

Machine Design and Modeling

Subject leader: dr. Rácz Péter

Aim of course

- Provide basic knowledge to create parts and technical drawings from them with CAD software (CREO)
- Introduce technical drawing of simple machine elements
- Capable of create and interpret assembly drawings

Course description

Computer aided engineering (CAD) in the production process. General steps of machine design and modeling.

Sketching in CAD environment, constraint. Parametric part modeling. Managing the model tree. Creating a complex geometric model with extrusion, revolution and sweeping. Creating technical drawings from a part in CAD environment.

Content of assembly and sub-assembly drawings. Title block, item numbers. Drawing and selection of bolted connections based on standards and catalogs. Drawing bearings and selecting them from an online catalog (SKF). Types and drawings of springs, welded joints and seals. Basic knowledge of constructions. Drawing of gears. Construction of shafts, torque transfer elements, connections. Calculation of fits, allowances and tolerances. Interpreting assembly drawings.

Content of course

Week	Topic	
	Drawing	CAD
1	Assessment CAD in the production process Assembly drawing	Basic part modeling (contracted rectangle)
2	Fits, allowances and tolerances	Sketching
3	Bolted connections	Extrude
4	Bolted connections	Revolve
5	Pins, keys, axial retaining rings	Complex part modeling (crown nut) Break
6	Bearings Break	Drawing – views, dimensioning (bearing housing) Break
7 (online 1)	Geometric tolerances, technical drawing of shafts Shafts, spline shafts	Drawing – tolerances, surface finish (slotted plate) Revolve, cosmetic thread Modeling of bolts and screws
8 (online 2)	Pulleys, taper lock bush, special connections Bearings	Assembly modeling Assembly drawing Complex part modeling (castle nut)
9 (online 3)	Gears, springs Geometric tolerances, technical drawing	Break Drawing – views, dimensioning

	of shafts	
10 (online 4)	Welded, adhesive and riveted connections Pulleys, taper lock bush	Advanced part modeling (sweep, helical sweep, cotter pin, bolt) Drawing – tolerances, surface finish
11 (online 5)	Seals Gears, springs	Test Drawing – technical drawing of a shaft
12 (online 6)	Mid-term test Nonpermanent connections	Break Assembly modeling, assembly drawing
13 (online 7)	Re-test Seals	Re-test Advanced part modeling (sweep, helical sweep)

Assesment

- 2 homeworks (14+20) – 34%
- 2 tasks on practical classes (2x3) – 6%
- 2 mid-term tests (20+40) – 60%
- 2 homeworks (30+30) – 60%
- 1 exam (40) - 40%

Homeworks

Task	Start	Deadline
Homework 1 (14 - 30) (CAD model and drawing of a part)	1. week	11. week 13. week (online 7)
Homework 2 (16+4 - 30) (assembly drawing – by hand)	1. week	12. week 13. week (online 7)

The homeworks must be submitted up to the deadline. In case of delay 20% of the maximum score (3 and 6) will be deducted from the final score.

For Homework 2 there will be a practical class task (4 marks). It is expected on the 10. week and can be fulfilled during class!

Successful homework is max. 14 and 20 marks.

- If the task cannot be accepted (does not reach 50%), it can be re-done, but the maximum score is only 7 and 10 marks in this case.
- From the mark at least 50% of the maximum 34 marks (ie 17 marks) should be reached, otherwise the mid-term mark will be inadequate (signature denied)!
- Homework and re-done homework can only be submitted during the lecture period!

Practical class tasks

- Each task is worth 3 marks each
- Expected on the 5. week and 10. week

Mid-term tests

- 1) test: expected time 12. week, available score 20
- 2) test: expected time 12. week, available score 40
 - For the mark at least 50% of the maximum marks (ie. 10 and 20 marks) should be reached on each tests, otherwise the mid-term mark will be inadequate (1)
 - Inadequate test can be corrected with a re-test in the 14. week
 - The maximum score of the re-test is 50% (10 and 20 marks)

Inadequate mid-term test can be corrected with an exam during the examination period, but only if the other requirements (ie. 50% from the homeworks) are fulfilled

Consultation about the homeworks and test is possible the next week after the assignment!

Homeworks must be submitted up to the deadline. In case of delay the final mark will be 0!
Homeworks cannot be corrected!

Final mark will be the summary of the homework marks and the exam marks (final mark = homework mark + exam mark).

Grade:

0 - 49 marks	inadequate	1
50 - 60 marks	adequate	2
61 - 70 marks	average	3
71 - 80 marks	good	4
81 - 100 marks	excellent	5

Obligatory material

Presentation slides

Tutorial videos of CREO

C. Jensen, J. D. Helsel, D. R. Short: Engineering Drawing&Design

Recommended material

Standards by István Házkötő

Herczeg István: Szerkesztési Atlasz (in Hungarian)

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