

**EML 3005: Mechanical Design**  
Mechanical & Aerospace Engineering Department  
University of Florida  
**Spring 2005**

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Class Time: MWF, Period 2 (8:30-9:20), Weil 270

Office Hours: MWF, Periods 6 & 7 (12:50-2:45)

Textbook: Machine Design, by Robert L. Norton, 2<sup>nd</sup> Edition  
Prentice Hall. ISBN 0-13-017706-7

Scope: This course deals with the mechanical design of machine elements, design process, conceptual design, system and component design, and selection of certain standard parts. Design of machine elements such as journal bearings, rolling-element bearings, shafts, spur and helical gears, springs, fasteners, clutches and brakes will be presented. Kinematics of certain mechanisms and gears will be presented. Background from a diverse group of subjects such as material selection, static and dynamic load determination, strength of materials (stress, strain and deflection), static failure theories, fatigue failure theories, and surface failure theories will be utilized to come up with acceptable design of a variety of machine elements.

1. Introduction to mathematical software MATLAB
  - a. See tutorial sessions at:  
<http://hawk.mae.ufl.edu/eml4920/Assignments/assignments.html>
2. Bearings and Lubrication
  - a. Hydrodynamic lubrication, Journal bearing design
  - b. Nonconformal contacts and Rolling-element bearings
  - c. Design project: Automobile oil pump bearings
3. Shaft Design
  - a. Bending and torsional loads, Shear and bending stresses
  - b. Failure in combined loading, Design considerations
  - c. Static and fatigue loading, Design implications
  - d. Design project: Shaft design with 3D loading
4. Spur and helical Gear Design
  - a. Kinematics of gear teeth, Involute tooth form
  - b. Loading, bending and contact stresses
  - c. Design of spur and helical gears
  - d. Design project: 5-speed manual transmission design
5. Kinematic and kinetic design of a 4-bar linkage mechanism
  - a. Kinematics of motion
  - b. Kinetics
  - c. Design of linkages based on stresses induced by motion
6. Design of Fasteners
  - a. Preloaded fasteners in tension: Design for static and dynamic loading
  - b. Fatigue considerations
  - c. Design project

Homework: Several detailed problems will be assigned involving practical design of a variety of machine elements. Some design problems will require the use of MATLAB or MATHCAD programs.

Grading Policy:	Homework	25 %
	Test 1	20 %
	Test 2	20 %
	Final Exam	35 %

Teaching Assistants: Anurag Kasyap ([anurag@ufl.edu](mailto:anurag@ufl.edu)) and S. Siddiqui ([shadab@ufl.edu](mailto:shadab@ufl.edu))