

Design of Manufacturing Devices

Code: MK5GYETG04GX17_EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 2nd year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

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

Topics:

The aim of the subject is the students know the types and utilization of the manufacturing devices and tools during the technological process. The first part of the semester the students learn device construction and designing knowledge. They select standard workpiece device for a given technological task on the practice. From the standard device elements they design workpiece device for special workpieces and serial production. The second part of the semester build on Manufacturing Processes II. the students acquire the basic calculation methods and design principles what necessary for the planning of metal-forming technologies. In practice, the students create a finite element simulation based on the earlier planned metal-forming technologies. During the lectures and practices, the following software are presented: Solidworks, EdgeCAM, Simufact forming.

Literature:

Compulsory:

- Berta M.: CNC szerszámgépek szerszámrendszerei, Nyíregyházi Főiskola, Nyíregyháza, 2015, p. 156, ISBN 978 615 5545 03 0
- Molnár J., Szabó S.: Készüléktervezés, Miskolci Egyetemi Kiadó, 1995
- Childs, Peter R. N.: Mechanical Design Engineering Handbook, Butterworth-Heinemann, 2018, ISBN 9780081013069
- Gen, Mitsuo, Kim, Kuinam J., Huang, Xiaoxia, Hiroshi, Yabe: Industrial Engineering, Management Science and Applications 2015, Springer Verlag, 2015, ISBN 9783662471999
- Prakash M. Dixit, Uday S. Dixit: Modelling of Metal Forming and Machining Processes, Springer-Verlag, 2008, ISBN 978-1-84996-749-5
- Henry S. Valberg: Applied Metal Forming: Including FEM Analysis, Cambridge University Press, 2010, ISBN 978-0-521-51823-9

Recommended:

- Gyáni K., Kazár L., Molnár J.: Készüléktervezés, kézirat, Nehézipari Műszaki Egyetem, Gépészmérnöki Kar, Tankönyvkiadó, Budapest, 1977.
- Fritz Klocke: Manufacturing Processes I, Cutting, RWTH Edition, RWTH Aachen University, p. 524, ISBN 978-3-642-11978-1
- Mikel P. Groover: Fundamentals of Modern Manufacturing, Materials, Processes and Systems, Third Edition, United States of America, p. 520, ISBN 978-0-471-74485-6
- Vladimir B. Ginzburg, Robert Ballas: Flat Rolling Fundamentals, Marcel Dekker, Inc., New York and Basel, 2000, ISBN 978-0-824-78894-0

Schedule

1st week: Registration week

2nd week:

Lecture: The device elements of centralization. The types of clamping elements.

Practice: Analysis of technological system. Survey of the necessary devices.

4th week:

Lecture: Electromechanic, hydraulic, pneumatic and vacuum devices. Magnet force devices.

Practice: Computer aided modelling of device elements II. (Solidworks software)

6th week:

Lecture: The types and establishment of device bodies. Setting of devices on the technological process.

Practice: Finite element method analysis of the pressure. (Solidworks software)

8th week: 1st drawing week

9th week:

Lecture: Planning aspects of mechanical-, steam- and air hammers. The kinematics of hammers. Acting forces on the ram. The impact energy and the theoretical impact number. The founding of hammers.

Practice: Selection of device, tool and working machine for a given technological task. Calculation of the technological parameters. Analysis of CNC machine having more cutting tools. Technological planning. (EdgeCAM software)

11th week:

Lecture: The aspects of planning and loadability testing of rolling mills. The load of structural elements. Sizing and strength checking for plastic deformation and fatigue.

Practice: Planning and finite element simulation of die forging technology (SolidWorks and Simufact Forming).

13th week:

Lecture: Mechanical equipment for drawing. Rod and tube drawing machines. Planning of multi-stage wire drawing machines.

Practice: Planning and finite element simulation of cold rolling technology (SolidWorks and Simufact Forming).

3rd week:

Lecture: Designing of drilling devices. The manufacturing errors of the drilling process.

Practice: Computer aided modelling of device elements I. (Solidworks software)

5th week:

Lecture: Force transmission elements and constructions. Centralization pressure.

Practice: Computer assembly designing of devices elements. (Solidworks software)

7th week:

Lecture: Type and group devices. Devices in flexible manufacturing systems.

Practice: Computer technological designing of prismatic workpieces. (EdgeCAM software)

10th week:

Lecture: The aspects of planning and choosing of hydraulic and mechanical presses. Kinematic relation, characteristic curve and loadability of mechanical presses.

Practice: Designing of motion cycles of tools. Analysis of production strategies. Selection of the optimal technology. Selection of cutting tool for a given technological task from tool catalogue. (EdgeCAM software)

12th week:

Lecture: Determination of load of roll stand frame, roll adjust device and different structural elements.

Practice: Planning and finite element simulation of die forging technology (SolidWorks and Simufact Forming).

14th week:

Lecture: Test for the signature

Practice: Planning and finite element simulation of cold rolling technology (SolidWorks and Simufact Forming).

Requirements

A, for a signature:

- 1.) Students have to visit the lectures and seminars. Three misses are permissive for the seminar.
- 2.) Students have to create an own planning (device) and finite element simulation tasks.
- 3.) At the end of the semester they have to write a test.

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).