

ME 321 Mechanical Engineering Analysis for Design

Department of Mechanical Engineering and Materials Science
Edmund T. Pratt, Jr. School of Engineering
Duke University

Fall 2012

Lecture: MWF 12:00PM-12:50PM Hudson 216

Recitation: M 3:05-4:20 PM CIEMAS B209
M 4:40-5:55 PM CIEMAS B209

Instructors: Dr. Xuanhe Zhao xuanhe.zhao@duke.edu 301A Hudson 660-5441

TAs: Qiming Wang qiming.wang@duke.edu

Graders: Teeravit Visutipol tv24@duke.edu

Office Hrs: After class or by appointment

Prerequisites: EGR 20L, EGR 123L, EGR 75L, Math 108

Textbooks:

Budynas, Nisbett. "Shigley's Mechanical Engineering Design, 9th Edition". McGraw-Hill. 2010 (required).
Kurowski. "Engineering Analysis with SolidWorks Simulation 2012". SDC Publications, 2012 (required).
Reyes. "Beginner's Guide to SolidWorks 2011". SDC. 2011 (optional).

Grading:

Exams (Test #1 20%, Test #2 25%, Test #3 30%)	75%
Lab Assignments & Homework	15%
Final Project	10%

NOTE: Exams will be given during the lecture period and will be cumulative. There will be a Finite Element Analysis Project in lieu of a Final Exam. LATE assignments will not be accepted except unless for have arranges with me to make up work missed due to a short term illness or other approved excuse.

Tentative Time Windows for the Exams:

Test #1: The week of Oct 8th
Test #2: The week of Nov 12th
Test #3: The end of the semester

Scale:

Final grades will be determined from a scale no more demanding than:

90-100%	A
80-89%	B
70-79%	C
60-69%	D

Policy on Collaboration:

All tests are to be completed individually and without collaboration. All graded assignments, whether for lab or lecture must be your own work but collaboration on homework assignments and on laboratory assignments is permitted. It is not acceptable to turn in someone else's work or to copy someone else's work. Work done in teams will obviously be collaborative. Individual contributions need to be stated on teamwork documents.

Learning Objectives:

At the conclusion of this course, you should be able to:

1. **Analyze** individual and simple combinations of machine components.
2. **Calculate** necessary geometric properties of machine components based on failure theories for static and dynamic loading.
3. **Present** engineering analysis studies in a professional manner.

Measurable Outcomes (Assessment Methods):

In order to demonstrate your abilities, you will be required to:

1. Calculate static and dynamic loading in components (homework, exams).
2. Sketch accurately free body diagrams of complex combinations of mechanical components (homework, exams, and SolidWorks assignments).
3. Calculate stress conditions at critical points (homework, exams).
4. Determine the factor of safety for both static loading with von Mises theory, and cyclical loading with standard fatigue analysis (homework, exams).
5. Perform Finite Element Analyses on machine components. (homework)
6. Document engineering analyses in a professional manner (labs, project).
7. Discuss the role of analysis in the ethical responsibility of an engineer. (homework)
8. Understand the impact of engineering decisions on society, the economy and the environment. (project)