Class #1 (handout 1.1: Syllabus)

Course Syllabus:
E14 — INTRODUCTION TO SOLID MECHANICS

TTh 1:15-3:05  Winter, 2012-2013
Meyer Forum (124)

Course Objectives:
By the end of the course, students in E14 should be able to:

1. Explain giving several examples of the role that analysis and modeling play in engineering design and engineering applications more generally.
2. Apply analytical skills for evaluating structural response.
3. Explain the foundations for concepts and equations on structural integrity,
4. Communicate about systems using mathematical, verbal and visual means, and
5. Have an intuitive feel and questioning mind about structural performance.

For many students E14 is their first formal introduction to engineering analysis. Therefore the course aims not only to have students learn the mechanics of analysis but also to see its broader application in the engineering professions. The course may also serve to aid in decision-making about pursuing an engineering major.

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                  721-9433 (office)
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Prerequisites:    A working knowledge of algebra, trigonometry, calculus & vector algebra. Physics 41 or its equivalent is required (mainly for the topics of vector notation, free-body diagrams and Newton’s Laws).

Course Reading:
The course readings (Parts I and II) are a draft of the 2nd edition of Statics: Analysis and Design of Systems in Equilibrium, by S.D. Sheppard, T. Anagnos, and B.H. Tongue, for John Wiley. It will be available for purchase before class on Thursday (1/10) and Tuesday (1/15). The cost is $43, payable in cash or check (to Copyamerica). The first two chapters are available on the E14 website.

Students are expected to have read the material before the class session for which it is assigned, as listed in the course calendar. In addition, pointers will be given in Class Notes to particularly useful worked examples in the textbook.

Course Assistants:
E14’s Course Assistants (CAs) are a critical part of the teaching team. You will be spending considerable time with these individuals, both in class and in office hours. They are there to support your learning. Their office hours are listed on Coursework. Please meet:

Kristine Tom  Kathy Tong  Juliana Velez  Jason Walker  Matt Bandelt

January 7, 2013
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Announcements: Class announcements will be e-mailed and posted on Coursework.

Course Grading: Grades will be based on:

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<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework assignments</td>
<td>30%</td>
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<tr>
<td>In-class exam (1/31)</td>
<td>20%</td>
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<tr>
<td>Take-home exam (2/26)</td>
<td>25%</td>
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<tr>
<td>Final exam (3/20, 7 PM)</td>
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Exams:
The in-class exam (1/31) covers the first three weeks of the course material through equilibrium. You may take the exam with a 1-page summary sheet (and a calculator).

The take-home exam covers course material through trusses. It will be distributed at the end of class on Tuesday 2/26, and will be due at the beginning of class on Thursday 2/28.

In-class exams encourage students to organize and consolidate what they have learned in preparation for the exam; a recognized negative aspect of in-class exams is the time pressure. Because the Feb. 26th exam is a take-home exam, it should remove all time pressure. In addition, it is possible to (and should expected that we will) ask design-related questions in a take-home exam. Design problems are difficult to cover during a 50-minute, in-class exam.

The final exam (3/20) is cumulative in that the course topics build upon concepts and skills introduced throughout the quarter.

Class Sessions (TTh, 1:15-3:05, Meyer Forum, 124):
Class sessions are used as a time to introduce the theoretical foundation of mechanics of solids. An important aspect of this introduction is clearly defining the assumptions and limits of the relationships. Students are encouraged to ask questions throughout the class session. Examples of the application of structural relationships in engineering analysis are presented. Theory and applications are complemented by demonstrations, hands-on exercises, and lab assignments. Often results from the lab assignments will be incorporated into homework sets. The labs endeavor to give students a hands-on feel for both quantities and concepts. In addition, the labs get students working in small groups. The labs planned this quarter are:

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<tr>
<th>Lab</th>
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<tr>
<td>Lab A</td>
<td>Design Exercise 1 (Gummy Bear Towers)</td>
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<td>Lab B</td>
<td>Longboard Case (Part 1)</td>
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<td>Lab C</td>
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<td>Lab D</td>
<td>Design Exercise 2 (Bridges)</td>
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<td>Lab E</td>
<td>Bicycle Analysis</td>
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<td>Lab F</td>
<td>Longboard Case (Part 2)</td>
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Seating during class sessions will be by PODS (Spades, Hearts, Diamonds, Clubs), with an assigned CA.
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Team Learning:
Most classes during this course will include a team learning activity, in which you will cooperate in working on a problem with one or more fellow students. Cooperative activities offer several advantages for achieving the course outcomes, and are also good preparation for your future responsibilities as a professional, whether in engineering or another field.

Several benefits team learning as well as guidelines for routines we will follow during team learning in class are described here.

Benefits from Team Learning: Research conducted over the past 70 years has demonstrated several advantages that can result from small-group problem-solving:

• **1+1>1.** Pooling resources provides advantages over working individually. The benefits come about only when the team members make genuine efforts to cooperate and communicate, and the payoff can be quite substantial for both team members and for individuals.

• **Deeper, “metacognitive” learning.** The main advantage from team learning emerges during the social interaction, when team members discuss and explain their thinking about how to approach a problem. Metacognition means “thinking about your thinking,” which is viewed as an important skill by many companies today. Team learning can seem inefficient because it takes time for others to discuss their thinking, but this reflection – slowing down to review your work – is essential for deeper learning.

• **Social motivation.** Working with another person can oftentimes be more engaging and rewarding than working in isolation. The more experience you have with cooperative learning, the greater the motivational advantages.

Guidelines for Team Learning: To benefit the most from team learning in class, it is important to keep these guidelines in mind:

• **Be sure that all team members are on board.** Introduce yourself! Before starting work on a new and/or complex problem, all team members must connect with one another and agree on roles.

• **Plan of Action: Review, Record, Reflect, Report.** When working individually, a common approach is to simply dive into the problem. However, the “four R’s” are the roles that need to be handled during problem solving, whether when working as an individual or as part of a team. In Team Learning, the routine includes development of a plan: Deciding on roles, laying out a timeline, taking notes, and deciding on who will take the responsibility for reporting when the job is finished. These activities are an essential part of the job of a professional engineer.

Office Hours
Office hours an important part of the course and are listed on Coursework. You are encouraged to use them as a place and time to do homework, as well as come and ask the teaching staff specific questions. They are an opportunity to work with fellow students and get to know the teaching staff better. There are 10 hours of office hours per week. We get lonely if you don’t come to office hours!
Tutoring
The Center for Teaching and Learning offers Stanford undergraduates free tutoring in many subjects including E14. Tutors can help you think through difficult concepts, work through problem sets, and prepare for quizzes and exams. Tutors are trained to coach rather than to provide answers giving you the skills you need to succeed on your own after the tutoring session. Look for residential drop-in hours or make an individual appointment at their website: tutoring.stanford.edu.

Homework (General Notes)
The nine (9) homework assignments are a combination of problems that represent direct application of course concepts, and design and lab oriented problems.

The homework assignments will be available on Coursework according to the schedule given at the back of this syllabus. Most weeks the combination of homework and course reading should take on average 6-10 hours of work outside of class time, which is within the general university guidelines for a four-unit class.

Homework assignments are to be turned in at the start of class each Thursday of the week after they are assigned (unless otherwise noted). Solutions to the homework sets are made available to students a week after their due-date.

Here are some basic requirements for homeworks:

(1) Work problems on standard 8-1/2 x 11” green engineering paper in PENCIL; use only the front side of each page,
(2) Staple the pages together in the upper left-hand corner; write your name, the homework assignment number and your POD group on the upper right-hand corner of each page;
(3) Show your work. An “answer” placed on paper is not considered an acceptable solution without your supporting work. Showing your work generally means including a drawing, a list of assumptions, and supporting calculations. Be neat and write legibly;
(4) Box your answers. Place a box around your answers. For numerical answers include units and the appropriate number of significant figures (generally 2 to 3 significant figures).

Homework Grading
Homework grading is one of our ways of giving your feedback on your understanding of the underlying concepts and your ability to translate those concepts in engineering problem solving. Homework grading is done by graders (not CAs), who are an integral part of the teaching team. The graders are in continual communication with the instructors and CAs and are familiar with both the course’s subject and objectives.

Your homework will be reviewed for the items listed above under "Homework (General Notes)", and for its “correctness.” Correctness encompasses both your solution method and final answer. Each problem of the homework will generally be evaluated and assigned to a performance category such as "perfect" (100%), "mostly right" (80%), "missing some key concepts" (60%), “missing a number of key concepts” (40%), “minimal work shown,” (20%).

Graded homeworks will be returned in class.
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Homework (Formal Engineering Analysis Procedure)
In addition to following the guidelines listed above under "Homework (General Notes)," each homework assignment will specify how much of the Engineering Analysis Procedure outlined below (as well as in Box 1.1 on pg. 6 of Part I of your text) should be used on particular problems.

Box 1.1: Overview of Engineering Analysis Procedure

Goal: Formulate the question to be answered by the analysis; what is the analysis to find? In many textbook problems, the question is provided in the problem statement, so this step involves restating the problem in your own words to be sure you understand what is being asked. Make sure that your restatement mentions every final result you should have once you finish working the problem. In engineering practice, the question is often whether a design meets a specific requirement.

Given: Summarize and record what is known. For textbook problems, this may mean restating what is given in the problem, including creating a sketch of the situation. In engineering practice, the source of information might be a design drawing or specification, previous analysis, or a standard reference source.

Assume: Make assumptions about the behavior of the system under consideration to create a simplified representation or model that can be analyzed. This is sometimes referred to as system modeling.

Draw: Draw any diagrams necessary to clarify the model. In statics, a free-body diagram is used to clarify the assumptions made in modeling the system under consideration.

Formulate Equations: Apply engineering principles, generally in mathematical form, to set up equations that represent the model’s behavior. In statics, these principles are Newton’s laws expressed as equilibrium conditions.

Solve: Solve the resulting equations. In some cases, this can be done by hand. In other cases, the solution requires the use of appropriate software. Clearly state how numerical answers address goal in undertaking the analysis.

Check & Interpret: Check the results using technical knowledge, engineering judgment, and common sense. Interpret numerical values relative to the goals of the analysis.

Late Homework Policy
In general, homework sets are due at the beginning of class, the Thursday following their assignment. Homeworks turned in after the due date/time will be "docked" 10% for one day late (turning it in by 3:30 PM on Friday), 30% for three days late (by noon on Monday), and 50% for more than three days late. Homeworks will not be accepted after solution sets have been posted on Coursework (which will typically be 1 week after their due date). Turn in late homeworks either to Manny (550-114) or T.O. (550-132); M-F, 8:00-noon and 1-3:30 PM; they will record the time/date of the turn-in and make sure that it properly gets into the grading system. Do not just leave homework assignments on Manny’s or TO’s desk or chair—this makes it likely that they will get lost.

Collaboration
Collaboration will be a major part of the labs and class session, as described above. In addition, students are encouraged to work cooperatively on the homework assignments. It is o.k. to ask a fellow classmate for clarification on a problem or direction on its solution after a good-faith effort. Ultimately each student is responsible for the solution of every homework problem.
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turned-in. You are required to document any help you received on an assignment and who provided it.

Class Handouts
Copies of class handouts will be uploaded to coursework, after the class session. Most class sessions will have a handout.

Communication
In addition to class sessions, e-mail will be one of the means used by the teaching staff to communicate with students. A class e-mail list will be established through a class website on Coursework (http://coursework.stanford.edu/). Make sure to register for E14 on Coursework. Examples of previous exams and homework solutions will be posted on this course website.

Students with Documented Disabilities
Students who may need an academic accommodation based on the impact of a disability must initiate the request with the Office of Accessible Education (OAE). Professional staff will evaluate the request with required documentation, recommend reasonable accommodations, and prepare an Accommodation Letter for faculty dated in the current quarter in which the request is being made. Students should contact the OAE as soon as possible since timely notice is needed to coordinate accommodations. The OAE is located at 563 Salvatierra Walk (phone: 723-1066, URL: http://studentaffairs.stanford.edu/oae)