

**Module: Process Integration**

|                              |   |                                |      |
|------------------------------|---|--------------------------------|------|
| <b>Level</b>                 | Master                                      | <b>Short Name</b>              | PINT |
| <b>Responsible Lecturers</b> | Pelka, Mathias, Prof. Dr-Ing                |                                |      |
| <b>Department, Facility</b>  | Electrical Engineering and Computer Science |                                |      |
| <b>Course of Studies</b>     | Applied Information Technology, Master      |                                |      |
| <b>Compulsory/elective</b>   | Compulsory elective                         | <b>ECTS Credit Points</b>      | 5    |
| <b>Semester of Studies</b>   | 2   | <b>Semester Hours per Week</b> | 4    |
| <b>Length (semesters)</b>    | 1   | <b>Workload (hours)</b>        | 150  |
| <b>Frequency</b>             | WiSe  | <b>Presence Hours</b>          | 60   |
| <b>Teaching Language</b>     | English                                     | <b>Self-Study Hours</b>        | 90   |

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

|                                    |  |                            |                  |
|------------------------------------|--|----------------------------|------------------|
| <b>Exam Type</b>                   | Project Work   | <b>Exam Language</b>       | German/English   |
| <b>Exam Length (minutes)</b>       |  | <b>Exam Grading System</b> | One-third Grades |
| <b>Learning Outcomes</b>           | <p>The students:</p> <ul style="list-style-type: none"> <li>• Interpret the impact of industrial revolutions leading to Industry 4.0 and the advent of the smart factory</li> <li>• analyse the concepts of integrated operation management systems for the smart factory and the industrial internet-of-things and the implications for the integration of the industrial processes</li> <li>• understand different systems, system concepts, system architectures and the reasons for each choice of the smart factory and other cyber-physical systems</li> <li>• classify functionalities of an MES system such as production data acquisition, asset management, quality management, detailed production planning and control and can describe and evaluate them in an overall task context</li> <li>• have gained first experiences in designing automated industrial processes</li> </ul> |                            |                  |
| <b>Participation Prerequisites</b> |  |                            |                  |

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

|   |   |
|---|---|
| <b>Consideration of Gender and Diversity Issues</b> | <ul style="list-style-type: none"> <li>✓ Use of gender-neutral language (THL standard)</li> <li>✓ Target group specific adjustment of didactic methods</li> <li>✓ Making subject diversity visible (female researchers, cultures etc.)</li> </ul> |
| <b>Applicability</b>                                |   |
| <b>Remarks</b>                                      |   |

## Module Course: Process Integration (Lecture)

(of Module: Process Integration)

|   |         |                                |          |
|---|---------|--------------------------------|----------|
| <b>Course Type</b>                                    | Lecture | <b>Form of Learning</b>        | Presence |
| <b>Mandatory Attendance</b>                           | no      | <b>ECTS Credit Points</b>      | 3        |
| <b>Participation Limit</b>                            |         | <b>Semester Hours per Week</b> | 3        |
| <b>Group Size</b>                                     |         | <b>Workload (hours)</b>        | 90       |
| <b>Teaching Language</b>                              | English | <b>Presence Hours</b>          | 45       |
| <b>Study Achievements<br/>("Studienleistung", SL)</b> |         | <b>Self-Study Hours</b>        | 45       |
| <b>SL Length (minutes)</b>                            |         | <b>SL Grading System</b>       |          |

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

|                                    |  |                            |  |
|------------------------------------|--|----------------------------|--|
| <b>Exam Type</b>                   |  | <b>Exam Language</b>       |  |
| <b>Exam Length (minutes)</b>       |  | <b>Exam Grading System</b> |  |
| <b>Learning Outcomes</b>           |  |                            |  |
| <b>Participation Prerequisites</b> |  |                            |  |

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

|                   |  |
|-------------------|--|
| <b>Contents</b>   | <ul style="list-style-type: none"> <li>• Discussion of the four industrial revolutions</li> <li>• Aims for the Smart Factory</li> <li>• Concepts and variants of integrated operations management in the Smart Factory using the Industrial Internet-of-Things (IIoT)</li> <li>• Integration of applications in the IIoT Edge using OPC UA and other fieldbus technologies as an example for a cyber-physical system</li> <li>• Cyber-Security related hardening of integrated industrial systems</li> <li>• Interface description, design and implementation between automation process level and higher operating levels using workflow engines</li> <li>• Synthesis of a complex hard and software project using state-of-the-art technology</li> </ul> |
| <b>Literature</b> | <ul style="list-style-type: none"> <li>• Veneri, Giacomo, and Antonio Capasso. Hands-on industrial Internet of Things: create a powerful industrial IoT infrastructure using industry 4.0. Packt Publishing Ltd, 2018.</li> <li>• Buchmann, Johannes, et al. Introduction to Public Key Infrastructures. Berlin: Springer, 2013.</li> <li>• Reuckert, Bernd. Practical Process Automation: Orchestration and Integration in Microservices and Cloud Native Architectures. O'Reilly UK Ltd, 2021.</li> <li>• Kletti, Jürgen. MES Manufacturing Executing System, Springer 2015</li> </ul>   |

- Kurbel, Karl E. Enterprise resource planning and supply chain management. Functions, Business Processes and Software for Manufacturing Companies. Progress in IS. Springer, Dordrecht (2013).

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| <b>Remarks</b> |  |
|----------------|--|

## Module Course: Process Integration (Practical Training)

(of Module: Process Integration)

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|---|--------------------|--------------------------------|----------|
| <b>Course Type</b>                                    | Practical Training | <b>Form of Learning</b>        | Presence |
| <b>Mandatory Attendance</b>                           | yes                | <b>ECTS Credit Points</b>      | 2        |
| <b>Participation Limit</b>                            |                    | <b>Semester Hours per Week</b> | 1        |
| <b>Group Size</b>                                     | 12                 | <b>Workload (hours)</b>        | 60       |
| <b>Teaching Language</b>                              | English            | <b>Presence Hours</b>          | 15       |
| <b>Study Achievements<br/>("Studienleistung", SL)</b> | Practical Training | <b>Self-Study Hours</b>        | 45       |
| <b>SL Length (minutes)</b>                            |                    | <b>SL Grading System</b>       | Pass     |

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

|                                    |  |                            |  |
|------------------------------------|--|----------------------------|--|
| <b>Exam Type</b>                   |  | <b>Exam Language</b>       |  |
| <b>Exam Length (minutes)</b>       |  | <b>Exam Grading System</b> |  |
| <b>Learning Outcomes</b>           |  |                            |  |
| <b>Participation Prerequisites</b> |  |                            |  |

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

|                   |   |
|-------------------|---|
| <b>Contents</b>   | In the practical trainings during the semester, the students apply what they have learned in the lecture to given or self-study topics for selected application scenarios |
| <b>Literature</b> | See lecture   |
| <b>Remarks</b>    |   |