

## Manufacturing Processes II.

Code: MK3GYT2G05GX17-EN

ECTS Credit Points: 5

Evaluation: exam

Year, Semester: 4th semester

Its prerequisite(s): Manufacturing Processes I

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+3

### Topics:

Economical and flexible, advanced metal-forming processes form the core of modern industrial production. The Manufacturing Processes II. presents the most important metal-working and shearing processes and the related machines and tooling. Planning of technological methods in manufacturing. Introduction of the basic industrial design- and operation documentation procedure in manufacturing. Primary forming processes (casting, powder metallurgy, metallurgical, hot forming processes). Sheet metal forming processes and its technology (volume shaping, material separation processes, sheet forming). The main methods of forging and its manufacturing processes, forging machines. Manufacturing form plastics, ceramics, composites, technologies and applicable tools and machines.

### Literature:

#### Compulsory:

- L. Edwards, M. Edean: Manufacturing with Materials, Butterworths, London, 1990., ISBN 0-408-02770-3
- Heinz Tschaetsch: Metal Forming Practise: Processes - Machines – Tools, Springer-Verlag Berlin Heidelberg, 2006., ISBN 978-3-642-06977-2
- Mikel P. Groover: Fundamentals of Modern Manufacturing, Materials, Processes and Systems, Third Edition, John Wiley & Sons, 2007, ISBN 978-0-471-74485-6

#### Recommended:

- M. F. Ashby: Materials Selection in Mechanical Design. 3rd edition. Elsevier. London, 2005. ISBN 0-7506-6168-2.
- James G. Bralla: *Handbook of Manufacturing Processes*, First Edition, Industrial Press Inc., New York, 2007, ISBN 0-831 1-3179-9
- J. T. Black, Ronald A. Kohser: DeGarmo's Materials and Processes in Manufacturing, John Wiley & Sons, 2011., ISBN 978-0-470-92467-9

### Schedule

#### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> week:

**Lecture:** History of metal forming. Definitions, advantages of metal forming. Bulk deformation processes. Sheet metal forming processes.

**Practice:** Technological planning of thread manufacturing + 30 minutes cutting laboratory

#### 3<sup>rd</sup> week:

**Lecture:** Properties of materials. The uniaxial tensile test. Engineering and true elongations.

**Practice:** The manufacturing process of toothed gears (Sunderland, Fellows and Pfauter methods) + 30 minutes cutting laboratory

**4<sup>th</sup> week:**

**Lecture:** Industrial materials. Upsetting test. Types of stress-strain relationships.

**Practice:** The basic studies of technological planning on CNC machines, cutting tool selection

**6<sup>th</sup> week:**

**Lecture:** Fundamental concept of metal rolling. Forces and geometrical relationships in rolling. Roll bit condition.

**Practice:** Designing of bending technologies

**8<sup>th</sup> week: 1<sup>st</sup> drawing week****9<sup>th</sup> week:**

**Lecture:** Overview of metal forming of sheet metals. Stresses and shape modification during metal forming. Sheet metal cutting and forming processes.

**Practice:** Designing of setting technology

**11<sup>th</sup> week:**

**Lecture:** Classification of manufacturing processes (casting, forming, material removal, joining). Advantages of casting. Casting terminology. Sand casting.

**Practice:** Workpiece production on CNC machine (*cutting laboratory*)

**13<sup>th</sup> week:**

**Lecture:** Manufacturing of polymers. Major processes (extrusion, injection molding, blow molding, thermoforming, rotomolding).

**Practice:** Basic studies of Computer Aided Manufacturing (CAM)

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week****5<sup>th</sup> week:**

**Lecture:** Classification of different forming processes. Types of rolling. Rolling operations. Equipment of rolling, rolling mills. Thread rolling, ring rolling.

**Practice:** Designing of blanking technologies

**7<sup>th</sup> week:**

**Lecture:** Extrusion (direct and indirect). Classification of forging operations. Types of forging dies. Wire and bar drawing.

**Practice:** Designing of drawing technologies

**10<sup>th</sup> week:**

**Lecture:** Bending and deep drawing. Standard parts, basic rules of design these elements, tool types.

**Practice:** Analysis of cutting technologies on the cutting laboratory (*cutting laboratory*)

**12<sup>th</sup> week:**

**Lecture:** The formation of cast structure. Shell-mold casting. Permanent mold casting.

**Practice:** The basic studies of device designing + 30 minutes *cutting laboratory*

**14<sup>th</sup> week:**

**Lecture:** Test for the signature

**Practice:** The types of manufacturing systems

**Requirements****A, for a signature:**

- Students have to visit the lectures and seminars. Three misses are permissive for the seminar.
- At the end of the semester they have to write a test from the seminar tasks (technological calculations).

**B, for grade:**

Students have to take a written and oral exam for the lecture. They will receive the questions topics. They will get the final grade on the exam (1 - 5).