University Of California, Berkeley
Department of Mechanical Engineering

ME C85 – Introduction to Solid Mechanics [3 units]

Required Course

Syllabus

ABBREVIATED TRANSCRIPT TITLE (19 SPACES MAXIMUM): Intro Solid Mechncs
GRADING: Letter
SEMESTER OFFERED: Fall and Spring
COURSES THAT WILL RESTRICT CREDIT: None
INSTRUCTORS: Professors Johnson, Papadopoulos, Steigmann and Zohdi
DURATION OF COURSE: 15 weeks
EST. TOTAL NUMBER OF REQUIRED HRS OF STUDENT WORK PER WEEK: 9
IS COURSE REPEATABLE FOR CREDIT? No
CROSSLIST: Civil Engineering C30

CATALOG DESCRIPTION

A review of equilibrium for particles and rigid bodies. Application to truss structures. The concepts of deformation, strain and stress. Equilibrium equations for a continuum. Elements of the theory of linear elasticity. The states of plane stress and plane strain. Solution of elementary elasticity problems (beam bending, torsion of circular bars). Euler buckling in elastic beams.

COURSE PREREQUISITES

Physics 7A, Math 53 and Math 54 (may be taken concurrently), and Engineering 7.

TEXTBOOK(S) AND/OR OTHER REQUIRED MATERIAL

Required text: Hibbeler, Russell C. *Statics and Mechanics of Materials*. 2nd. Prentice Hall, 2004. Print.

COURSE OBJECTIVES

The objective of the course is to introduce the basic concepts of the kinematics and kinetics of rigid and linearly elastic bodies in a methodologically unified manner.

DESIRED COURSE OUTCOMES

Upon completing the course, students should be able to: draw free-body diagrams; apply the equations of equilibrium to two- and three-dimensional solids; understand the concepts of strain and stress; solve simple boundary-value problems in linear elastostatics (tension, torsion, beam bending).

TOPICS COVERED

Week 1: Review of vector algebra; forces
Week 2: Equilibrium of particles
Weeks 3-4: Equilibrium of rigid bodies; free-body diagrams
Week 5: Trusses
Week 6: Deformation; strain; principal strains
Weeks 7-8: Stress; equilibrium equations for a continuum; principal stresses
Week 9: Linearly elastic stress-strain relations; isotropy; homogeneity
Week 10: Plane stress and plane strain
Weeks 11-12: Beam bending
Weeks 12-13: Torsion of circular bars
Weeks 14-15: Elastic deflection of beams; Euler buckling

COURSE FORMAT

Three hours of lecture and one hour of discussion per week.

CONTRIBUTION OF THE COURSE TO MEETING THE PROFESSIONAL COMPONENT

Students learn the importance of solid mechanics in engineering practice. The course also trains the students to identify, formulate, and solve engineering problems using analytical skills attains in earlier science and mathematics courses.

RELATIONSHIP OF THE COURSE TO ABET PROGRAM OUTCOMES

- an ability to apply knowledge of mathematics, science, and engineering
- an ability to identify, formulate, and solve engineering problems
- an ability to communicate effectively
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES

Weekly homework assignments (25%), two Midterm examinations (20%+20%), final examination (35%).

PERSON(S) WHO PREPARED THIS DESCRIPTION: Panos Papadopoulos, Tarek Zohdi