

University of Southern California  
Daniel J. Epstein Department of Industrial and Systems Engineering

**ISE 232L: Manufacturing Processes**

Class Number 31603R, Units 3

Fall 2014

**Course Syllabus**

**Course General:**

The course meets Monday & Wednesday & Friday, 1:00~1:50pm.

Lecture sessions: VKC-211

Lab sessions: GER-309

**Course Instructor:**

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

Office Hours: Monday & Wednesday (12-1pm and 2-4pm) or by appointment, GER-201.

**Teaching Assistant:**

(Course & Project) Mr. Behnam Zahiri, Email: be.zahiri@usc.edu.

Office Hours: Monday & Wednesday (9:30-11am) or by appointment, GER-235.

(Lab & Project) Mr. Xuan Song, Email: xuansong@usc.edu.

Office Hours: Friday (12-1pm and 3-5pm) or by appointment, GER-309.

**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*,” Seventh Edition, Serope Kalpakjian and Steven R. Schmid, Pearson Prentice Hall, 2013.

### 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 (1:00~1:50 pm)	Wednesday (1:00~1:50 pm)	Friday (1:00~1:50 pm)	Assignments
1	Aug. 25 – Course Introduction	Aug. 27 –Manufacturing Background & Product Development	Aug. 29 - Project Overview & Team Forming	Forming Teams
2	Sept. 1 – Labor Day ( <b>No Class</b> )	Sept. 3 — Lab 1	Sept. 5 - Lab 2	
3	Sept. 8 – Team Exercise & Project Idea	Sept. 10 – Mechanical Properties	Sept. 12 - Lab 3	Project Assigned
4	Sept. 15 – Physical Properties	Sept. 17 – Engineering Material (Metal)	Sept. 19 - <b>Project Idea Presentation (5min/team)</b>	Project Idea Due
5	Sept. 22 – Engineering Material (Polymer)	Sept. 24 – Course Project & Manufacturing Process Overview	Sept. 26 - Lab 4	Course Project Assigned
6	Sept. 29 – <b>Quiz 1</b> & Metal Casting	Oct. 1 – Metal Casting	Oct. 3 - Lab 5	
7	Oct. 6 – Polymer Injection Molding	Oct. 8 – Forging	Oct. 10 - Lab 6 ( <b>Lab Quiz</b> )	
8	Oct. 13 – Sheet-metal Forming	Oct. 15 – <b>Course Project Presentation (10min/team)</b>	Oct. 17 – <b>Course Project Presentation (10min/team)</b>	Course Project Due

9	Oct. 20 - <b>Quiz 2</b> & Lab Project Assigned	Oct. 22 – Metal Machining	Oct. 24 – Lab 7: Tour of Undergraduate Fab Lab with CNC machining demonstration	Lab Project Assigned
10	Oct. 27 – Metal Machining & CNC	Oct. 29 – Introduction to CAM & CAD & CAE	Oct. 31 – Lab 8	
11	Nov. 3 – Introduction to Rapid Prototyping	Nov. 5 – SLA & SLS	Nov. 7 – Lab 9: Tour of RTH-319 with 3D printing demonstration	Product Sketch Due
12	Nov. 10 – FDM & 3DP & Rapid Tooling	Nov. 12 – Lab 10	Nov. 14 – Lab 11	
13	Nov. 17 – Semiconductor Fabrication	Nov. 19 – MEMS Fabrication & Course Evaluation	Nov. 21 - Lab 12	
14	Nov. 24 – <b>Quiz 3</b> & Discussion on Lab Project	Nov. 26 – Thanksgiving ( <b>No Class</b> )	Nov. 28 - Thanksgiving ( <b>No Class</b> )	
15	Dec. 1 - <b>Lab Project Presentation (10min/team)</b>	Dec. 3 – <b>Lab Project Presentation (10min/team)</b>	Dec. 5 – Wrap-up & Tradeshow	Lab Project Due
16	Dec. 8 – Study Day			
17		Dec. 17 – <b>Final Exam (11 – 1 p.m.)</b>		