

ME 195A Senior Design Project

Fall 2007

Prerequisites: ME 114, ME 154; ME 120 (may be taken concurrently)

Credit Units: 3 units, 9 hours laboratory

Class hours: Wednesday, 14:30 – 17:20 (but expect to commit at least 10 hrs/week to your project!)

Instructors/Meeting Room: Section 1 (42789): Prof. Agarwal, Room E135
Section 2 (42791): Prof. Wang, Room E192
Section 3 (42793): Prof. Hsu, Room E117, Course Coordinator
Section 4 (47529): Prof. Rhee, Room E114
Technical support: Mr. Stuart Davis, Room E120

Office hours: Check with instructor

COURSE DESCRIPTION:

First half of a one-year team project carried out under faculty supervision. Project will proceed from problem definition to analysis, design and validation, experimentation including possible construction and testing.

Required Text: *Senior Design Project Manual 2006-2007*, edited by Dr. Fred Barez, MAE Department available at: <http://www.engr.sjsu.edu/bjfurman/courses/ME195/ME195pdf/ME195coursemanual.pdf>

Grading (overall): A letter grade will be assigned to each student by the section instructor at the end of the semester and will be based on evaluation of the following course requirements:

- (25%) Delivery of at least three presentations on achievements and timely progress
- (15%) Class and seminar/guest speaker attendance, quizzes, and assignments
- (45%) End-of-semester report and accomplishments
- (15%) Individual performance evaluation

Work Area:

- **Do NOT** leave trash in the area. Hazardous materials are to be kept in safe containers.
- **Do NOT** leave equipment running unattended

Safety: NO STUDENT IS PERMITTED TO WORK ALONE IN A WORK AREA WITH MACHINE TOOLS OR HAZARDOUS MATERIAL PRESENT. Refer to the Safety Rules in your manual and posted in each Laboratory.

Academic Integrity

Students in this course are expected to maintain high ethical standards in all matters pertaining to the course, including, but not limited to, examinations, homework, course assignments, presentations, writing, laboratory work, team work, treatment of class members, and behavior in class. Cheating and plagiarism are violations of the SJSU Policy on Academic Dishonesty (S98-1) and will not be tolerated in the class. Students are expected to have read the Policy, which is available at:

<http://www2.sjsu.edu/senate/S04-12.pdf>

Plagiarism is defined as, *the use of another person's original (not common-knowledge) work without acknowledging its source.*¹ Thus plagiarism includes, but is not limited to²:

¹ Definition adapted from "Defining and Avoiding Plagiarism: The WPA Statement on Best Practices," <http://www.ilstu.edu/~ddhesse/wpa/positions/WPAplagiarism.pdf>; and "What is Plagiarism?," <http://www.stanford.edu/dept/vpsa/judicialaffairs/students/plagiarism.sources.htm>.

² Adapted from, "Avoiding Plagiarism," http://owl.english.purdue.edu/handouts/research/r_plagiar.html.

- copying in whole or in part, a picture, diagram, graph, figure, etc. and using it in your work without citing its source
- using exact words or unique phrases from somewhere without acknowledgement
- putting your name on a report, homework, or other assignment that was done by someone else

Students are expected to familiarize themselves with how to avoid plagiarism. Several helpful resources can be found at:

<http://www.stanford.edu/dept/vpsa/judicialaffairs/students/plagiarism.sources.htm>

Course Goals

The overall goals for the course are to:

1. Provide senior students a capstone experience in design from concept to fabrication and validation of the final product.
2. Familiarize students with general industry practices, such as planning, scheduling, budgeting, part procurement, fabrication, assembly, and functional tests.
3. Develop students' creative abilities in solving open-ended design problems.
4. Develop students' engineering judgment as well as their confidence in making and accepting responsibility for design decisions.
5. Develop students' oral and written communication skills necessary to describe the assumptions, methods, and results of engineering analysis, synthesis, and decision making associated with their design
6. Make students aware of the importance of teamwork in the design of products and provide them with an opportunity to develop team and leadership skills.
7. Develop students' understanding of professional practices, engineering ethics, as well as global, environmental, and societal issues.

Learning Objectives for ME 195

By the end of the course each student should be able to:

Design Skills

1. Apply the complete product development process including:
 - Defining the problem/societal need, carrying out market study/economic and budget analyses
 - Developing a complete set of functional specifications the design solution must meet
 - Generating solution concepts
 - Selecting the most promising design concept using structured methodologies
 - Developing design models and/or drawings for prototype and final design components
 - Procuring, fabricating, and assembling prototype and final design hardware
 - Evaluating, testing, and analyzing prototype and final design components and systems
 - Identifying future modifications and improvements that could be made to the design based on test data
 - Writing a project report and making presentations
2. Develop a schedule, and meet schedule and budget constraints.

- Interact effectively with vendors, suppliers, and shop personnel.

Communication Skills

- Write high quality design reports (i.e., using correct language and terminology, correct technical information, and professionally prepared graphs and tables).
- Give clear, informative, technically correct oral presentations using professionally prepared visual aids

Team Skills

- Work harmoniously and effectively on a team to complete a design project.

Contemporary Issues

- List several examples of contemporary issues related to their project, and articulate a problem statement *or* position statement for each.
- Identify possible solutions to these contemporary problems, as well as any limitations of such strategies.

Global and Societal Issues

- Evaluate and describe accurately the environmental impact of your product.
- Evaluate and describe accurately any environmental and economic tradeoffs of your product.
- Evaluate and describe accurately the health, safety, and economic tradeoffs of your product.

Engineering Ethics

- Demonstrates knowledge of the ASME code of ethics (<http://files.asme.org/asmeorg/Governance/3675.pdf>).
- Given a job-related scenario that requires a decision with ethical implications, identify possible courses of action, discuss the pros and cons of each one, and decide on the best one.

COURSE SCHEDULE**Week/Date Subject**

- 8/29 (Room E 189) Enrollment, introduction, course overview and organization of design teams. Laboratory activity

Assignment: Read Sections 2 through 4 in the ME 195 Course Manual; review the Design Flow Chart on the web at: <http://www.engr.sjsu.edu/bjfurman/courses/ME195/ME195pdf/designflow.pdf> and “Building Blocks for Teams” from Penn State on the web at: <http://tlt.its.psu.edu/suggestions/teams/student/index.html>

Review Steve Hanssen’s presentation on Project Planning:
<http://www.engr.sjsu.edu/bjfurman/courses/ME195/presentations/ProjPlanHanssen01SEP04.ppt>

Develop the team structure and team meeting schedule; develop the problem statement.

Due next week: Group structure, contact information (names, email, and phone) and problem statement. (See the Project Proposal form in the ME 195 Course Manual)

- 9/5 (Room E 189) **Guest speaker:** Mr. Steve Traugott, TerraLuna, LLC, on Project Planning and Project Management. Laboratory activity.

Due today: Group structure, contact information, and problem statement. Quiz #1

Assignment: Develop the Project Proposal. Review Steve Traugott’s presentation:
<http://www.engr.sjsu.edu/bjfurman/courses/ME195/presentations/ProjPlanTraugott30AUG06.ppt>

Due next week: complete Project Proposal (See the Project Proposal form in the ME 195 Course Manual) and development schedule (Gantt Chart). For an example of a Gantt Chart, see:
<http://www.engr.sjsu.edu/bjfurman/courses/ME195/presentations/GanttChartExample.xls>.

Week/Date Subject

3 9/12 (Room E 189) **Guest speaker:** David Anderson: Design for X. Laboratory activity.

Due today: *complete* Project Proposal and development schedule. Quiz #2.

Assignment: Read: Section 3.7 in the ME 195 Course Manual and, as an example of a state-of-the-art review, http://www.netl.doe.gov/technologies/oil-gas/publications/Status_Assessments/pipe_leak.pdf

Review Steve Hanssen's presentation on Design for Manufacturability:

<http://www.engr.sjsu.edu/bjfurman/courses/ME195/presentations/DFMHanssen15SEP04.ppt>

Prepare for Oral preparation No. 1 on Project planning and development

Due next week: Background and state-of-the-art review

4 9/19 Individual section meetings with instructor. Laboratory activity.

Due today: Background and state-of-the-art review.

Assigned oral presentation No. 1 on project planning

Assignment: Read: Chapter 1.5 on Performance Specifications in Design of Machinery by R. L. Norton

Due next week: Functional Specification for the project or an aspect of the design problem

5 9/26 Individual section meetings with instructor. Laboratory activity.

Due today: Functional Specification for the project or an aspect of the design problem

Assigned oral presentation No. 1

Assignment: Read: Section 3.8 in the ME 195 Course Manual and <http://www.businessballs.com/brainstorming.htm>

Due next week: Concepts for solution (minimum of 10 distinctly different approaches to solve the design problem or an aspect of the design problem)

6 10/3 Individual section meetings with instructor. Laboratory activity.

Due today: **Assigned oral presentation No. 1**

Assignment: Read: the Pugh Method at: <http://www.asq.org/learn-about-quality/decision-making-tools/overview/decision-matrix.html>

Due next week: Pugh Selection chart and identification of prime design concept(s)

7 10/10 (Room E123) Shop Safety Training by Stuart Davis. Sign-up required. Laboratory activity.

Due today: Pugh Selection chart and identification of prime design concept(s).

Assignment: Preparation for oral presentation No. 2 on progress in project development

8 10/17 Individual section meetings with instructor. Laboratory activity.

Due today: **Assigned oral presentation No. 2 on progress and achievements**

Assignment: Preparation for oral presentation No. 2

9 10/24 Individual section meetings with instructor. Laboratory activity.

Due today: **Assigned oral presentation No. 2**

Assignment: Ethics reading assignment (TBD) and ME 195 Course Manual, ed by Fred Barez

Due next week: Definition of engineering ethics

10 10/31 (Room E 189) **Engineering Ethics** presentation and discussion. Laboratory activity.

Due today: Discussion on engineering ethics

Assignment: Ethics writing assignment

Due next week: Ethics writing assignment

Week/Date Subject

11 11/7 Individual section meetings with instructor. Laboratory activity.

Due today: Assigned oral presentation No. 2 and Ethics writing assignment

Assignment: Preparation for oral presentation No. 3 on results and achievements

Due next week: Scheduled oral presentation No. 3

12 11/14 (Room 123) Shop Safety Training by Stuart Davis. Sign-up required. Laboratory activity.

Assignment: Preparation for oral presentation No. 3 on results and achievements

Due next week: Scheduled oral presentation No. 3

13 11/21 Individual section meetings with instructor. Laboratory activity.

Due today: Assigned oral presentation No. 3

Assignment: Preparation for scheduled oral presentation No. 3 on results and achievements

Due next week: Scheduled oral presentation No. 3

14 11/28 Individual section meetings with instructor. Laboratory activity.

Due today: Assigned oral presentation No. 3

Assignment: Prepare for scheduled oral presentation No. 3 on results and achievements.

Due next week: Scheduled oral presentation No. 3

15 12/5 Individual section meetings with instructor. Laboratory activity

Due today: Assigned oral presentation No. 3

Assignment: Prepare Semester Report and plans for ME 195B in S08 semester

Due next week: Plans for Semester Report and plans for ME 195B in S08 semester

Important Notes:

1. Each project team will make at least three presentations during individual section meetings at times to be arranged by the section instructor
2. Students' attendance of scheduled individual and general sessions is mandatory. Absence from these sessions without the Section Instructor's permission will affect a student's overall marks.