CE W30 / ME W85: Introduction to Solid Mechanics
Summer 2016 – Online Offering

Required Textbooks:

[GHSWR] *Engineering Mechanics 1: Statics* by Gross, Hauger, Schröder, Wall, and Rajapakse: Springer, 2nd edition (2013), ISBN: 9783642303180.[1]

[G] *Engineering Mechanics of Deformable Solids* by Govindjee: Oxford University Press (2013), ISBN: 9780199651641.

Course Outline

Week 1: Homework 1 due June 22 (Lectures 1-2). Homework 2 due June 26 (Lectures 3-6)

Lecture	Module	Topic	Reading	HW
1	Statics	Review of static equilibrium for rigid bodies	[GHSWR] Preface, Chapter 1, Appendix A	
2	Statics	Concurrent forces: A special case	[GHSWR] Chapter 2	2.10, 2.15
3	Statics	Application of statics for systems with moments	[GHSWR] Chapter 3	3.12, 3.18
4	Statics	Theory of alternate reference points		
5	Statics	Special considerations for two dimensional problems		
6	Statics	Equivalent force systems	[GHSWR] Chapter 4	4.9a, 4.13

[1] [GHSWR] has an optional solution manual which is available electronically from Amazon: *Engineering Mechanics 1, Supplementary Problems: Statics*

Week 2: Homework 3 due June 29 (Lectures 7-9). Homework 4 due July 3 (Lectures 10-11)

Lecture	Module	Topic	Reading	HW
7	Statics	Distributed forces		
8	Statics	Applications of statics: Complex systems	[GHSWR] Chapters 5, 6, and 9	5.12, 6.4
9	Axial bar	Introduction to deformable bodies	[G] Preface, Chapter 1	1.8
10	Axial bar	1-D stress, strain, equilibrium, constitution	[G] 2.1–2.3	2.3, 2.4
11	Axial bar	Axial response	[G] 2.4–2.4.1	2.9, 2.15

Week 3: Homework 5 due July 6 (Lectures 12-13). Homework 6 due July 10 (Lectures 14-16)

Lecture	Module	Topic	Reading	HW
12	Axial bar	Axial response by direct integration	[G] 2.4.2	2.11, 2.16, 2.31
13	Axial bar	Conservation of energy and stress based design	[G] 2.5–2.6	2.33
14	Multi-D	General Concepts of Stress	[G] 3.1	3.4
15	Multi-D	Pointwise Stress	[G] 3.2	3.8, 3.10, 3.15
16	Multi-D	Polar and Spherical Stresses	[G] 3.3	

Week 4: **Midterm 1** on July 14. Homework 7 due July 13 (Lectures 17-18). Homework 8 due July 17 (Lectures 19-21)

Lecture	Module	Topic	Reading	HW
17	Multi-D	General Concepts of Strain	[G] Chapter 4	4.1, 4.5, 4.12
18	Multi-D	Generalized Hooke's Law	[G] Chapter 5	5.3, 5.11
19	Multi-D	Axial loading as a multi-dimensional phenomena, thin-walled pressure vessels	[G] 6.1	6.4
20	Multi-D	Thin walled pressure vessels and St. Venant's Principle	[G] 6.2–6.3	6.7, 6.10, 6.11
21	Torsion	Kinematics and Equilibrium of Torsion	[G] 7.1–7.2	7.2

Week 5: Homework 9 due July 20 (Lecture 22). Homework 10 due July 24 (Lectures 23-25)

Lecture	Module	Topic	Reading	HW
22	Torsion	Torsion of Circular Elastic Bars	[G] 7.3–7.4	7.5, 7.8, 7.13, 7.21, 7.26, 7.28
23	Torsion	Thin-Walled Torsion	[G] 7.7	7.41, 7.43
24	Beams	Kinematics of Bending	[G] 8.1	8.2
25	Beams	Equilibrium of Bending	[G] 8.2	8.5

Week 6: **Midterm 2** on July 28. Homework 11 due July 27 (Lectures 26-27). Homework 12 due July 31 (Lectures 28-30)

Lecture	Module	Topic	Reading	HW
26	Beams	Elastic Response of Beams	[G] 8.3	8.8, 8.13, 8.15
27	Beams	Beam deflections by Integration	[G] 8.4	8.19, 8.34
28	Beams	Multi-axis Bending	[G] 8.5	8.38
29	Beams	Shear Stresses in Beams	[G] 8.6	8.41, 8.47
30	Transformations	Transformation of Vectors and Tensors	[G] 9.1–9.2.1	9.1

Week 7: Homework 13 due August 3 (Lectures 31-32). Homework 14 due August 7 (Lectures 33-34)

Lecture	Module	Topic	Reading	HW
31	Transformations	Principal values, Maximum Shear, Eigenvalues and Eigenvectors	[G] 9.2.2–9.2.3	9.2, 9.4
32	Transformations	Mohr's Circle of Stress	[G] 9.2.4–9.2.5	9.6, 9.11
33	Transformations	Transformation of Strain	[G] 9.3	9.15, 9.16a, 9.18
34	Failure	Yield and Fracture Criteria	[G] 9.4	9.25, 9.26, 9.28, 9.29

Week 8: Homework 15 due August 10 (Lectures 35-36), Final exam August 12

Lecture	Module	Topic	Reading	HW
35	Failure	Stability: Introduction	[G] 12.1–12.2	12.4
36	Failure	Euler Loads for Columns	[G] 12.3	12.12, 12.14, 12.15

Reading: Assignments are required and should be done before the corresponding lectures. Reading assignments often contain material not covered in lecture; you are responsible for this additional material.

Course Grade: Check your understanding questions 5% (after each lecture), Homework 15%, Midterm 1 15%, Midterm 2 15%, Final exam 50%. Per summer session rules, a minimum score of 50% on the final exam is required to pass the course, independent of your performance in the course prior to the final examination.

The final examination is closed book, closed notes, but you may bring 3 sheets of self-prepared notes to the exam. You may write on both sides of the sheets which may not be larger than 8 1/2 x 11 inches in size (or optionally A4 size). The final exam is comprehensive and covers the entire course; it will take place August 12 from 10am to 1pm on the Berkeley campus.

Midterm Exams: Midterm 1 will be on July 14 and cover Lectures 1-13. Midterm 2 will be on July 28 and cover Lectures 14-25.

Homework: Assignments are due every Wednesday and Sunday before 11:55pm (Pacific Time).

Limited **Collaboration** is permitted on homework assignments. You may freely discuss the homework with each other, e.g. on the discussion forums, but may not show your written work to others. Similarly, the use of solution keys or solution sets of any type is expressly forbidden with the exception of the solutions manual for GHSWR. All cases of misconduct on homework will be reported to the Student Conduct Office in addition to the assignment of a zero for the **entire** homework portion of the course grade. Misconduct on examinations will likewise be reported to the Student Conduct Office and result in an automatic failing grade for the course.