

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

**ISE 232L: Manufacturing Processes**  
Class Number 31603D, Units 3  
Spring 2020  
Course Syllabus

**Course General:**

The course meets Tuesday & Thursday, 9:30~10:50pm.

Lecture sessions: VKC-261

Lab sessions: SAL-127

**Course Instructor:**

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

Office Hours:

Tuesday & Thursday (2:00 - 3:30 pm) or by appointment, GER-201.

**Teaching Assistant:**

Mr. Jie (Jack) Jin, Tel: 213-880-1294, Email: jiejin@usc.edu

Thursday (2-5 pm) or by appointment, GER-242

**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 of 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:**

None course on material science (e.g. MASC 110L) is desired (but not required).

**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%
- Lab Quiz ..... 5%
- Midterm exam..... 10%
- 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.

Lab Quiz: One quiz will be given based on lab teaching in the first half of the semester.

Midterm exam: One midterm examination will be given in the middle of the semester.

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 three 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.

## Tentative Course Schedule:

In general, there are two-hour lectures and one-hour laboratory each week.

Week #	Tuesday (9:30-10:50 pm)	Thursday (9:30-10:50 pm)	Assign-ments
1	Jan. 14 – Ch1: Course introduction & Manufacturing background	Jan. 16 –Product development, Project overview & Team forming	Team Formed

2	Jan. 21 – <b>Lab 1</b>	Jan. 23 —Team exercise, Project idea & Ch2: Mechanical properties	Project Assigned
3	Jan. 28 – Ch3 Physical properties & Ch5&6: Engineering material (Metal)	Jan. 30 – Ch7: Engineering material (Polymer)	
4	Feb. 4 – <b>Lab 2</b>	Feb. 6 – <b>Project Idea Presentation (8min/team)</b>	Project Idea Due
5	Feb. 11 – Course project overview & Manufacturing process overview	Feb. 13 – Ch10-12: Metal casting	Dissection Project Assigned
6	Feb. 18 – <b>Lab 3</b>	Feb. 20 – Ch19: Polymer injection molding	
7	Feb. 25 – Ch14: Forging & Ch16: Sheet-metal forming	Feb. 27 – Sheet-metal forming & Dissection project discussion	
8	Mar. 3 – <b>Lab 4</b>	Mar. 5 – Ch21: Machining introduction & Ch23 Cutting model	Dissection Project Due
9	Mar. 10 - <b>Dissection Project Presentation (12min/team)</b>	Mar. 12 – <b>Mid-term Exam</b>	Prototyping Project Assigned
10	Mar. 17 – Spring recess ( <b>No Class</b> )	Mar. 19 - Spring recess ( <b>No Class</b> )	
11	Mar. 24 – <b>Lab 5 (Lab Quiz)</b>	Mar. 26 –Prototyping project & Ch24: Metal machining	Product Sketch Due
12	Mar. 31 – <b>Lab 6:</b> Tour of Undergraduate Fab Lab with CNC machining demonstration	Apr. 2 – Ch37&38: Intro to CAM & CNC & CAE	
13	Apr. 7 – <b>Lab 7:</b> Tour of Center of Advanced Manufacturing with 3D printing demonstration	Apr. 9 – Ch20: Intro to Rapid Prototyping, Rapid tooling & 3D printing	
14	Apr. 14 – Ch20: Intro to SLA, SLA, FDM & 3DP	Apr. 16 – Ch28&29: Semiconductor fabrication & MEMS	
15	Apr. 21 - <b>Lab 8</b>	Apr. 23 – Fabrication system & Lab project discussion	Prototyping Project Due
16	Apr. 28 - <b>Prototyping Project Presentation (12min/team)</b>	Apr. 30 – Wrap-up & <b>Tradeshow</b>	Prototyping Project Due
17	May 5 – Study day		
18	May 12 – <b>Final exam (8 – 10 am)</b>		

### 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 the 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 conflict with aspects of academic performance. Please refer to the Holy Days Calendar (<http://orl.usc.edu/religiouslife/holydays/>).

## **Statement on Academic Conduct and Support Systems**

### Academic Conduct

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Section 11, Behavior Violating University Standards <https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/>.

Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct/>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the Office of Equity and Diversity <http://equity.usc.edu/> or to the Department of Public Safety <http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us>. This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. The Center for Women and Men <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage [sarc@usc.edu](mailto:sarc@usc.edu) describes reporting options and other resources.

### Support Systems

A number of USC’s schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the American Language Institute <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. The Office of Disability Services and Programs [http://sait.usc.edu/academicsupport/centerprograms/dsp/home\\_index.html](http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html) provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, USC Emergency Information <http://emergency.usc.edu/> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.