



The University of Tennessee at Martin

School of Engineering

Syllabus

Engineering 473
Machine Design





What are we going to study?



The application of the mechanics of materials to the design and analysis of machine components.



What will I learn?

How to determine if **components** commonly found in mechanical machinery have adequate **strength/life**.

Components

- Cylinders
- Rotating Disks
- Interference Fits
- Shafts
- Splines
- Keyways
- Gear Teeth
- Bearings
- Power Screws
- Fasteners
- Welds
- Springs
- Brakes/Clutches

Strength

- Ductile
- Brittle
- Yield
- Fracture
- Fatigue



Prerequisites

ENGR 220	Strength of Materials
ENGR 311	Engineering Applications of Probability and Statistics
ENGR 472	Kinematics/Dynamics of Machines (Corequisite)
ENGR 310	Engineering Materials (Recommended)
ENGR 210	Engineering Design (Recommended)
ENGR 341	Fluid Mechanics (Recommended)



Course Format & Meeting Time



Lecture 11:00-11:50 M,W,F
Lab 3:00-5:50 M

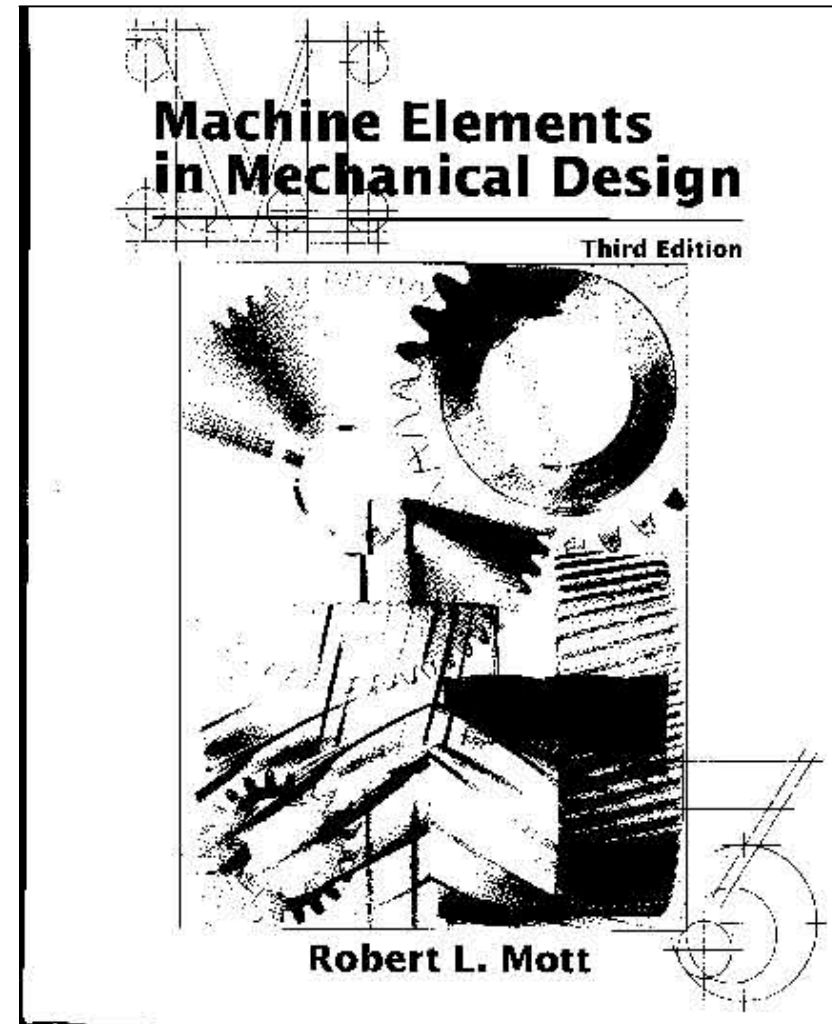
Labs will be used to conduct experiments, take tests, and to perform finite element analyses using I-DEAS.



Text



Robert L. Mott, Machine Elements in Mechanical Design, 3rd Ed., Prentice-Hall, 1999.

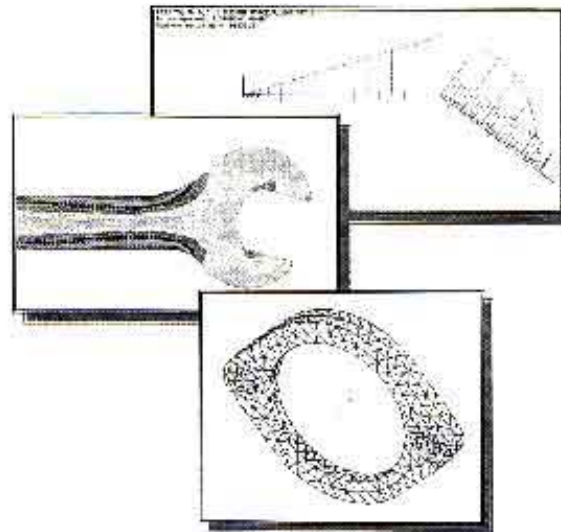




Lab Text



Introduction to Finite Element Analysis *Using I-DEAS 8[®]*

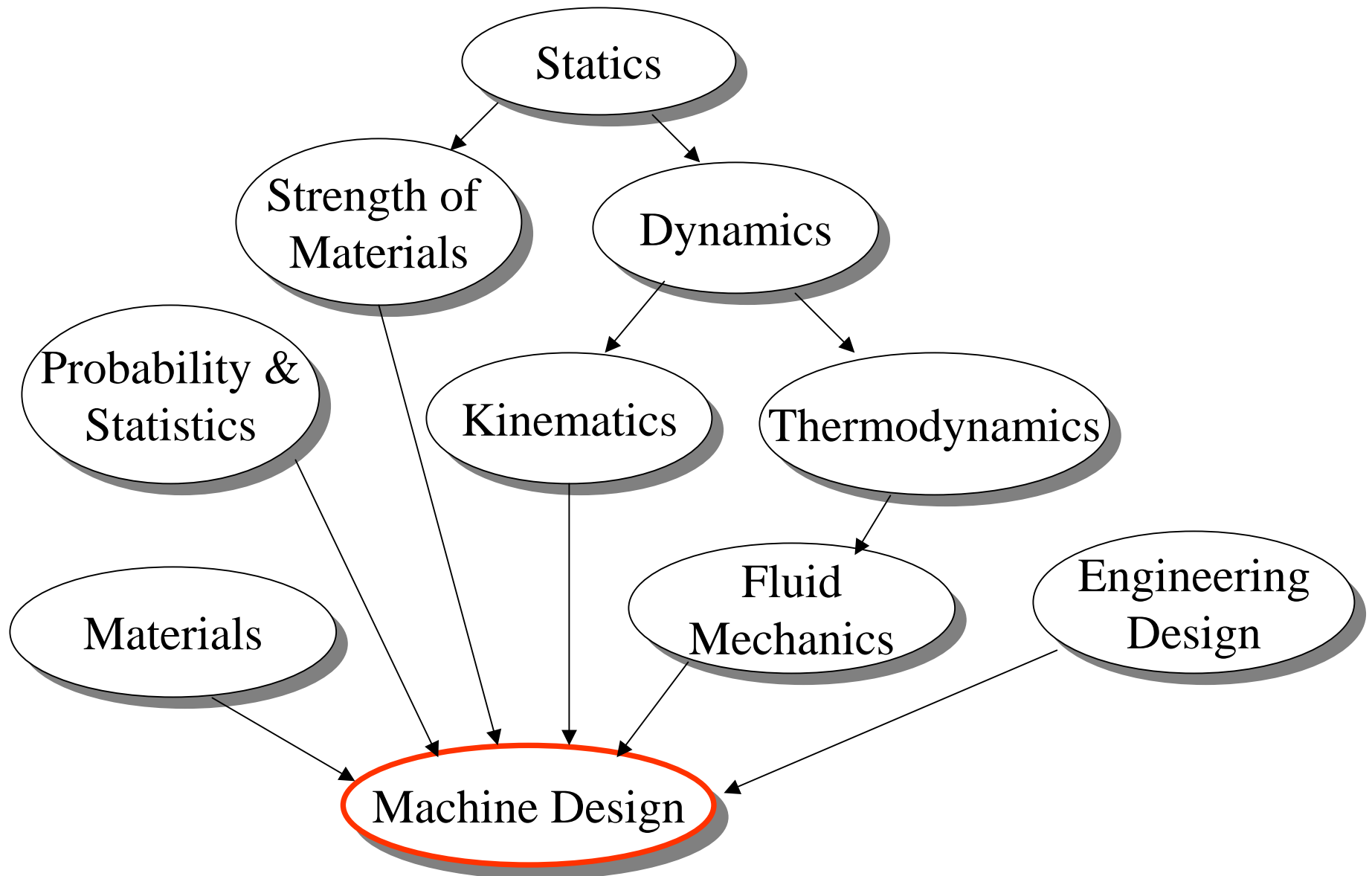


Randy H. Shih
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Relationship to Other Courses





What is expected of me?



Attend Class

- It is professional to be prompt and to have good attendance

Do Homework

- Homework is due one week after it is assigned
- Keep a notebook of all homework
 - Will aid in studying for exams
 - Will aid review for EIT prior to graduation
 - Facilitates grading



What is expected of me?

(Continued)



Submit Technical Report on Design Project

Pass two exams given during the semester

Pass final comprehensive exam



How will my grade be determined?



- Homework 20%
- Technical Report 20%
- Two Exams 20% each
- Final 20%

Grading Scale

90 – 100	A
80 – 89	B
70 – 79	C
60 – 69	D
< 60	F



Homework Format



- Use engineering paper
- Show all work
- Be NEAT
- Write only on front of paper
- Don't write on every line
- Write BIG
- Put class number on each problem

Homework is due one week after it is assigned.

No credit for late homework.

Machine Design | Class 3 - Problem #2 | Rick Leckert | 1/3

Given:

Find: Most critically stressed location.

Solution: Location 1 - Root

$$\text{Bending stress} = \sigma_b = \frac{Mc}{I}$$
$$c = \frac{1.2}{2} = 0.6 \text{ in}$$
$$I = \frac{\pi}{64} D^4 = \frac{\pi}{64} (1.2)^4 = 0.168 \text{ in}^4$$
$$M = (100 \text{ lbf}) (8 \text{ in}) = 800 \text{ lbf in}$$
$$\sigma_b = 18,340 \text{ psi} = \underline{18.3 \text{ ksi}}$$
$$\text{Axial Stress} = \sigma_a = \frac{F}{A}$$
$$A = \frac{\pi}{4} D^2 = \frac{\pi}{4} (1.2)^2 = 1.13 \text{ in}^2$$
$$\sigma_a = \frac{2,000 \text{ lbf}}{1.13 \text{ in}^2} = 1,770 \text{ psi} = \underline{1.77 \text{ ksi}}$$



On-line Classroom Resources



The screenshot shows a Netscape browser window with the following content:

- Navigation:** Home, Search, Home, Design, Netcase, Mail, Security, Help.
- Header:** THE UNIVERSITY OF TENNESSEE AT MARTIN
- Section:** School of Engineering
- Sub-section:** Online Engineering Class Resources
- Text:** This website contains lecture notes and solutions to homework problems for Dr. LeMuster's classes.
- Section:** Important Announcements
- Party time:** There is an engineering picnic on Thursday, April 27th. It will begin at 5:00 and we will begin to eat around 5:30-6:00. It is free and open to all engineering students and their guests. It will be held by the pond (near the walking track). Please sign up and indicate if you are bringing a guest by Thursday the 21st. There are sign-up sheets near the office and on the student organization's boards.
- Plant Trip:** The Machine Design class is touring the powder metal production facilities of Dynamital, Inc., in Brownsville, TN on Monday, May 1st. Anyone else who is interested in participating is welcome. We will be leaving at 3:00 and returning around 7:30. Please contact me if you plan to attend so we don't leave without you. I also need a head count for reserving proper transportation.
- Quest Lecture:** Dr. Sedig Agili will be interviewing for a EE faculty position on April 24th. He will be

- Lecture Notes
- Homework Solutions
- Announcements



Students with Disabilities



Any student eligible for and requesting academic accommodations due to a disability is requested to provide a letter of accommodation from P.A.C.E. or Student Academic Support Center within the first two weeks of the semester.



References



1. Othwein, W., Machine Component Design, West Publishing Company, 1990.
2. Mott, R. L., Machine Elements in Mechanical Design, 3rd Ed., Macmillan Publishing Company, 1995.
3. Norton, R. L., Machine Design: An Integrated Approach, Prentice-Hall, 1996.
4. Deutschman, A. D., W.J. Michels and C.E. Wilson, Machine Design: Theory and Practice, Macmillan Publishing Co., 1975.
5. Flinn, R.A., and P.K. Trojan, Engineering Materials and Their Applications, Houghton Mifflin Company, Boston, 1975.
6. Allen, D.K., Metallurgy Theory and Practice, American Technical Publishers, 1969.
7. Shigley, J.E. and Charles R. Mischke, Mechanical Engineering Design, 5th Ed., McGraw-Hill, 1989.