Design of Machine Elements (1)

(Autumn 2025)

Instructor: H. Golpira

Course Description and Objectives

It teaches students the theoretical calculations for machine design. It merges static, strength of material, and material science and engineering with expert knowledge to design a high-performance mechanism at a low cost. The course provides a base for advanced machine design approaches, *i.e.*, FEM.

Topics Covered

1. Safety factor for brittle materials under static loading
2. Safety factor for brittle materials under dynamic loading
3. Safety factor for ductile materials under static loading
4. Safety factor for ductile materials under dynamic loading
5. Safety factor for brittle/ductile materials under combined loading
6. Shaft diameter calculations
7. Critical speed of shafts
8. Key dimensions
9. Compress the helical spring
10. Coil torsion spring
11. Standard and unified thread in the bolt
12. Power screws
13. Bolts under external loads
14. Design bolt for shear stress

Homework/Assignments

The course assignments will be performed throughout the semester. Exercises are determined in the classroom. This homework is not active in grading, but it upgrades the student's ability to deal with the midterm and the final exam.

October 2025

References

[1] *Budynas, R. G., & Nisbett, J. K. (2021). Shigley's mechanical engineering design. New York: McGraw-Hill.*

Grading

- Final Exam: 50%
- Midterm: 50%