

<b>Department</b>	09 Engineering and Management
<b>Course title</b>	<b>Automation Systems and Sensor Technologies</b>
<b>Hours per week (SWS)</b>	4
<b>Number of ECTS credits</b>	4
<b>Course objective</b>	<p>Competence Level 2 „Understand“:</p> <ul style="list-style-type: none"> <li>• The students know the differences and the application of open and closed loop controls.</li> <li>• The students are familiar with the technical terms and the most important forms of presentation and description of control technology.</li> <li>• The students know the physical basic principles of partly competing sensor technologies.</li> </ul> <p>Competence Level 3 „Apply“:</p> <ul style="list-style-type: none"> <li>• The students can realize simple pneumatic, hydraulic and electrical controls.</li> <li>• The students can design controls based on a programmable logic controllers (PLC).</li> </ul> <p>Competence Level 4 „Analyse“:</p> <ul style="list-style-type: none"> <li>• The students can analyse unknown systems, describe their dynamic performance as well as select and tune suitable controllers.</li> <li>• The students can estimate quantitatively the effect of disturbances on measurements.</li> </ul> <p>Competence Level 5 „Assess“:</p> <ul style="list-style-type: none"> <li>• The students can assess the stability and quality of a control system.</li> <li>• The students are able to evaluate the use of different sensors for specific applications based on specifications.</li> </ul>
<b>Prerequisites</b>	<p>Module physics            Modules engineering mathematics 2            Module electrical engineering            Module engineering mechanics</p>
<b>Recommended reading</b>	<p>BOLTON, William, 2019. Mechatronics: electronic control systems in mechanical and electrical engineering. 7th edition. Harlow, New York: Pearson. ISBN 978-1-292-25097-7 (Print) 978-1-292-25100-4 (Online)</p> <p>CZICHOS, H., 2018. Measurement, Testing and Sensor Technology, 1st edition. Springer International Publishing. ISBN 978-3-030-09476-8</p> <p>GOLNARAGHI, F., KUO, B., 2017. Automatic control systems. 10th edition. New York: McGraw Hill Education. ISBN 978-1-259-64383-5</p>
<b>Teaching methods</b>	<p>No mandatory prerequisites are required for the module, but it bases on the competences provided by the module "engineering mathematics 2". Basic knowledge from the modules "physics", "electrical engineering" and "engineering mechanics" are also useful.</p> <p>The module has no compulsory prerequisites, but provides the technical prerequisites for the module "Production Engineering and Automation with Internships" in the field of industrial engineering.</p> <p>The automation part is open for exchange students too.</p>
<b>Assessment methods</b>	<p>Written Exam.</p> <p>The exam has a total of 90 points, 45 points for the business part and 45 points for the engineering part. The earned points of both parts will added to a total score determining the grade.</p>
<b>Language of instruction</b>	English
<b>Name of lecturer</b>	<p>Prof. Dr.- Ing. Johann Glas            Prof. Dr. rer. nat. Markus Mauerer</p>
<b>Email</b>	johann.glas@hm.edu; markus.mauerer@hm.edu
<b>Link</b>	

# Courses in English

## Course Description



### Course content

#### Automation systems:

- Tasks, goals and areas of application of the automation technology
- Systems technology:
  - Description of dynamical systems
  - Mathematical system description
- Basics of closed loop control
  - Elementary control circuit links
  - Stability of closed control loops
  - Continuous closed loop controllers: selection and tuning
- Basics of open loop control
  - Pneumatic and hydraulic controls
  - Electrical controls
  - Design of controls and programmable logic controllers

#### Sensors Technologies:

- Physical basics of sensors:
  - Capacitive sensors
  - Piezo effect
  - Magnetism
  - Semiconductors: physical basics, technology
  - Ray optics, wave optics, quantum optics
- Specifications, designs and applications of sensors in industrial metrology, automotive engineering, optical communications, biotechnology and medical technology.

### Remarks

Seminar-like lecture, exercises and lab exercises. Attendance time: 60 hours  
Private study, exam preparation: 60 hours.