

University of Toledo

Mechanical Engineering Technology

Master Syllabus

Course Title: *Mechanical Design II* **Course Code & Number:** *MET 4200*

Credit Hour Total: 3

Lecture Contact Hours: 3 **Lab Contact Hours:** N/A

Prerequisite(s): *MET 3200, MET 2310, MET 2320, ENGT 3040*

Text: *Machine Elements in Mechanical Design, 5th Edition, R.L. Mott, 2014*

Software: *none*

Course Description: (Approved Catalog Description)

Design and application of mechanical components and machine elements including shafts, gears, gear drives, belt drives, chain drives, fasteners, power screws, clutches, brakes and machine frames.

Related Program Outcomes:

Outcomes a, b, f. Students demonstrate the ability to select and apply their knowledge of math, science, and engineering, as well as their skills, to identify, analyze, and solve technical problems

Outcome d. Students demonstrates the ability to design machine elements

Course Objectives:

Upon completion of this course, the students will be able to:

1. Demonstrate an ability to understand the functions and design requirements of several kinds of keys and flexible couplings and to recognize commercially available designs and apply them properly
2. Specify suitable seals for shafts and other types of machine elements, and be able to describe several alternate methods of fastening machine elements to shafts;
3. Develop a systematic approach to shafts design s analysis, be able to perform calculations of the forces exerted on shafts by gears, belt sheaves , chain sprockets, and torque distribution.

4. Apply the shaft design procedure to determine the required diameter of shafts at any section to resist the combination of torsional shear stress and bending stress.
5. Identify the types of rolling bearings that are commercially available and analyzing bearings methods for selection and be able to explore all of these kinds of bearings, and complete the basic design analysis required to ensure satisfactory operation
6. Demonstrate an ability to use appropriate tables and charts to determine and specify suitable sizes for power screws, and ball screw drives for a given application.
7. Develop skills in designing and analyzing springs of the helical compression, helical tension, and torsional types
8. Analyze the performance of fasteners and to select suitable types and sizes.
9. Perform the design and analysis of plate-type, caliper disc, cone, drum and shoe, and band brakes and clutches.

Course Outline:

- Keys, Couplings, and Seals
- Shaft Design
- Rolling Contact Bearings
- Plain Surface Bearings
- Fasteners
- Motion Control: Clutches and Brakes
- Machine Frames, Bolted Connections, and Welded Joints
- Design details