

MECH 4336 - Principles of Engineering Design Fall 2015 Syllabus

"Scientists investigate that which already is; Engineers create that which has never been!" - Albert Einstein

Instructor: Dr. Jack Chessa, Associate Professor of Mechanical Engineering

Class Time and Location: T, Th 7:30-8:50, CRBL 205

Office: A118 (across from Mechanical Engineering Department)

Email: jfchessa@utep.edu

Office hours: Wednesday, 1:30-4:30, or by appointment

Textbook: "Shigley's Mechanical Engineering Design" by Budynas and Nisbett (same book you used in MECH 3334).

References: "Roark's Formulas for Stress and Strain" by Young and Budynas, "Machinery's Handbook" and "Standard Handbook of Machine Design" by Shigley and Mischke.

Course Objectives – To utilize and apply the concepts developed in your studies of mathematics, physics and engineering mechanics to analyze and design principal mechanical elements and systems containing these elements.

Course Overview – We will begin with a brief review of some of the concepts from mechanics of materials as well as design. This will be primarily in the context of analyzing a given design's ability to meet the specified design requirements. There will be an individual project associated with this effort. Then we will focus on the design theory and equations for various mechanical elements such as fastened and welded joints, bearings, gears, etc. There will be a group project related to the design of a system that employs one or more of these mechanical elements.

Course Delivery Mode – This class will be in the conventional lecture mode, but supplemental material will be given via YouTube and Blackboard so it is expected that you have access to these entities. Also there will be material given using NX 8.5 and Advanced Simulation in NX 8.5. While, these can be accessed via MyApps.com this is very unstable and you should have access to a computer with NX 8.5 with Advanced Simulation installed. Inability to access NX 8.5 either due to MyApps being down will not be an acceptable reason from not completing an assignment.

Homework and Readings – Homework and readings will be assigned each class and due the next class. I will typically not be collecting homework, but solutions will be

provided. Occasionally I will collect a homework assignment for grading, so it is required that you do bring your completed assignment to class. Late assignments will not be accepted. Also, I may give a homework or closely related problem as an unannounced quiz

Grading – The final grade will be calculated as follows:

Three in-class exams (26% each for 78% total)
Group Project Score (8%)
Individual Project Score (8%)
Quizzes and homework (6%)

Final Project Reports – At the end of each project a printed final report will be required. This report is a reflection on your final design as well as the required engineering analysis needed to support your design. Drafting engineering documents that have brevity and clarity are critical to the design process. Your final project report should have the following sections

1. *Design overview*: A short description of the design. What it is and basically what it does. This should only be a paragraph or so.
2. *System requirements*: This is a very critical section. You must clearly state the design requirements and operating conditions needed. This needs to have a clear diagram of all the expected operating loads that the system will see so that you can show that your design meets these requirements.
3. *Design description*: A brief description of your design and how basically it meets the system requirements.
4. *Engineering justification of requirements*: This is a significant section. This section contains all the engineering calculations to show that your design meets all the system requirements. This will include a detailed stress analysis on each component, connection, fit etc. The factor of safety of each component to each loading must be clearly summarized (preferably in a few tables).
5. *Brief design narrative*: This is typically not in an engineering report, but for this class I am quite interested in how you arrived at your final design. This section is for you to briefly summarize your group's design process.

Academic Dishonesty: If any academic dishonesty is suspected, the student will be referred to the Office of Student Life. This includes copying during and exam, receiving outside help, etc. If you are unsure about what constitutes academic dishonesty please consult the following site:

<http://studentaffairs.utep.edu/Default.aspx?tabid=4386>

Students with Special Needs: Students with disabilities or special needs, including both permanent disabilities (including: learning disabilities, Attention Deficit Disorder, visual, mobility and hearing impairments, psychological disabilities, and chronic systemic disorders) as well as some temporary medical conditions (e.g. a broken arm), are encouraged to see the UTEP Disabled Student Services Office (DSSO)

located at Union East Room 106 or contact them at (915) 747-5148 or at dss@utep.edu.

Approximate Class Schedule – This is a rough estimate of the class readings, assignments, lectures and exams for the semester. This may change as the semester progresses. Please check Blackboard for a more detailed and updated schedule of assignments, readings and lectures.

WEEK	TOPICS	READING	EXAM/PROJECT
1	Design Process, Mechanics of materials review	Chapters 3 and 4	
2	Failure theory	Chapters 5 and 6	Project no. 1 assigned
3	FEA analysis		Exam no. 1
4	Design of fastened joints	Chapter 8	
5			Project no. 1 due
6			Group project assigned
7	Design of welded joints	Chapter 9	
8	Exam no. 2		Exam no. 2
9	Dimensioning and tolerancing	Handouts	
10	Spring design	Chapter 10	
11			
12	Bearing design	Chapter 11	
13	Exam no. 3, Gear design	Chapter 12	Exam no. 3
14			
15			Group project due