

King Fahd University of Petroleum & Minerals
MECHANICAL ENGINEERING DEPARTMENT
ME 308: Machine Design II

Catalogue Description

Design of Elements: bearings (journal and anti-friction); spur, helical, bevel and worm gears; flexible drives (belts and chains); clutches and brakes; Springs; design optimization. Laboratory sessions to supplement and to apply the material covered in the lectures. Consideration of manufacturing aspects of the design (limits and fits); projects in stages leading to an assembly.

Status in Curriculum (Required or Elective) Required (offered Fall & Spring)

Prerequisites: ME 307

Co-requisites: None

Prerequisites by Topics:

- Stress and deflection analysis
- Buckling
- Static and fatigue failure criteria
- Analysis and design of bolted and welded joints
- Shaft design and analysis

Textbook: **Mechanical Engineering Design (SI version)** by J.E. Shigley, C.R. Mischke and R. G. Budynas, 9thed (SI units).

References:

1. **Standard Handbook of Machine Design** by J.E. Shigley and C.R. Mischke, McGraw Hill Book Company.
2. **Mark's Standard Handbook For Mechanical Engineers**, by AvaloneBaumeister, 10th Ed. McGraw Hill Book Company.

Coordinator: **Dr. Samir Mekid**, Professor of Mechanical Engineering

Goals: (general objectives)

1. To analyze mechanical systems and select proper machine elements (bearings, gears, springs, belts and pulleys, chains and sprockets).
2. To design machine elements by specifying their type, geometry, material and heat treatment and to integrate these elements to build a mechanical system.
3. To learn how to work in a design team and to understand group dynamics
4. To perform a complete design project and communicate the work orally and by writing complete engineering design reports.

Course Outline (Lecture Topics):

<i>Course Outline</i>	<i>Chapter</i>	<i>(# lectures)</i>
1. Rolling contact bearings	Chapter 11	7
2. Spur gears	Chapter 13	6
3. Helical worm and bevel gears	Chapter 13	4
4. Strength of Spur and Helical gears	Chapter 14	6
5. Lubrication and journal bearings	Chapter 12	9
6. Clutches, brakes, couplings and flywheels	Chapter 16	9
7. Belts and chain drives	Chapter 17	4

Design Activities/Projects:

Design assignments through homework and lab project are assigned.

Computer Usage:

Students are encouraged to solve some assigned homework problems using the available engineering software e.g. Excel, Matlab and most requirements in the project using SolidWorks with Embedded FEM if necessary.

Laboratory:

Laboratory sessions will be conducted in parallel with lectures and will include long projects. Your achievement and progress during class time will be graded by the end of each Lab. A final report for every project is also

required and will be graded as well. When a new project is assigned the former one will be collected for grading. Late submissions will **NOT** be accepted.

Assessment Tools:

- i- Mid-term Examinations (15% +15%)
- ii- Homework Assignments and attendance (7%)
- iii- Quizzes (8%)
- iv- Lab project and lab participation (25%)
- v- Final Exam (30%)

Course Learning Outcomes:

1. The student is expected to analyze mechanical systems and select the proper machine elements (bearings, gears, pulleys, belts,...) from commercial catalogs for a required application.
2. The student is expected to be able to analyze proposed design solutions and suggest modifications and improvements.
3. The student should be able to execute original designs of machine elements.
4. The student should be able to produce design sketches and integrate the designed or selected elements into a working mechanical system.
5. The student will be able to hold, lead efficient design team meetings and write minutes.
6. The student will be able to implement design procedures to perform complete design projects individually and in teams.
7. The student is expected to communicate the implemented design ideas by performing production drawings, writing technical reports and making oral presentations.

Course Learning Outcomes mapped to Student Outcomes:

Student Outcomes	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>	<i>j</i>	<i>k</i>
Course-to-Student outcome mapping	1 2 3		3 4 7	2	1 3		2 3 5 7			1	6 7
Emphasis*	S		S	L	L		M			L	L

* **L:** Little/None **M:** Moderate **S:** Strong

Status of Continuous Improvement review of this Course:

Date reviewed: -----

Prepared by: Dr. Samir Mekid

Date prepared: December 4, 2014