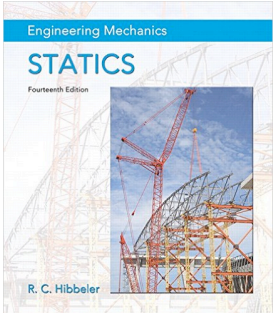
ENGR14 – Intro to Solid Mechanics

Tue/Thu 11:30am-1:20pm, 550-200

Ellen Kuhl, ekuhl@stanford.edu
Walter Goodwin, wgoodwin@stanford.edu
Kayla Powers, kepowers@stanford.edu
Shivani Torres, shivant@stanford.edu
Jeanny Wang, jeanny61@stanford.edu

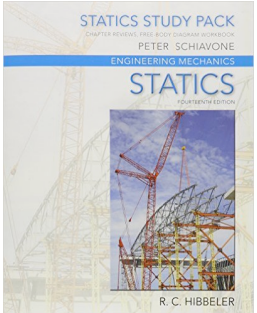
Why do things break? To reliably predict what's going on inside a structure, we need to know the forces that act on it. It's Newton's law that helps us to determine these forces. Basically, this course is all about Newton's law, force equilibrium, and its application to civil, mechanical, aerospace, and biological problems. We explore it for particles first, then for two-dimensional, and finally for three-dimensional systems. First we look at the structure from the outside, then from the inside. We learn how to identify, formulate, and solve engineering problems. To do so, you should be familiar with and not afraid of maths, vectors, and basic physics.



Textbook / eTextbook

Russell C. Hibbeler
Prentice Hall, 14th Edition

Engineering Mechanics
Statics



Honor code. The honor code is available at http://honorcode.stanford.edu. If you have any questions regarding its interpretation, please ask. Suspected infractions will be referred to Judicial Affairs for resolution.

Grading.	Homework	20 %	five homework assignments, 4% each
	Exams	80 %	two midterms, one final, 30%, 25%, 25% each

It is your responsibility to carefully review graded work when it is returned. Ask for clarification if something is unclear. Grades may be appealed with a concise, written appeal to the instructor no later than one week after the assignment is returned.

Course grade. ≥ 90 A range ≥ 80 B range ≥ 70 C range < 70 lower

Final averages within two points of a grade cutoff may be adjusted based on strong progress and at my discretion. Final grades will not be curved. I encourage you to study in groups and help your classmates to learn the course material.

Exams. Your highest exam score will count for 30% of your final grade and your other two exams will count for 25% each. The first midterm and the final are closed book/closed notes exams. You may bring one handwritten, letter sized formula sheet to each exam but no photocopies or printouts. Bring a calculator, but pre-

programmed functions or programs may not be used. The second midterm is a take home exam. No internal or external communication is permitted during the exam. Exams must be taken at the scheduled time.

Practice Midterm 1	Tue, 01/31, in class
Midterm 1	Thu, 02/02, in class
Midterm 2	Thu, 02/28, 24hr take home
Practice Final Exam	Thu, 03/16, in class
Final Exam	Thu, 03/23, in class

Homework. Homework sets will be announced in class and assigned via coursework. You are encouraged to consult with other students, but each of you must ultimately do your own work. Homework will be graded for completeness, correctness, and clarity. Assignments must be completed in pencil on engineering computation paper. Solutions must be legible and orderly, with complete and properly labeled free body diagrams. Answers must be clearly boxed. The meaning of variables that you introduce must be clear. If the grader cannot read and follow your work, you will not get credit. You have up to three late days to use over the quarter. A late day is charged for any fraction of a day past the due date. It is your responsibility to contact the teaching staff to arrange late submission. Once you have used your allocation of late days, further late submissions will be corrected, but will receive a score of zero. The final homework may not be submitted late.

Course Objectives. By the end of this course, you will be able to do the following.

- Explain Newton's laws of motion and gravitation; understand the standard procedures for performing vector addition, dot products, cross products and general numerical calculations.
- Explain the concept of the free-body diagram for a particle; formulate and solve equilibrium problems for particles using the equations of force equilibrium.
- Explain the concept of the free-body diagram for two- and three-dimensional structures; formulate and solve equilibrium problems for rigid bodies using the equations of force and moment equilibrium.
- Explain the steps for the analysis of engineering truss structures and frames.
- Explain the method of sections to determine the internal loadings in a member; formulate and solve equations that can be visualized through shear and moment diagrams.
- Explain the concept of dry friction; formulate and solve the equilibrium of rigid bodies subjected to friction; explain the concept of rolling resistance.
- Explain concept of the center of gravity, the center of mass, and the centroid; formulate and solve these equations for a system of discrete particles and a body of arbitrary shape.
- Explain the general concepts to identify, formulate, and solve engineering problems.

ENGR14 – Intro to Solid Mechanics

Tue/Thu 11:30am-1:20pm, 550-200

Day	Date	Topic	Reading	HW due
	W01	**Force Week**	**Ch 1-2**	
Tue	01/10	What's statics?	1.1-1.5	
Thu	01/12	What's a force?	2.1-2.9	
	W02	**Particle Week**	**Ch 3**	
Tue	01/17	What's a free body diagram at a particle?	3.1-3.2	
Thu	01/19	What's force equilibrium at a particle?	3.3-3.4	HW1
	W03	**Moment Week**	**Ch 4**	
Tue	01/24	What's a moment?	4.1-4.4	
Thu	01/26	What's a couple? What's distributed loading?	4.5-4.7	HW2
	W04	**Practice Week**	**Ch 1-4**	
Tue	01/31	Problems, problems, problems…	1.1-4.7	
Thu	02/02	**Midterm 1**, in class, closed book, 1 cheat sheet	1.1-4.7	
	W05	**2d Equilibrium Week**	**Ch 5**	
Tue	02/07	What's a free body diagram of a 2d system?	5.1-5.2	
Thu	02/09	What's force and moment equilibrium in 2d?	5.3-5.4	
	W06	**3d Equilibrium Week**	**Ch 5**	
Tue	02/14	What's a free body diagram of a 3d system?	5.5	
Thu	02/16	What's force and moment equilibrium in 3d?	5.6-5.7	HW3
	W07	**Structures Week**	**Ch 6**	
Tue	02/21	What's a truss?	6.1-6.3	
Thu	02/23	What's a frame?	6.6	HW4
	W08	**Internal Force Week**	**Ch 7**	
Tue	02/28	**Midterm 2**, all day take home, Tue-Wed 2pm	5.1-6.6	
Thu	03/02	What's a shear and moment diagram?	7.1-7.3	
	W09	**Friction & Center Week**	**Ch 8-9**	
Tue	03/07	What's friction?	8.1-8.2	
Thu	03/09	What's the center?	9.1-9.2	HW5
	W10	**That's it Week**	**Ch 1-9**	
Tue	03/14	The Last Lecture	1.1-9.2	
Thu	03/16	Problems, problems, problems…	1.1-9.2	
Thu	03/23	**Final**, 12:15-3:15, closed book, 1 cheat sheet	1.1-9.2	