

Module MBB 7920 – Metal Forming Technology and Laser Material Processing

| | | | | | | | | |
|---|---|-------------------------------|------------------------------------|--|-------------------------------|--------------------------------------|----------------------------|-------------------------|
| 1 | Module Number 7920 | Study Programme MBB | Semester 6 | Offered in <input checked="" type="checkbox"/> WS <input checked="" type="checkbox"/> SS | Duration 1 Semester | Module Type Comp. elective | Workload (h) 240 | ECTS Points 8 |
| 2 | Courses | | Teaching and Learning Forms | | Contact Time | | Self-Study Time | Language |
| | | | | | (SWS) | (h) | (h) | English |
| | a) Metal Forming Technology | | Lecture | | 4 | 60 | 120 | |
| | b) Laser Material Processing | | Lecture | | 2 | 30 | | |
| | c) Lab Metal Forming Technology | | Lab | | 1 | 15 | | |
| | d) Lab Laser Material Processing | | Lab | | 1 | 15 | | |
| 3 | Learning Outcomes and Competences Once the module has been successfully completed, the students can... <p>Knowledge and Understanding</p> <ul style="list-style-type: none"> • Explain the basic processes of metal forming • Describe sheet metal forming processes mostly used in industry • Understand the process limits • Describe the functionality of forming presses • Understand possibilities of modern production processes with laser as a tool <p>Use, Application and Generation of Knowledge</p> <p><i>Use and Transfer</i></p> <ul style="list-style-type: none"> • Create reports and presentations in English • Develop possible process chains for new products • Calculate sheet metal processes by FEM simulations • Create new design concepts for parts, using sheet metals or tubes <p><i>Scientific Innovation</i></p> <ul style="list-style-type: none"> • Optimize existing process chains by further use of simulation tools • Independently develop approaches for new forming concepts and assess their suitability • Develop concepts for the optimization of forming processes • Automatization of high volume production with sheet metals <p>Communication and Cooperation</p> <ul style="list-style-type: none"> • Interpret the results of FEM process simulation of sheet metal forming • Use the learned knowledge, skills and competences to evaluate the feasibility of forming processes • Present the feasibility to manufacture new components • Working in groups and present new solutions for design tasks <p>Scientific Self-Conception/ Professionalism</p> <ul style="list-style-type: none"> • Justify the feasibility of sheet metal forming process chains and methodically • Production of the group work sheet metal designs to see how it works | | | | | | | |

Module MBB 7920 – Metal Forming Technology and Laser Material Processing

| | |
|----------|---|
| 4 | <p>Contents</p> <p>a) Lecture “Metal Forming Technology” (4 ECTS):</p> <ul style="list-style-type: none"> • Plasticity • Sheet metal forming: Deep drawing, drawing of complex parts, car body parts, blanking, press hardening, hydroforming • Hydraulic and mechanical presses, modern servo presses • Development of process chains • Applications: FEM simulation, components, case studies, weight reduction <p>b) Lecture “Laser Material Processing” (2 ECTS):</p> <ul style="list-style-type: none"> • Laser beam sources: Principle of laser and beam characteristics, beam guidance and –forming, laser security • Laser material processes: Cutting, welding, removing, hardening, marking, quality systems for laser material processing • Laser- and sheet metal processing systems: Cutting and welding systems, punching and forming of sheet metal, design of sheet and pipe constructions • Introduction of laser based additive manufacturing technologies: powder-bed based technologies (L-PBF-M/P), direct energy deposition (DED) and introduction to new tooling concepts such as conforming cooling channels <p>c) Laboratory Exercises “Metal Forming Technology” (1 ECTS):</p> <ul style="list-style-type: none"> • Material behaviour experiments: Work hardening, digital strain measurement • Sheet metal forming experiments: Deep drawing, bending, cutting • Machines: Modern servo press technology in comparison to conventional presses • Learning the industrially used FEM simulation programme AutoForm, carrying out own process designs. • Independent development of a process chain: FEM, tool production, production of a component by deep drawing, trimming with laser. At the end of this exercise, each student can take an own component. <p>d) Laboratory Exercises “Laser Material Processing” (1 ECTS):</p> <ul style="list-style-type: none"> • Design of sheet metal parts in 3D-CAD-systems • Programming of machines for sheet metal processing • Manufacturing of sheet metal parts, complete sheet metal process chain incl. laser cutting |
| 5 | <p>Participation Requirements</p> <p>Recommended:</p> <ul style="list-style-type: none"> - Basic knowledge in production technology - 3D-CAD software |
| 6 | <p>Examination Forms and Prerequisites for Awarding ECTS Points</p> <p>a) Metal Forming Technology: Written examination 120 min., graded</p> <p>b) Laser Material Processing: Written examination 60 min., graded</p> <p>c) Laboratory Metal Forming Technology: Not graded (it is also possible to grade the lab exercise if students need a grade) The prerequisite for this laboratory exercise is participation in the lecture "Metal Forming Technology". The laboratory exercises take place on individual dates in small groups; dates are agreed in the lecture.</p> <p>d) Laboratory Laser Material Processing: Not graded (it is also possible to grade the lab exercise if students need a grade) The prerequisite for this laboratory exercise is participation in the lecture " Laser Material Processing ". The laboratory exercises take place on individual dates in small groups; dates are agreed in the lecture.</p> |
| 7 | <p>Further Use of Module</p> <p>Compulsory elective subject within Bachelor program.</p> <p>Further use of module contents in:</p> <ul style="list-style-type: none"> • MBB Production Engineering • MBB Automation Technology |
| 8 | <p>Module Manager and Full-Time Lecturer</p> <p>Responsible: Prof. Dr.-Ing. Stefan Wagner Lecturer: Prof. Dr.-Ing. Stefan Wagner, Prof. Dr.-Ing. Lukas Löber</p> |

Module MBB 7920 – Metal Forming Technology and Laser Material Processing

| | |
|----|---|
| 9 | Literature <ul style="list-style-type: none">• Lecture Materials• Metal Forming Handbook, ISBN 978-3-642-58857-0• Altan, T.: Sheet Metal Forming, Fundamentals; ISBN 978-1-61503-842-8• Altan, T.: Sheet Metal Forming, and Applications; ISBN 978-1-61503-844-2• TRUMPF Design Guideline for Sheet Metal Design, Fa. TRUMPF Ditzingen |
| 10 | Last Updated 02.09.2024 |