the planned area of the Master’s thesis.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Requirements for credit points / exams and grading scheme (where appropriate, weighting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>course</td>
</tr>
<tr>
<td>Practical Training</td>
</tr>
<tr>
<td>Exam</td>
</tr>
<tr>
<td>Written report about the internship (10-15 pages, Arial 12, single-spaced)</td>
</tr>
<tr>
<td>Grading scheme</td>
</tr>
<tr>
<td>1-5</td>
</tr>
<tr>
<td>weighting</td>
</tr>
<tr>
<td>15 ECTS</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.Sc. in Biomedical Technologies (specialization course), recommended for master´s thesis in Nanoanalytics/Interfaces</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>recommended semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd semester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>participation requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.Sc. degree, 2 passed specialization blocks and successful completion of either modules AS6.1 and AS6.2 or modules AS9.1 and AS9.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>person responsible for the module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schäffer, Tilman, Prof., Dr. rer. nat.</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>teaching staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleischer, Monika, Prof., Dr. rer. nat.</td>
</tr>
<tr>
<td>literature / teaching materials</td>
</tr>
<tr>
<td>module number:</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>AE11 (Veranstaltungsnummer wird zugeteilt)</td>
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<table>
<thead>
<tr>
<th>credit points</th>
<th>6 CP</th>
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<tbody>
<tr>
<td>work load</td>
<td>Total: 180 h contact hours: 42 h self study (preparation for exams included): 138 h</td>
</tr>
<tr>
<td>duration of the module</td>
<td>2 semester</td>
</tr>
<tr>
<td>time schedule (winter/summer term)</td>
<td>The module is offered each semester</td>
</tr>
<tr>
<td>language (English/German)</td>
<td>German</td>
</tr>
<tr>
<td>maximum/minimum number of participants</td>
<td>Maximum: 20</td>
</tr>
</tbody>
</table>

| module structure /teaching methods | Lecture, practical training, |

<table>
<thead>
<tr>
<th>Requirements for credit points / exams and grading scheme (where appropriate, weighting)</th>
<th>course</th>
<th>exam</th>
<th>Grading scheme</th>
<th>weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>Oral exam (ca. 40 min)</td>
<td>1-5</td>
<td>6 ECTS</td>
<td></td>
</tr>
</tbody>
</table>

<p>| applicability | M.Sc. in Biomedical Technologies (elective course) |
| recommended semester | 1st or 2nd semester |
| participation requirements | B.Sc. degree in Medical Technologies |</p>
<table>
<thead>
<tr>
<th><strong>person responsible for the module</strong></th>
<th>Schinköthe, Wolfgang, Prof., Dr.-Ing.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>teaching staff</strong></td>
<td>Schinköthe, Wolfgang, Prof., Dr.-Ing.</td>
</tr>
<tr>
<td><strong>literature / teaching materials</strong></td>
<td>Literature will be distributed before start of lecture.</td>
</tr>
</tbody>
</table>
| module number: | AE 12  
(Veranstaltungsnummer wird zugeteilt) |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>title of the module:</td>
<td>Technologien der medizinischen Bildgebung und Labordiagnostik</td>
</tr>
<tr>
<td>nature of the module:</td>
<td>elective course</td>
</tr>
<tr>
<td>credit points</td>
<td>3 CP</td>
</tr>
</tbody>
</table>
| work load | Total: 90 h  
contact hours: 28 h  
self study (preparation for exams included): 62 h |
| duration of the module | 1 semester |
| time schedule (winter/summer term) | The module is offered once per year in the summer term |
| language (English/German) | German |
| maximum/minimum number of participants | Maximum: 20 |
| module structure /teaching methods | Lecture |
| contents | Bildgebende Diagnostik  
- Röntgen  
- Computertomographie  
- Magnetresonanztomographie  
- Positronenemissionstomographie  
- Labordiagnostik  
- Klinische Chemie  
- Immunologie  
- Molekulare Diagnostik (DNA Analyse)  
Informationstechnologie in der Medizintechnik |
| objectives | - Kenntnis bildgebender und labormedizinischer Diagnoseverfahren und deren klinischer Bedeutung und Einsatzfelder.  
- Grundverständnis der zugrundeliegenden physikalischen und biomolekularen Messprinzipien.  
- Einblick in die Entwicklung und Herstellung medizintechnischer Geräte und die damit verbundenen technologischen Herausforderungen.  
- Verständnis grundlegender Zusammenhänge im Gesundheitswesen in Bezug auf Arbeitsabläufe, Kostenentwicklung und Behandlungsqualität. |
<p>| Requirements for credit points / exams and grading scheme (where appropriate, weighting) | course | exam | Grading scheme | weighting |
| | Lecture | Oral exam (ca. 30 min) | 1-5 | 3 |
| applicability | M.Sc. in Biomedical Technologies (elective course) |
| recommended semester | 1st or 2nd semester |
| participation requirements | B.Sc. degree in Medical Technologies |
| person responsible for the module | Yang, Bin, Prof., Dr.-Ing. |</p>
<table>
<thead>
<tr>
<th>teaching staff</th>
<th>Lauer, Lars, Dr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>literature / teaching</td>
<td>Literature will be distributed before start of lecture.</td>
</tr>
<tr>
<td>materials</td>
<td></td>
</tr>
<tr>
<td>module number:</td>
<td>title of the module:</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>AE 13 (Veranstaltungsnummer wird zugeteilt)</td>
<td>Interface-Design</td>
</tr>
</tbody>
</table>

**credit points**
6 CP

**work load**
- contact hours (SWS)
- self study
  - Total: 180 h
  - contact hours: 42 h
  - self study (preparation for exams included): 138 h

**duration of the module**
1 semester

**time schedule**
(winter/summer term)
The module is offered once per year in the summer term

**language**
(English/German)
German

**maximum/minimum number of participants**
Maximum: 20

**module structure /teaching methods**
Lecture, practical training, seminar

**contents**

**objectives**
Das Modul vermittelt Grundlagen und Vertiefungen zum Interfacedesign. Studierende besitzen nach dem Besuch des Moduls
- das Wissen über die wesentlichen Grundlagen des Interfacedesigns als Bestandteil der methodischen Entwicklung und zur Vertiefung des Technischen Designs,
- die Kenntnis über wesentliche Interaktionsprinzipien zur Wahrnehmung, Kognition und Betätigung und Benutzung,
- die Fähigkeit wichtige Methoden zur Gestaltung der Mensch-Maschine-Schnittstelle anwenden, Lösungen zu realisieren und zu präsentieren,
- die Fertigkeiten zur Planung und Durchführung von Usability-Tests mit Probanden,
- grundlegende Kenntnisse zu Kriterien und Bewertung von Anzeigen und Stelleteilen über die XKompatibilitäten,
- ein detailliertes Verständnis von Makro-, Mikround Informationsergonomie und deren Integration in die Planungs-, Konzept-, Entwurfs- und Ausarbeitungsphase,
- die Fähigkeit zur Durchführung und Auswertung einer Workflow-Analyse als Querschnittsfunktion,
- die Fähigkeit effiziente Bedienstrategien zu beurteilen,
- das Wissen über Auswirkungen und zukünftige Trends der Interfacegestaltung.

<table>
<thead>
<tr>
<th>Requirements for</th>
<th>course</th>
<th>exam</th>
<th>Grading scheme</th>
<th>weighting</th>
</tr>
</thead>
</table>

34
<table>
<thead>
<tr>
<th>credit points / exams and grading scheme (where appropriate, weighting)</th>
<th>Lecture</th>
<th>Written exam (ca. 120 min)</th>
<th>1-5</th>
<th>6 ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>applicability</td>
<td>M.Sc. in Biomedical Technologies (elective course)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>recommended semester</td>
<td>1st or 2nd semester</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>participation requirements</td>
<td>B.Sc. degree in Medical Technologies</td>
<td></td>
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<tr>
<td>person responsible for the module</td>
<td>Maier, Thomas, Univ.-Prof., Dr.-Ing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>teaching staff</td>
<td>Maier, Thomas, Univ.-Prof., Dr.-Ing. Schmid, Markus, Dr.-Ing.</td>
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<tr>
<td>literature / teaching materials</td>
<td>Literature will be distributed before start of lecture.</td>
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</table>
| **module number:**  
**AE 14**  
(Veranstaltungsnummer wird zugeordnet) | **title of the module:**  
Grundlagen der Keramik und Verbundwerkstoffe | **nature of the module:**  
elective course |
<table>
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</thead>
<tbody>
<tr>
<td><strong>credit points</strong></td>
<td>6 CP</td>
<td></td>
</tr>
</tbody>
</table>
| **work load**  
- contact hours (SWS)  
- self study | Total: 180 h  
contact hours: 42 h  
self study (preparation for exams included): 138 h |  |
| **duration of the module** | 2 semester |  |
| **time schedule**  
(winter/summer term) | The module is offered once per year in the winter term |  |
| **language**  
(English/German) | German |  |
| **maximum/minimum number of participants** | Maximum: 20 |  |
| **module structure/teaching methods** | Lecture |  |
- Grundlagen von Festkörpern im Allgemeinen und der Keramik.  
- Einteilung der Keramik nach anwendungstechnischen und stofflichen Kriterien, Trennung in Oxid-/ Nichtoxidkeramiken und Struktur-/ Funktionskeramiken.  
- Abgrenzung Keramik zu Metallen.  
- Grundregeln der Strukturmechanik, Bauteilgestaltung und Bauteilprüfung.  
- Klassische Herstellungsverfahren vom Rohstoff bis zum keramischen Endprodukt.  
- Formgebungsverfahren, wie das Axialpressen, Heißpressen, Kalt-, Heißisostatpressen, Schlicker-, Spritz-, Foliengießen und Extrudieren keramischer Massen.  
- Füge- und Verbindungstechnik.  
- Sintertheorie und Ofentechnik.  
- Industrielle Anwendungen (Überblick und Fallbeispiele). |  |
| **objectives** | Die Studenten können:  
- Merkmale und Eigenheiten keramischer Werkstoffe unterscheiden, beschreiben und beurteilen.  
- Belastungsfälle und Versagensmechanismen verstehen und analysieren.  
- werkstoffspezifische Unterschiede zwischen metallischen und keramischen Werkstoffen wiedergeben und erklären.  
- Technologien zur Verstärkung von Werkstoffen sowie die wirkenden Mechanismen benennen, vergleichen und erklären.  
- Verfahren und Prozesse zur Herstellung von massivkeramischen Werkstoffen benennen, erklären, bewerten, gegenüberstellen, |  |
auswählen und anwenden.
- Herstellungsprozesse hinsichtlich der techn. und wirtschaftl. Herausforderungen bewerten und anwendungsbezogen auswählen.
- in Produktentwicklung und Konstruktion geeignete Verfahren und Stoffsyste me identifizieren, planen und auswählen.
- Werkstoff- und Bauteilcharakterisierung erklären, bewerten, planen und anwenden.

<table>
<thead>
<tr>
<th>Requirements for credit points / exams and grading scheme (where appropriate, weighting)</th>
<th>course</th>
<th>exam</th>
<th>Grading scheme</th>
<th>weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>Written exam (ca. 120 min)</td>
<td>1-5</td>
<td>6 ECTS</td>
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</table>

**applicability**
M.Sc. in Biomedical Technologies (elective course)

**recommended semester**
1\(^{st}\) or 2\(^{nd}\) semester

**participation requirements**
B.Sc. degree in Medical Technologies

**person responsible for the module**
Gadow, Rainer, Univ.-Prof., Dr.Dr.h.c.

**teaching staff**
Gadow, Rainer, Univ.-Prof., Dr.Dr.h.c.

**literature / teaching materials**
Literature will be distributed before start of lecture.
<table>
<thead>
<tr>
<th>module number:</th>
<th>title of the module:</th>
<th>nature of the module:</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE 15</td>
<td>Nanotechnologie I - Chemie und Physik der Nanomaterialien</td>
<td>elective course</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>credit points</th>
<th>3 CP</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>work load</th>
<th>nature of the module:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- contact hours (SWS)</td>
<td>elective course</td>
</tr>
<tr>
<td>- self study</td>
<td>elective course</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>duration of the module</th>
<th>1 semester</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>time schedule</th>
<th>The module is offered each semester</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>language</th>
<th>German</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>maximum/minimum number of participants</th>
<th>Maximum: 20</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>module structure /teaching methods</th>
<th>Lecture</th>
</tr>
</thead>
</table>

|----------|---------------------------------|

<table>
<thead>
<tr>
<th>objectives</th>
<th>Die Studierenden</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>verstehen die Nanoskaligkeit natürlicher Materie und können sie an Beispielen illustrieren.</td>
</tr>
<tr>
<td></td>
<td>- können die Definition der Nanotechnologien und Nanomaterialien anwenden und die Potenziale und Risiken von Nanomaterialien diskutieren.</td>
</tr>
<tr>
<td></td>
<td>- können den Aufbau und die Struktur von Nanomaterialien erklären.</td>
</tr>
<tr>
<td></td>
<td>- können die Dimensionalität von Nanomaterialien (3 D, 2 D, 1 D und 0 D) bestimmen.</td>
</tr>
<tr>
<td></td>
<td>- können Methoden zur Analyse von Nanomaterialien auswählen und die Vorgehensweise bei deren Anwendung skizzieren.</td>
</tr>
<tr>
<td></td>
<td>- können unterschiedliche Verfahren zur Synthese aus unterschiedlichen physikalischen Phasen (Gasphase und Flüssigphase) von Nanomaterialien erläutern und deren grundlegende Prinzipien beschreiben.</td>
</tr>
<tr>
<td></td>
<td>- verstehen die besonderen Attribute von top down- und bottom up-Verfahren zur Synthese und Verarbeitung von Nanomaterialien.</td>
</tr>
<tr>
<td></td>
<td>- sind in der Lage besondere mechanische, chemische, elektrische, optische, magnetische, biologische und toxikologische Eigenschaften von Nanomaterialien zu bewerten.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Requirements for credit points / exams and grading scheme (where appropriate, weighting)</th>
<th>course</th>
<th>exam</th>
<th>Grading scheme</th>
<th>weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>Written exam (ca. 90 min)</td>
<td>1-5</td>
<td>3 ECTS</td>
<td></td>
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</tbody>
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38
<table>
<thead>
<tr>
<th><strong>applicability</strong></th>
<th>M.Sc. in Biomedical Technologies (elective course)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>recommended semester</strong></td>
<td>1\textsuperscript{st} or 2\textsuperscript{nd} semester</td>
</tr>
<tr>
<td><strong>participation requirements</strong></td>
<td>B.Sc. degree in Medical Technologies</td>
</tr>
<tr>
<td><strong>person responsible for the module</strong></td>
<td>Hirth, Thomas, Prof., Dr.</td>
</tr>
</tbody>
</table>
| **teaching staff** | Tovar, Günter, Apl. Prof., Dr.  
Hirth, Thomas, Prof., Dr. |
<p>| <strong>literature / teaching materials</strong> | Literature will be distributed before start of lecture. |</p>
<table>
<thead>
<tr>
<th>module number: AE 16 (Veranstaltungsnummer wird zugeteilt)</th>
<th>title of the module: Nanotechnologie II - Technische Prozesse und Anwendungen</th>
<th>nature of the module: elective course</th>
</tr>
</thead>
<tbody>
<tr>
<td>credit points</td>
<td>3 CP</td>
<td></td>
</tr>
</tbody>
</table>
| work load | Total: 90 h  
- contact hours: 28 h  
- self study (preparation for exams included): 62 h |  |
| duration of the module | 1 semester |  |
| time schedule (winter/summer term) | The module is offered once per year in the winter term |  |
| language (English/German) | German |  |
| maximum/minimum number of participants | Maximum: 20 |  |
| module structure /teaching methods | Lecture |  |
| contents | Technische Prozesse zur Synthese und Verarbeitung von Nanomaterialien unterschiedlicher Dimensionalität (3 D, 2 D, 1 D und 0 D) und aus unterschiedlichen physikalischen Phasen (gasförmig, flüssig, fest) |  |
| objectives | Die Studierenden  
- verstehen technische Prozesse zur Synthese und Verarbeitung von Nanomaterialien unterschiedlicher Dimensionalität (3 D, 2 D, 1 D und 0 D) und aus unterschiedlichen physikalischen Phasen (gasförmig, flüssig, fest) und können Prozessketten illustrieren.  
- können Anwendungen von Nanomaterialien mit besonderen mechanischen, chemischen, Biochemischen, elektrischen, optischen, magnetischen, biologischen und medizinischen Eigenschaften verstehen und bewerten.  
- interpretieren die öffentliche Wahrnehmung von Nanotechnologien und Nanomaterialien und können reale Chancen und Risiken von Nanotechnologien und Nanomaterialien bewerten. |  |
| Requirements for credit points / exams and grading scheme (where appropriate, weighting) |  |
| course | exam | Grading scheme | weighting |
| Lecture | Written exam (ca. 90 min) | 1-5 | 3 ECTS |
| applicability | M.Sc. in Biomedical Technologies (elective course) |  |
| recommended semester | 1st or 2nd semester |  |
| participation requirements | B.Sc. degree in Medical Technologies |  |
| person responsible for the module | Hirth, Thomas, Prof., Dr. |  |
| teaching staff | Hirth, Thomas, Prof., Dr.  
Tovar, Günter, Apl. Prof., Dr. |  |
| literature / teaching materials | Literature will be distributed before start of lecture. |  |
| **module number:** | AE 17  
(Veranstaltungsnummer wird zugeteilt) | **title of the module:** | Optische Systeme in der Medizintechnik | **nature of the module:** | elective course |
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>credit points</strong></td>
<td>6 CP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>work load</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- contact hours (SWS)</td>
<td>Total: 180h</td>
<td>contact hours: 42h</td>
<td>self study (preparation for exams included): 138h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- self study</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>duration of the module</strong></td>
<td>1 semester</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>time schedule</strong></td>
<td></td>
<td></td>
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<tr>
<td>(winter/summer term)</td>
<td>The module is offered once per year in the summer term</td>
<td></td>
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<tr>
<td><strong>language</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(English/German)</td>
<td>German</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>maximum/minimum number of participants</strong></td>
<td>Maximum: 20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>module structure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/teaching methods</td>
<td>Lecture, practical training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| **contents**        | Basic optical system design and optical system parameters.  
Basic architecture of optical systems used in medicine (microscope, surgical microscope, endoscope, ophthalmic systems)  
Modern microscopy methods (structured illumination, confocal, fluorescence).  
Optics of the human eye and ophthalmic systems.  
Lasers in medical diagnostics and therapy.  
Spectroscopic and hyperspectral methods and systems.  
3-D optical metrology.  
Basic properties of detectors. |                           |                                      |                          |                  |
| **objectives**      | The students know how to calculate basic optical quantities within simple optical systems.  
The students are familiar with  
- the optical setup of microscopes, endoscopes, and ophthalmic systems  
- spectral systems and their application  
- the properties of the human eye  
- properties of laser beams  
- polarization  
The students have an overview  
- over state of the art microscopic methods in order to enhance resolution and/or contrast  
- laser systems and their application in medicine  
- important properties of optical detectors |                           |                                      |                          |                  |
<p>| <strong>Requirements for</strong> | course                                   | exam                      | Grading scheme                       | weighting                |
| <strong>credit points / exams and grading scheme (where appropriate, weighting)</strong> | Written exam | 1-5 | 6 ECTS |
| <strong>applicability</strong>   | M.Sc. in Biomedical Technologies (elective course) |                           |                                      |                          |                  |
| <strong>recommended semester</strong> | 1st or 2nd semester                       |                           |                                      |                          |</p>
<table>
<thead>
<tr>
<th><strong>participation requirements</strong></th>
<th>B.Sc. degree in Medical Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>person responsible for the module</strong></td>
<td>Herkommer, Alois, Univ.-Prof., Dr.</td>
</tr>
<tr>
<td><strong>teaching staff</strong></td>
<td></td>
</tr>
</tbody>
</table>
| **literature / teaching materials** | Literature will be distributed before start of lecture. Additional recommended books:  
- Gross H.: Handbook of optical systems Vol. 1-4  
- Hecht, E.: Optik (Optics)  
- Kühlke D.: Optik |
<table>
<thead>
<tr>
<th>Modulkennziffer:</th>
<th>Modultitel:</th>
<th>Art des Moduls:</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM5 .1 (Veranstaltungsnummer wird zugeteilt)</td>
<td><em>Physik und Technologie der medizinischen Strahlenanwendungen - Vorlesung</em></td>
<td>Wahlfach</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Leistungspunkte</th>
<th>3 LP</th>
</tr>
</thead>
</table>

**Arbeitsaufwand**

| - Kontaktzeit SWS | Gesamt: 90 h |
| - Selbststudium | Kontaktzeit: 3 SWS (32 h) Selbststudium: 58 Stunden |

**Moduladauer**

| 1 Semester |

**Turnus**

| Das Modul wird in jedem Sommersemester angeboten |

**Unterrichtssprache**

| Deutsch |

**Gruppengröße / beschränkte Teilnehmerzahl**

| Vorlesung: max. 20 Teilnehmer |

**Lehrformen**

| Vorlesung (3 SWS) |

**Modulinhalt**

| Technische Umsetzung der Gesetzmäßigkeiten der Atom-, Kern- und Strahlenphysik in Gerätetechnik der radiologischen Diagnostik, Nuklearmedizin und Strahlentherapie: |

- Beschleuniger für die Strahlentherapie und die Radionuklidanwendung
- Bestrahlungsfeld-Verifikationstechniken und Therapie-Bildverfahren
- Gerätetechnik der Brachytherapie
- Gerätetechnik der Hyperthermie
- Geräte für die Bildgebung (Röntgendiagnostik, Szintigratie, bildgestützte Radiotherapie)
- Nuklidanwendung in Kernreaktor, Generatorsystemen und im Zyklotron
- Messverfahren und -protokolle für die Qualitätssicherung und den Strahlenschutz |

**Qualifikationsziele**

| - Die Studierenden verfügen nach erfolgreichem Abschluss des Moduls über das physikalisch-technische Basiswissen, das für die wissenschaftliche und klinische Arbeit in der medizinischen Strahlenforschung in der Onkologie erforderlich ist. |

- Sie kennen Funktionsweise und Technik der gängigen in der Nuklearmedizin, Radiologie und Strahlentherapie eingesetzten Geräte. |

**Prüfungsform / Benotung (ggf. Gewichtung)**

<table>
<thead>
<tr>
<th>Veranstaltung</th>
<th>Prüfungsform</th>
<th>Benotung</th>
<th>Leistungspunkte</th>
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</thead>
<tbody>
<tr>
<td>Schriftliche Klausur</td>
<td>3 LP</td>
<td></td>
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</tbody>
</table>

**Verwendbarkeit**

| Die Vorlesung dieses Moduls ist Teilmodul des Moduls BM5 im Masterstudiengang Medizinische Strahlenwissenschaften. Es kann nur die Vorlesung (3 SWS = 3 ECTS) belegt werden. |

**Empfohlenes Semester**

| 2. Fachsemester |

**Teilnahmevoraussetzungen**

<p>| B.Sc. in Medizintechnik. |</p>
<table>
<thead>
<tr>
<th><strong>Modulverantwortlicher</strong></th>
<th>Dohm, Oliver, Dr. rer. nat./ Prof. Dr. Daniela Thorwarth</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dozent</strong></td>
<td>Dohm, Oliver, Dr. rer. nat., Kaulich, Theodor, Dr. rer. nat., Thorwarth, Daniela, Dr. rer. nat., Zeeb, Bastian</td>
</tr>
<tr>
<td><strong>Literatur / Lernmaterialien</strong></td>
<td>Wird zu Semesterbeginn bekannt gegeben.</td>
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<tr>
<td>module number: BM8</td>
<td>Title of the module: Biostatistics 1</td>
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<td>--------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>credit points</td>
<td>6</td>
</tr>
<tr>
<td>work load</td>
<td>Total: 180 h</td>
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<tr>
<td></td>
<td>contact hours: 70 h</td>
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<td></td>
<td>self study (preparation for exams included): 110 hours</td>
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</tr>
<tr>
<td>time schedule (winter/summer term)</td>
<td>Annual</td>
</tr>
<tr>
<td>language (English/German)</td>
<td>German / English</td>
</tr>
<tr>
<td>maximum/minimum number of participants</td>
<td>Lecture: no limit Tutorial: max. 28 participants</td>
</tr>
<tr>
<td>module structure /teaching methods</td>
<td>Statistics 1: Lecture 1 (2 SWS), Tutorial (1 SWS) (mandatory, English) 3 ECTS Anova: Lecture 1 (2 SWS), Tutorial (1 SWS) (elective, English) 3 ECTS Statistics 2: Lecture 1 (2 SWS), Tutorial (1 SWS) (elective, German) 3 ECTS Clinical Studies: Lecture 1 (2 SWS), Tutorial (1 SWS) (elective, English) 2 ECTS</td>
</tr>
<tr>
<td>contents</td>
<td>Statistics 1: Scales, Descriptive Statistics (Graphics, Tables, Parameters), Correlation and Regression, Diagnostic Tests, Confidence intervals, Kaplan Meier Analysis of Survival Data Examples and Principles of statistical tests, Tests for independent samples, Tests for dependent Samples, Assessment of Normal Distribution, one factorial analysis of variance, Multiple Testing, Principles of sample size estimation Anova: One factorial analysis of variance, analysis of covariance, two factorial analysis of variance without interaction, two factorial analysis of variance with interaction, two factorial analysis of variance with one between and one within factor, multiple comparisons, mixed models and generalized estimating equations Statistics 2: Epidemiological Studies: Target population, Risk factors, sources of bias, adjustment, Exact and Chi-Square Tests, Multiple Logistic Regression, Cluster analysis, Discriminant analysis, Meta analysis, Surveillance, Registries, Standards (STROBE, MOOSE, ..) Biostatistics of Clinical Studies: Statistical methods for clinical studies, sample size estimation, sequential and adaptive designs, diagnostic studies, studies with censored data</td>
</tr>
<tr>
<td>objectives</td>
<td>The students are able to develop statistical modelling and analysis of experiments, interventional and observational clinical studies and of epidemiological studies. They are able to interpret the results. The students have knowledge of statistical analysis (descriptive, confirmatory, regression, multivariate) and they are able to decide which method is the most adequate in a specific study.</td>
</tr>
</tbody>
</table>
### Requirements for credit points / exams and grading scheme (where appropriate, weighting)

<table>
<thead>
<tr>
<th>Course</th>
<th>Exam</th>
<th>Grading Scheme</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistics 1</td>
<td>Written exam</td>
<td></td>
<td>3 ECTS</td>
</tr>
<tr>
<td>Analysis of</td>
<td>Mandatory attendance</td>
<td></td>
<td>3 ECTS</td>
</tr>
<tr>
<td>Variance</td>
<td>Mandatory Attendance</td>
<td></td>
<td>3 ECTS</td>
</tr>
<tr>
<td>Statistics 2</td>
<td>Mandatory Attendance</td>
<td></td>
<td>3 ECTS</td>
</tr>
<tr>
<td>Clinical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biostatistics</td>
<td></td>
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</tbody>
</table>

### applicability
This Module is elective for MSc Biomedical Technology and MSc Medizinische Strahlenwissenschaften

### recommended semester
1st / 2nd Semester

### participation requirements
The knowledge of the Course Statistics 1 is required to attend the other three courses which are independent of each others.

### person responsible for the module
Martus, Peter, Prof. Dr. rer. nat.

### teaching staff
Martus, Peter, Prof. Dr. rer. nat.,
Sharma, Manu PhD,
Wang, Lisa, MSc, PhD Student

### literature / teaching materials
To be announced at the beginning of the term
<table>
<thead>
<tr>
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<th>Modultitel:</th>
<th>Art des Moduls:</th>
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</thead>
<tbody>
<tr>
<td>BM12.1 (Veranstaltungsnummer wird zugeteilt)</td>
<td>Nuclear medicine, diagnostic and interventional radiology, radiation therapy - Lecture course</td>
<td>Wahlfach</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Leistungspunkte</th>
<th>3 LP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arbeitsaufwand*</td>
<td>Gesamt: 90 h</td>
</tr>
<tr>
<td>- Kontaktzeit SWS</td>
<td>Kontaktzeit: 2 SWS (21 h)</td>
</tr>
<tr>
<td>- Selbststudium</td>
<td>Selbststudium: 69 Stunden</td>
</tr>
<tr>
<td>Modulsdauer*</td>
<td>1 Semester</td>
</tr>
<tr>
<td>Turnus*</td>
<td>Das Modul wird in jedem Wintersemester angeboten</td>
</tr>
<tr>
<td>Unterrichtssprache</td>
<td>Deutsch</td>
</tr>
<tr>
<td>Gruppengröße / beschränkte Teilnehmerzahl</td>
<td>Vorlesung: max. 20 Teilnehmer</td>
</tr>
<tr>
<td>Lehrformen*</td>
<td>Vorlesung (2SWS)</td>
</tr>
</tbody>
</table>

**Modulinhalt***

Grundlagen der Nuklearmedizin, der diagnostischen und interventionellen Radiologie und der Strahlentherapie aus der Sicht des Mediziners:
- Physikalische Grundlagen der Nuklearmedizin
- Grundprinzipien nuklearmedizinischer Anwendungen (Radiopharmaka)
- Anwendung offener und umschlossener Radionuklide in Diagnostik und Therapie
- Nuklearmedizinische Therapie und intratherapeutische Dosismessung
- Physikalische Grundlagen der Strahlentherapie
- Indikationen für die Anwendung bestimmter diagnostischer und therapeutischer Verfahren
- Radiographische Verfahren, Magnetresonanz-Tomografie, Ultraschall

**Qualifikationsziele***

- Die Studierenden kennen nach Abschluss des Moduls alle für die moderne Nuklearmedizin, Radiologie und Strahlentherapie relevanten klinischen Verfahren und Techniken.
- Sie können diese hinsichtlich diagnostischer und therapeutischer Effektivität bewerten und das strahlungsbedingte Risiko für Patient und Personal quantifizieren.

**Prüfungsform / Benotung (ggf. Gewichtung)***

<table>
<thead>
<tr>
<th>Veranstaltung</th>
<th>Prüfungsform</th>
<th>Benotung</th>
<th>Leistungspunkte</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Schriftliche Klausur</td>
<td>-</td>
<td>3 LP</td>
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</tbody>
</table>

**Verwendbarkeit***

Die Vorlesung dieses Moduls ist Teilmodul des Moduls BM 12 im Masterstudiengang Medizinische Strahlenwissenschaften. Es kann nur die Vorlesung (2 SWS = 3 ECTS) belegt werden.

**Empfohlenes Semester**

3. Fachsemester

**Teilnahmeveranlassungen***

- 

**Modulverantwortlicher***

Zips, Daniel, Prof., Dr. med.

**Dozent***

Zips, Daniel, Prof., Dr. med.
| Bares, Roland, Prof., Dr. med.,  |
| Pfannenberg, Christina, Prof., Dr. med. |
| Weidner, Nicola, Dr. med.,  |
| Müller, Arndt-Christian, Dr. med., |
| Welz, Stefan, Dr. med.,  |
| Paulsen, Frank, Dr. med.,  |
| Heinzelmann, Frank, Dr. med., |

**Literatur / Lernmaterialien**

Wird zu Semesterbeginn bekannt gegeben.
<table>
<thead>
<tr>
<th>module number: BM 15 (Veranstaltungsnummer wird zugeteilt)</th>
<th>title of the module: NanoBioPhysics and scanning probe microscopy</th>
<th>nature of the module: elective course</th>
</tr>
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<tbody>
<tr>
<td>credit points</td>
<td>3 CP</td>
<td></td>
</tr>
<tr>
<td>work load</td>
<td>Total: 90 h&lt;br&gt;- contact hours: 30 h&lt;br&gt;- self study (preparation for exams included): 60h</td>
<td></td>
</tr>
<tr>
<td>duration of the module</td>
<td>1 semester</td>
<td></td>
</tr>
<tr>
<td>time schedule (winter/summer term)</td>
<td>The module is offered once per year in the summer term</td>
<td></td>
</tr>
<tr>
<td>language (English/German)</td>
<td>German or English</td>
<td></td>
</tr>
<tr>
<td>maximum/minimum number of participants</td>
<td>Maximum: 20</td>
<td></td>
</tr>
<tr>
<td>module structure /teaching methods</td>
<td>Lecture (2 SWS)</td>
<td></td>
</tr>
<tr>
<td>contents</td>
<td>Thematic focus:&lt;br&gt;- Introduction, interactions on the nanoscale, measurement of inter-and intramolecular forces, contact models, technology of scanning probe microscopy, biological basics, oscillations of nanostructures, static and dynamic imaging modes, magnetic nanostructures.</td>
<td></td>
</tr>
<tr>
<td>objectives</td>
<td>Students&lt;br&gt;- become familiar with a young field of nanoscience&lt;br&gt;- acquire fundamental knowledge about the area of NanoBioPhysics&lt;br&gt;- learn interdisciplinary methods and applications of scanning probe microscopy</td>
<td></td>
</tr>
<tr>
<td>Requirements for credit points / exams and grading scheme (where appropriate, weighting)</td>
<td>course</td>
<td>exam</td>
</tr>
<tr>
<td></td>
<td>Lecture</td>
<td>Written exam (ca. 90 min) or oral exam</td>
</tr>
<tr>
<td>applicability</td>
<td>M.Sc. in Biomedical Technologies (elective course)</td>
<td></td>
</tr>
<tr>
<td>recommended semester</td>
<td>1st or 2nd semester</td>
<td></td>
</tr>
<tr>
<td>participation requirements</td>
<td>B.Sc. degree</td>
<td></td>
</tr>
<tr>
<td>person responsible for the module</td>
<td>Schäffer, Tilman, Prof., Dr. rer. nat.</td>
<td></td>
</tr>
<tr>
<td>teaching staff</td>
<td>Schäffer, Tilman, Prof., Dr. rer. nat.</td>
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<tr>
<td>literature / teaching materials</td>
<td>Literature will be announced at the beginning of term.</td>
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<tr>
<td>module number: BM17</td>
<td>title of the module: Ethical Technology Assessment and Sustainable Development</td>
<td>nature of the module: elective course</td>
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<tr>
<td>credit points</td>
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<tr>
<td>work load</td>
<td>Total: 90 h</td>
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<tr>
<td>- contact hours (SWS)</td>
<td>30 h</td>
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<tr>
<td>- self study</td>
<td>self study (preparation for exams included): 60 h</td>
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<tr>
<td>duration of the module</td>
<td>1 semester</td>
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<td>time schedule (winter/summer term)</td>
<td>The module is offered once per year in the summer term</td>
<td></td>
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<tr>
<td>language (English/German)</td>
<td>English</td>
<td></td>
</tr>
</tbody>
</table>
| maximum/minimum number of participants | Maximum: 20  
Minimum: 6 |                                      |
| module structure /teaching methods | Seminar (2 SWS) |                                      |
| contents          | - Introduction to ethical technology assessment and sustainable development  
- Ethical case study of a certain biomedical technology: Ethical and social dimensions will be explored and discussed exemplarily by focusing a concrete technology  
- “My carbon footprint”: The individuals’ contribution and the contribution of biomedical technologies for sustainable development  
- Life-cycle assessment as a method to assess environmental impacts associated with all the stages of a product's life from cradle to grave |                                      |
| objectives        | - Students get an idea of what ethical questions are. Their awareness for ethical aspects of biomedical technologies is raised and they can exemplarily formulate and discuss them.  
- Students become familiar with fundamental issues of sustainable development and possible contributions to it.  
- Students work on criteria for sustainable innovations and the assessment of new technologies.  
- Students can assess possible benefits and risks from technological innovations and their use for a sustainable development. |                                      |
<p>| Requirements for credit points / exams and grading scheme (where appropriate, weighting) | course | exam | Grading scheme | weighting |
|                    | Seminar | Presentation during Seminar and writing of a reflection paper | 1-5 | 3 ECTS |
| applicability      | M.Sc. in Biomedical Technologies (elective course) |                                      |
| recommended semester | 2nd semester |                                      |
| participation      | B.Sc. degree |                                      |</p>
<table>
<thead>
<tr>
<th>requirements</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>person responsible for the module</strong></td>
<td>Spindler, Mone, Dr. phil.</td>
</tr>
<tr>
<td><strong>teaching staff</strong></td>
<td>Spindler, Mone, Dr. phil.</td>
</tr>
<tr>
<td><strong>literature / teaching materials</strong></td>
<td>Literature will be announced at the beginning of term.</td>
</tr>
<tr>
<td>module number: BM18</td>
<td>title of the module: <strong>MEDTEC Innovation</strong></td>
</tr>
<tr>
<td>---------------------</td>
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<tr>
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<tr>
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<tr>
<td>- self study</td>
<td>Contact hours:60 h</td>
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<td>Self-study: 120h</td>
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<tr>
<td>Duration of the module</td>
<td>2 semester</td>
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<tr>
<td>time schedule (winter/summer term)</td>
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<td>language (English/German)</td>
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<tr>
<td>maximum/minimum number of participants</td>
<td>Maximum: 12</td>
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<td>module structure / teaching methods</td>
<td>Lecture / Seminar combination (2 SWS)</td>
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<tr>
<td>contents</td>
<td>Thematic focus:</td>
</tr>
<tr>
<td></td>
<td>- The module deals with the development process of a medical device from the industry perspective. The students will be undergoing an innovation process from primary identification of clinical unmet needs to concept generation to a functional demonstrator. During this process several steps such as self-assessment, needs finding, idea generation, IP and market analysis, as well as the physical process of drafting a design and building a demonstrator will be included.</td>
</tr>
<tr>
<td>objectives</td>
<td>Students</td>
</tr>
<tr>
<td></td>
<td>- become familiar with the field of innovation management</td>
</tr>
<tr>
<td></td>
<td>- acquire fundamental knowledge about the importance of a structured process, challenging situations during the process and the application of ancillary tools</td>
</tr>
<tr>
<td></td>
<td>- learn important methods and processes along the definition of a project towards feasibility and fabrication of a demonstrator.</td>
</tr>
<tr>
<td>Requirements for credit points / exams and grading scheme (where appropriate, weighting)</td>
<td>course</td>
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<tr>
<td></td>
<td>Lecture / Seminar</td>
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<td>applicability</td>
<td>M.Sc. in Biomedical Technologies (elective course)</td>
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<tr>
<td>recommended semester</td>
<td>1st and 2nd semester</td>
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<td>participation requirements</td>
<td>B.Sc. degree</td>
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<tr>
<td>person responsible for the module</td>
<td>Wahl, Siegfried, Prof. Dr. rer. nat. Hofmann, Boris, Prof., Dr. rer. nat.</td>
</tr>
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<td>teaching staff</td>
<td>Wahl, Siegfried, Prof. Dr. rer. nat. Hofmann, Boris, Prof., Dr. rer. nat.</td>
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<td>Literature will be announced at the beginning of term.</td>
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<td>creditpoints</td>
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<td>1 semester</td>
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<td>language (English/German)</td>
<td>English</td>
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<tr>
<td>module structure /teaching methods</td>
<td>Lecture / Seminar combination</td>
</tr>
<tr>
<td>objectives</td>
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<tr>
<td>applicability</td>
<td>M.Sc. in Biomedical Technologies (elective course)</td>
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<tr>
<td>participation requirements</td>
<td>B.Sc. degree</td>
</tr>
<tr>
<td>teaching staff</td>
<td>And colleagues</td>
</tr>
<tr>
<td>module number:</td>
<td>title of the module:</td>
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<tr>
<td>---------------</td>
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<tr>
<td>AMT12</td>
<td>Master Thesis</td>
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<thead>
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<td>Total: 900 h</td>
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<td>- self study</td>
<td>contact hours: 600 h</td>
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<td>self study: 300 h</td>
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<th>maximal 24</th>
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<tr>
<th>teaching methods</th>
<th>seminar (3 SWS), practical work (40 SWS)</th>
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<table>
<thead>
<tr>
<th>content</th>
<th>depending on the project</th>
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</table>

| qualification goals | - to study published data to get insight a research field |
|                    | - to understand the general flow from the idea of an experiment via the experimental design and methodology to interpretation of the results taking sufficient and appropriate controls and published data into account |
|                    | - documentation, oral and written presentation of experimental data |
|                    | At the end of the master thesis the students should be able to develop an own research project idea and design and perform the appropriate experiments with help of published data. They should be able to present their research in oral and written form. |

<table>
<thead>
<tr>
<th>requirements for credit points / exams and grading scheme (where appropriate, weighting)</th>
<th>course</th>
<th>exam</th>
<th>Grading scheme</th>
<th>weighting</th>
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<tr>
<td>Master Thesis</td>
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<td>1-5</td>
<td>20%</td>
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<td></td>
<td>- written thesis</td>
<td>1-5</td>
<td>40%</td>
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<td></td>
<td>- performance</td>
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<td>20%</td>
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</tr>
<tr>
<td></td>
<td>- engagement</td>
<td></td>
<td>20%</td>
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<tr>
<td></td>
<td>=&gt; graded by two reviewers</td>
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<th>usability</th>
<th>M.Sc. in Biomedical Technologies</th>
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<th>4th semester</th>
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<th>prerequisite to attend the activities</th>
<th>Successful completion of the theoretical and practical course work in the 1st, 2nd and 3rd semester</th>
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<tr>
<th>person responsible for the module</th>
<th>The head of the examination committee</th>
</tr>
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<table>
<thead>
<tr>
<th>teacher</th>
<th>Various teachers of the faculty of Medicine, faculty of Science and Biomedical Technologies Industry</th>
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<table>
<thead>
<tr>
<th>literature / teaching materials</th>
<th>will be provided by the supervisor before start of master thesis</th>
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</table>

54