

University of Southern California
Daniel J. Epstein Department of Industrial and Systems Engineering
ISE 232L: Manufacturing Processes
Class Number 31603R, Units 3
Spring 2012
Course Syllabus

Course General:

The course meets Monday & Wednesday & Friday, 3:30~4:20pm.

Lecture sessions: KAP-145

Lab sessions: GER-309

Course Instructor:

Dr. Yong Chen, GER-201

Tel: 213-740-7829, Email: yongchen@usc.edu

Office Hours: Monday & Wednesday (2:00 ~ 3:30pm) or by appointment.

Teaching Assistant:

Yongqiang Li, PhD Student

Email: yongqial@usc.edu

Office Hours: Friday 1:00 to 3:30pm, GER-309 or by appointment.

Course Description:

This course aims to provide students with an understanding and appreciation of the breadth and depth of the field of manufacturing, and the strong interrelationships between manufacturing processes, product design and material properties. It will introduce some traditional manufacturing processes such as casting, forming, lathing, milling, polymer injection molding, and emerging manufacturing processes such as layer manufacturing, electronic device fabrication, and MEMS manufacturing. It will also discuss modern digital technologies used in manufacturing such as computer-aided design and engineering, computer-numerical control, and computer integrated manufacturing. Group projects are designed to prepare the students to gain understanding on how everyday products are designed and manufactured.

The course is a combined lecture and laboratory teaching. The lectures will consist of seven parts: (1) Manufacturing processes and its relations to product design and material properties, (2) metal component manufacturing; (3) plastic component manufacturing; (4) digital product design and manufacturing; (5) prototyping and additive processes; (6) semiconductor and MEMS manufacturing; and (7) manufacturing of complex products. Various case studies and related videos will be used in the lectures. The Labs will require students to form teams to design and prototype an innovative device by using provided CAD software systems and 3D printers.

Prerequisites:

An introductory course on material science (e.g. MASC 110L) or chemistry (CHEM 105aL or CHEM 115aL).

Textbook

“Manufacturing Engineering and Technology,” Sixth Edition, Serope Kalpakjian and Steven R. Schmid, Pearson Prentice Hall, 2009.

Grading Policy:

The grading for the class will be determined using the following weights:

- Problem assignments..... 20%
- Quizzes..... 15%
- Final exam..... 20%
- Lab project..... 25%
- Course project 15%
- Participation..... 5%
- Total Score..... 100%

Problem Assignments: Students will be given reading assignments and homework assignments (including labs) from the textbook. Homework assignments should be turned in promptly. They should demonstrate that the student has thoughtfully considered the material presented and its value. Half of the points will be deducted for late submissions.

Quizzes: One quiz will be given at the end of each lecture segment. The quizzes will be given without notification. The syllabus will only indicate the tentative dates that would help students to anticipate the readings necessary for a quiz. ***No make-up quiz will be given.*** We will count the best 3 quizzes for the final grade.

Final Exam: One final examination will be given at the end of the semester based on the university's final exam schedule.

Lab & Course Projects: The objective of the class projects is to help the students to gain hands-on experience and to use learned materials to solve real world problems. Each project team will have 3 students, who are expected to work together to accomplish the given tasks.

- (1) In the course project, each team is expected to dissect an everyday product and analyze the manufacturing processes and material of its components.
- (2) In the lab project, each team is expected to develop an innovative product related to the course project. A functional prototype and its CAD models need to be built and demonstrated at the end of the project.

Each project team must prepare a presentation for each project to explain their ideas, methods and results to the class. Presentations will take about 10 minutes per team and the presenters should be prepared to answer questions on the topic. The presentation and a project report will be used in the evaluation of team-based grades.

Participation: Participation in the classes and labs is required and will be taken into account. Bonus points are available for enthusiastic participation in class. If you will miss a class, please let me know in advance and work with your fellow students to catch up on what you miss. Please turn cell phones and pagers off or put them in vibrate mode before coming to the classes and labs.

Academic integrity:

“The Department of Industrial and Systems Engineering adheres to the University’s policies and procedures governing academic integrity as described in SCampus. Students are expected to be aware of and to observe the academic integrity standards described in SCampus, and to expect those standards to be enforced in this course.” Check out the helpful “Trojan Integrity: A Guide to

Avoiding Plagiarism” and other publications of the USC Office of Student Judicial Affairs (<http://www.usc.edu/student-affairs/SJACS/nonacademicreview.html>).

Disability Accommodation:

“Any Student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m. - 5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.”

Policy on Religious Holidays:

University policy grants students excused absences from class for observance of religious holy days. Students should contact instructor IN ADVANCE to request such an excused absence. Students are advised to scan the syllabi at the beginning of the semester to detect potential conflicts with their religious observances. Please note that this applies only to the sort of holy day that necessitates absence from class and/or whose religious requirements clearly conflict with aspects of academic performance. Please refer to the Holy Days Calendar (<http://orl.usc.edu/religiouslife/holydays/>).

Tentative Course Schedule:

There are two fifty-minute lecture sessions and one fifty-minute laboratory session each week.

Week #	Monday (3:30~4:20 pm)	Wednesday (3:30~4:20 pm)	Friday (3:30~4:20 pm)	Assignments
1	Jan. 9 – Course Introduction	Jan. 11 –Manufacturing Background & Product Development	Jan. 13 - Project Overview & Team Exercise	Forming Teams
2	Jan. 16 – Martin Luther King Day (No Class)	Jan. 18 — Product Design and Manufacturing with a Case Study	Jan. 20 - Lab 1	Project Assigned
3	Jan. 23 – Engineering Material & Mechanical Properties	Jan. 25 – Mechanical & Physical Properties	Jan. 27 - Lab 2	
4	Jan. 30 – Engineering Material (Metal)	Feb. 1 – Engineering Material (Polymer)	Feb. 3 - Project Idea Presentation (5min/team)	Project Idea Due
5	Feb. 6 – Manufacturing Process Overview & Course Project	Feb. 8 – Metal Casting	Feb. 10 - Lab 3	Course Project Assigned
6	Feb. 13 – Quiz 1 & Metal Casting	Feb. 15 – Polymer Injection Molding	Feb. 17 - Lab 4	
7	Feb. 20 – President Day (No Class)	Feb. 22 – Polymer Injection Molding	Feb. 24 - Lab 5	
8	Feb. 27 – Forging	Feb. 29 – Sheet-metal Forming	Mar. 2 - Lab 6 (Lab Quiz)	
9	Mar. 5 - Metal Machining	Mar. 7 – Course Project Presentation (10min/team)	Mar. 9 – Course Project Presentation (10min/team)	Course Project Due

10	Mar. 12 – Spring Recess (No Class)	Mar. 14 – Spring Recess (No Class)	Mar. 16 – Spring Recess (No Class)	
11	Mar. 19 – Metal Machining	Mar. 21 – Quiz 2 & Lab Project Assigned	Mar. 23 – Lab 7: Tour of Undergraduate Fab Lab with CNC machining demonstration	Lab Project Assigned
12	Mar. 26 – CAM & CNC	Mar. 28 – Lab 8: Visit WESTEC at LA Convention Center	Mar. 30 – Introduction to CAD & CAE & CG	Product Sketch Due
13	Apr. 2 – Introduction to Rapid Prototyping	Apr. 4 – SLA & SLS	Apr. 6 – Lab 9	
14	Apr. 9 – FDM & 3DP & Rapid Tooling	Apr. 11 –Semiconductor Fabrication	Apr. 13 - Lab 10 (Tour of RTH-319)	
15	Apr. 16 - MEMS Fabrication & Course Evaluation	Apr. 18 – Quiz 3 & Discussion on Lab Project	Apr. 20 – Lab 11	
16	Apr. 23 - Lab Project Presentation (10min/team)	Apr. 25 – Lab Project Presentation (10min/team)	Apr. 27 – Wrap-up & Tradeshow	Lab Project Due
17	Apr. 30 – Study Day		May. 4 – Final Exam (2 – 4pm)	