

<b>Course No.:</b> DLMBMMIT02	<b>Course Title:</b> Manufacturing Methods Industry 4.0	<b>Hours Total:</b> 150 h  <b>Credit Points:</b> 5 ECTS
<b>Course Type:</b> Wahlpflicht <b>Course Availability:</b> WS, SS <b>Course Duration:</b> Minimum 1 Semester		<b>Admission Requirements:</b> None
<b>Course Coordinator / Instructor:</b> See current list of tutors in the Learning Management System		<b>References to Other Modules:</b> Please see module description
<p><b>Course Description:</b></p> <p>The aim of the course is to enable students to evaluate and identify appropriate manufacturing methods in the context of Industrie 4.0. For that purpose, the course provides a comprehensive introduction of such processes based on traditional, standardized manufacturing techniques that have influenced and are still influencing production processes through technological developments under the generic term Industrie 4.0. These include, in particular, technological advances in additive manufacturing processes that enable applications such as rapid prototyping, rapid tooling and direct manufacturing. Finally, the course deals with the consequences of the digitization and networking of production facilities and their elements in terms of a cyber-physical system.</p> <p><b>Course Objectives and Outcome:</b></p> <p>Upon successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> <li>• evaluate different manufacturing methods against given product and process requirements.</li> <li>• define and design modern additive techniques in contrast to traditional manufacturing.</li> <li>• assess and estimate the impact of current trends on manufacturing like cyber-physical systems to given manufacturing challenges and practical problems.</li> <li>• apply modern processes like rapid prototyping, rapid tooling, and direct manufacturing.</li> </ul> <p><b>Teaching Methods:</b></p> <p>The learning materials include printed and online course books, vodcasts, online knowledge tests, podcasts, online tutorials, and case studies. This range of learning materials is offered to students so they can study at a time, place, and pace that best suits their circumstances and individual learning style.</p> <p><b>Course Content:</b></p> <ol style="list-style-type: none"> <li>1. <b>Introduction into Manufacturing Methods</b> <ol style="list-style-type: none"> <li>1. Basic Concepts</li> <li>2. Historical Development of Manufacturing</li> <li>3. About the Long Tail</li> </ol> </li> <li>2. <b>Manufacturing Methods</b> <ol style="list-style-type: none"> <li>1. Casting</li> <li>2. Shaping</li> <li>3. Cutting</li> <li>4. Joining</li> <li>5. Coating</li> </ol> </li> </ol>		

6. Moulding
3. **Additive Manufacturing**
  1. Basics and Legal Aspects
  2. Stereolithography
  3. Selective Laser Sintering
  4. Fused Deposition Modeling
  5. Multi-Jet Modeling
  6. 3D Printing
  7. Laminating
  8. Selective Mask Sintering
4. **Rapid Prototyping**
  1. Definitions
  2. Strategic and Operative Aspects
  3. Application Scenarios
5. **Rapid Tooling**
  1. Definitions
  2. Direct and Indirect Methods
6. **Direct/Rapid Manufacturing**
  1. Potentials and Requirements
  2. Implementation Examples
7. **Cyber-Physical Production Systems**
  1. Concepts
  2. Cyber-Physical Systems
  3. Cyber-Physical Production Systems
  4. Impact on Design and Maintenance of Plants
  5. Dynamic Reconfiguration and Migration of Plants

**Literature:**

- Gad, S. (2008): Implementing IT Governance: A Practical Guide to Global Best Practices in IT Management. Van Haren Publishing.
- Anderson, C. (2012). Makers. The New Industrial Revolution. New York: Crown Business.
- Gebhardt, A. (2012). Understanding Additive Manufacturing. Rapid Prototyping – Rapid Tooling – Rapid Manufacturing. München/Cincinnati: Hanser.
- Groover, M. P. (2012). Fundamentals of Modern Manufacturing: Materials, Processes, and Systems. John Wiley & Sons Inc.

An actual list with course-specific mandatory reading as well as references to further literature is available in the Learning Management System.

**Prerequisites to Qualify for Assessment:**

- Depending on the course: Completion of online knowledge tests (approx. 15 minutes per unit, pass / not pass)
- Course evaluation

**Assessment:**

- Exam, 90 min.

**Student Workload (in hours): 150**

Self-study: 90 h

Self-testing: 30 h

Tutorials: 30 h