AME 101 – Introduction to Mechanical Engineering and Graphics - Fall 2007

Lecture: Tuesday and Thursday 9:30 – 10:50 am, ZHS 252

Labs: Tuesday OR Thursday, 12:30 – 1:50 pm, SAL 127

Final exam: Thursday, Dec. 13, 11:00 am – 1:00 pm.

Web page: Accessible to registered students through Blackboard at http://blackboard.usc.edu. A direct link to the syllabus and other information is http://ronney.usc.edu/AME101F07/

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Texts:

- Lecture notes
- Handouts in laboratory sessions
- (OPTIONAL) *An Introduction to Mechanical Engineering* by Jonathan Wickert, 2nd edition, Thomson-Engineering Publishing, 2005, ISBN: 0534552978
- (OPTIONAL) *Solid Edge V18 for Designers* by Sham Tickoo, CADCIM Technologies, 2006
- (OPTIONAL) *Solid Edge Basics* by Walter Silva, Conceptual Product Development, 2002

Grading:

Homework	20%
Design projects & competitions	15%
Laboratory (graphics)	30%
Midterm exams (2)	10% each
Final exam	15%

- Breakdown of laboratory grade
  - 4 homeworks (60% of lab grade)
  - 1 mini-project (40% of lab grade)
- **NO LATE HOMEWORK WILL BE ACCEPTED, PERIOD, NO EXCEPTIONS** in either lecture or lab. Since everyone has some valid reason for missing or doing poorly on at least one homework assignment, your lowest homework score (or one missing score) from both lecture and lab will be eliminated. **(The grade for the laboratory mini-project cannot be dropped, only one of the 4 lab homework assignments before the project can be dropped!)** The only exceptions to this policy will be for documented medical reasons.

(Possibly) useful information and disclaimers

1. Exams will mirror lectures; be sure you understand the lectures. Please ask questions inside and outside class! (If you choose to buy the textbook, please understand that it's just an additional reference, not something that I will follow closely.)
2. I will call on students in class. This is not a popular practice with students, but I do it anyway because (a) it encourages students to attend class (though I don't take attendance); (b) it encourages students to pay attention in class and (c) it helps me to get to know the students, and the students to get to know each other by name - many of you will be together for 4 years, so why not get acquainted now?
3. This is my third time teaching this course, and since (in my humble opinion) all available textbooks are weak at best, my plan is to turn my lecture notes into a textbook. Thus, constructive suggestions are most welcome! Note: the lecture notes are still a work in progress, **so there will be changes**. I will do my utmost to inform students of changes and make the updating as painless as possible.
4. This course is sort of like engineering boot camp; not always popular but students do come back in a year or two and tell me that what they learned in this class made their subsequent classes easier.
5. There are basically three parts to this course: (1) the lecture subjects, (2) the projects and (3) the laboratory. The three are not closely connected to each other because they have three different educational objectives: (1) an introduction to mechanical engineering in preparation for future courses, (2) experience with working in teams when no one has complete knowledge about the project, and (3) an introduction to engineering graphics.

Objectives of the class

- Furnish you with some basic tools of engineering
  - Units – English and metric system
  - "Engineering scrutiny"
  - Statistics
  - Approaches to problem-solving and teamwork
- Provide introductory knowledge of engineering topics
  - Forces and torques
  - Fluid flows
  - Materials and stresses
  - Thermal and energy systems
- Provide introductory knowledge of engineering graphics (laboratory section)
  - Solid modeling
  - Views and shading
  - Dimensions
  - Fillets, rounds, patterns
  - Assemblies
  - Computer Numerical Control (CNC) milling
- Retention-related objectives
  - Provide a "roadmap" of why subjects you will be learning, and what will you do in the future with the knowledge gained
  - Making an intelligent choice of major - make your first engineering class a positive enough experience that you make a choice based on knowledge, not fear or intimidation
  - Develop confidence in your ability – "pride of ownership" of knowledge gained
- Topics NOT covered in this class (but should be)
  - Electrical circuits
  - Ethics (covered to some extent in WRIT 130 and 340)
  - Computer animation (covered in AME 308)
  - History of engineering
  - Philosophy of engineering
  - Written and oral reporting

Hidden agenda: To start teaching you to think like engineers. Over and over, engineering faculty hear from practicing engineers and corporate recruiters words like, "teach the students how to think and we'll teach them the rest."

> "You come in here with a skull full of mush and if you survive you leave thinking like a lawyer" - Actor John Houseman, portraying Harvard Law School Professor Charles Kingsfield in *The Paper Chase* (1973). [Substitute 'engineer' for 'laywer'.]

AME 101 Tentative schedule

"Plans are nothing… planning is everything" – Dwight D. Eisenhower

Week	Monday Date	Subject(s)	Tues. lecture	Thurs. lecture	Homework due
1	8/27	Introduction, units	PDR	PDR	
2	9/3	Units	PDR	PDR	
3	9/10	Engineering scrutiny	PDR	PDR	L1
4	9/17	Excel for engineers; statistics	PDR	PDR	G1
5	9/24	Forces and moments on structures	SL	SL	L2
6	10/1	Forces and moments on structures	PDR	PDR	
7	10/8	Forces and moments on structures	PDR	P1	L3
8	10/15	Materials and stresses	SL	Q1	G2
9	10/22	Materials and stresses	PDR	PDR	R1
10	10/29	Fluid flows	PDR	PDR	L4
11	11/5	Fluid flows	PDR	PDR	G4
12	11/12	Energy and thermal systems	PDR	PDR	L5
13	11/19	Energy and thermal systems	Q2	XXX	G4
14	11/26	Energy and thermal systems	PDR	P2	
15	12/3	Energy and thermal systems	PDR	PDR	L6
			XXX	FINAL (12/13)	GP, R2

Legend for schedule

PDR	PDR lectures
SL	Substitute lecturer
Q1	Midterm exam #1 (covering material through week 7)
Q2	Midterm exam #2 (covering material through week 11)
Ln	Lecture homework n due
Gn	Graphics lab homework n due
GP	Graphics lab project due
Pn	Design project n contest
Rn	Design project n report due
XXX	Break / holiday / end of semester

Homework topics

1. Units
2. Scrutiny, Excel, statistics
3. Forces & torques
4. Materials and stresses
5. Fluid flows
6. Energy and thermal systems

Tentative design projects

1. Spaghetti bridge (materials, forces, stresses) – week 7
2. Engine efficiency (energy & thermal systems) – week 14

Note: Design teams will be assigned **at random** and different for each project in order for students to become better acquainted with each other and to avoid the "A-list, B-list, C-list" group dynamics

Why USC engineering?

- Aggressive, proactive leadership – buildings, rankings
- Engineering has a high priority from the USC central administration
- Student services and programs (Merit research, work study, counseling and tutoring, professional organizations, under-represented group organizations, …)
- Breadth of courses and escape routes for those who decide engineering is not in their future
- Class sizes and faculty to student ratios
- But it's up to you to take advantage of all the opportunities and not develop "senioritis" in your freshman year

Who's in charge here???

- The USC Board of Trustees has the ultimate say in what happens on campus. "As a private corporation, USC is governed by a board of trustees which has approximately 50 voting members. The board is a self-perpetuating body, electing one-fifth of its members each year for a five-year term of office."
- President Steven Sample, Professor of Electrical Engineering - Systems – sets policy and directs others to execute that policy – not unlike the role of the U.S. President
- Provost Max Nikias (formerly Dean of Engineering), Professor of Electrical Engineering – Systems – the single person most responsible for making the vision of the President actually happen – role similar to that of "chief executive officer" of a corporation
- Dean of Engineering Yannis Yortsos – overall responsibility for the operation of the School of Engineering
    - Senior Associate Dean, Academic Affairs Cauligi Raghavendra (Professor of Electrical Engineering – Systems and Computer Science) – responsible for the integrity and operation of the academic program including teaching, accreditation, promotions and tenure of faculty, etc.
    - Associate Dean, Admissions and Student Affairs Louise A. Yates – you already know her
    - 5 other Associate Deans
- Chairman Michael Kassner, Department of Aerospace and Mechanical Engineering (AME) – overall responsibility for the operation of AME
- AME faculty – 27 and growing
- AME students – > 97 freshman, plus many "undeclared" engineers who will become AME majors. In what ways are you in charge?
    - Participate in aforementioned activities
    - Teaching evaluations
    - Directed research
    - (Someday) alumni activities

ABET

Engineering programs are accredited by the Accreditation Board for Engineering and Technology (ABET) (http://www.abet.org). Each course is expected to have a "course objective" and a list of "course outcomes." At the end of the semester, there will be a survey passed out to all students asking to what extent (on a 1 – 5 scale) the course outcomes were or were not met.

Course objective:

> To introduce the student to the science and art of Mechanical Engineering by providing (1) basic tools of engineering practice, (2) introductory knowledge of engineering topics, (3) facility with Computer-Aided Design software and (4) a perspective on how the large number of subjects covered in the mechanical engineering curriculum are inter-related.

Course outcomes:

By the end of the course, the student will

1. Understand the courses required for his/her Mechanical Engineering education at USC and why these courses are useful
2. Understand and manipulate the units of engineered systems
3. Scrutinize a calculated or measured result for "obvious" mistakes
4. Be able to work productively as part of an engineering team working toward a common objective
5. Create simple 2-D and 3-D models of parts and assemblies using Computer-Aided Design (CAD) software such as Solid Edge
6. Have a basic understanding of the forces and torques on rigid, solid objects
7. Have a basic understanding of engineered materials and the stresses they can withstand
8. Have a basic understanding of the flow of fluids and the forces they exert on structures
9. Have a basic understanding of thermodynamics, in particular application of the principle of conservation of energy to very simple systems.
10. Have a basic understanding of the three modes of heat transfer and be able to apply the basic equations of heat transfer to very simple systems.