<table>
<thead>
<tr>
<th>Rota</th>
<th>Duration</th>
<th>Semester</th>
<th>SWS</th>
<th>Credit Points</th>
<th>Workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>annually WS</td>
<td>1 Semester</td>
<td>3rd (Semester)</td>
<td>--SWS</td>
<td>3</td>
<td>90 h</td>
</tr>
</tbody>
</table>

**1 Modul Structure**

<table>
<thead>
<tr>
<th>Course (Abbreviation)</th>
<th>Type/ SWS</th>
<th>Presence</th>
<th>Self Study</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Single-loop and multi-loop controller design</td>
<td>Lecture/ SWS 2</td>
<td>25 h</td>
<td>25 h</td>
<td>2</td>
</tr>
<tr>
<td>b) Single-loop and multi-loop controller design</td>
<td>Tutorial/ SWS 1</td>
<td>15 h</td>
<td>25 h</td>
<td>1</td>
</tr>
</tbody>
</table>

**2 Language**

English

**3 Content**

1. Frequency domain single loop controller design
   1.1. Specification of controller performance in the time domain and in the frequency domain
   1.2. Loop shaping: Classical PID and Lead-Lag controller design revisited
   1.3. Design using frequency response approximation (FASTER)
   1.4. Limits of controller performance
   1.5. Internal Model Control
2. Frequency domain multivariable controller design
   2.1. I/O-system description, poles, zeros of MIMO systems
   2.2. Stability criteria
   2.3. Decoupling, sequential loop closure, approximate decoupling, directionality
   2.4. Multivariable frequency response approximation
3. Control structure selection

**Literature:**
2) Modern Control Engineering by Katsuhiko Ogata, 4th edition, Prentice Hall

**4 Competencies**

**5 Examination Requirements**

- Box Module Finals
- Box Accumulated Grade

**6 Formality of Examination**

- Module Finals
- Accumulated Grade

**7 Module Requirements (Prerequisites)**

**8 Allocation to Curriculum:**
Program: Automation & Robotics, Field of study: **Process Automation**

**9 Responsibility/ Lecturer**
Prof. Dr.-Ing. Sebastian Engell