

Penn State University
Department of Mechanical and Nuclear Engineering

ME 460 – Reliability and Risk Concepts in Design

- Prerequisites:** ME 051, M E 354.
- Required Text:** i) Machine Design – An Integrated Approach, by R. L. Norton, Prentice Hall, 3rd edition
 Other recommended reading is Fundamentals of Machine Elements, by Hamrock, B. J., Schmid, S. R. and Jacobson, B. Other materials will be provided in the class.
- Time & Place:** M W F 02:30P - 03:20P 119 EES BL
- Instructor:** Professor Aman Haque, 317A Leonhard Bldg., Tel: 865-4248, Email: ahaque@mne.psu.edu
- Office Hours:** Monday 10:00 am – noon or by appointment
- Course Objectives:** Upon completion of the course, students should be able to:
 1. Approach and analyze fundamental problems in the design of advanced level machine components and systems.
 2. Integrate advanced concepts in fatigue, vibrations, mechanics of materials and tribology for component and system level reliability.
 3. Demonstrate professionalism in interactions with colleagues, faculty, and staff..
- Program Objectives:** This course covers the following program objectives:
 1. Apply statics, dynamics and strength of materials concepts to reduce open-ended problems in machine component design to engineering problems.
 2. Apply static and fatigue failure theories in analysis of advanced machine components.
 3. Analyze the role of metallurgy and materials selection, temperature and lubrication states on component and system level reliability.
 4. Demonstrate team-work in engineering design.
 5. Make effective use of spreadsheets and engineering computational software as an analysis and design tools
 6. Explore existing databases on state of the art issues and concepts in machine design.
 7. Demonstrate professionalism in interactions with colleagues, faculty, and staff

Tentative Class Schedule

Week		Date	Topic	Out	Due
1	M	1/14	Introduction. Relationship to ME 50, ME 51 and practical significance		
	W	1/16	Mechanics of Materials preliminaries: Stress-Strain		
	F	1/18	Mechanics of Materials preliminaries: Combined Stresses		
2	M	1/21	Martin Luther King Day - No Classes		
	W	1/23	Example problems		
	F	1/25	Fatigue Review	HW1	
3	M	1/28	Fatigue Review		
	W	1/30	Surface Failure		

	F	2/1	Guest Lecture		
4	M	2/4	Surface Failure	HW2	HW1
	W	2/6	Surface Failure		
	F	2/8	Surface Failure		
5	M	2/11	Exam 1 (Static, Fatigue and Surface Failure)		HW2
	W	2/13	Cylinders & Press Fits		
	F	2/15	Shafts & Couplings	HW3	
6	M	2/18	Shafts & Couplings		
	W	2/20	Failure Case Study - 1		
	F	2/22	Hydrostatic & Hydrostatic Bearings		HW3
7	M	2/25	Hydrostatic & Hydrostatic Bearings	HW4	
	W	2/27	Hydrostatic & Hydrostatic Bearings		
	F	2/29	Failure Case Study - 2		
8	M	3/3	Guest Lecture		HW4
	W	3/5	Rolling Element Bearings		
	F	3/7	Rolling Element Bearings	HW5	
9	M	3/10	Spring Break		
	W	3/12	Spring Break		
	F	3/14	Spring Break		
10	M	3/17	Spur Gears	HW6	HW5
	W	3/19	Spur Gears		
	F	3/21	Exam 2 (Shafts and Couplings, Bearings)		
11	M	3/24	Helical, Bevel & Worm Gears		HW6
	W	3/26	Helical, Bevel & Worm Gears		
	F	3/28	Failure Case Study - 3	HW7	
12	M	3/31	Fasteners and Power Screws		
	W	4/2	Fasteners and Power Screws		
	F	4/4	Guest Lecture		HW7
13	M	4/7	Brakes	HW8	
	W	4/9	Brakes		
	F	4/11	Failure Case Study - 4		

14	M	4/14	Exam 3 (Gears, Fasteners and Power Screws)		HW8
	W	4/16	Clutches		
	F	4/18	Clutches	HW9	
15	M	4/21	Flexible Machine Elements; Belts		
	W	4/23	Flexible Machine Elements; Ropes		
	F	4/25	Flexible Machine Elements ; Chains	HW10	HW9
16	M	4/28	Micro-electromechanical Systems (MEMS)		
	W	4/30	MEMS Design		
	F	5/2	MEMS Design		HW10 Project Report Due
17			Final Exam (TBA)		

Grading:

Midterm Exam (3)	45%
Homework	15%
Project	15%
Final Exam	25%
TOTAL	100%

Course website: The course website is in the ANGEL (www.angel.psu.edu) system. Make sure that your email address in the Angel website is the one that you regularly use. The professor will use the course website to post homework, solutions and all other announcements.

Homework: Assignments are due no later than 5:00 p.m. on the due date, and should be turned in to the box outside your professor's office. **Papers must be stapled**, not folded at the corner or paper clipped. Unstapled assignments will not be accepted. **No late homeworks will be accepted.**

Attendance and Lateness: Attendance is required and may be recorded. A total of five unexcused absences or unexcused late attendances will be allowed. Any total combination exceeding five may result in a grade reduction of half letter grade (e.g. B+ goes to B).

Make up Exams: No makeup exams are allowed. There will be two exceptions, (1) the student brings a medical certificate and (2) the student appeals to the undergraduate program director, Dr. Laura Pauley, and Dr. Pauley directly requests me to administer the exam.

Grading Complaints or Concerns: Must be submitted in writing.

Academic Integrity: Information pertaining to Penn State's policy on academic integrity can be found at http://www.engr.psu.edu/undergrad/acad_int/students/. In this course, students are permitted to work together on homework assignments, but each student is required to submit his or her own original work. Students are required to work together on class projects and should submit reports completed by the group.