EME 50 Spring 2014

Manufacturing Processes

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office hours: Thursdays 2:00–4:00 pm

lectures: TR 7:30–8:50 am, 1204 Haring

machine shop sessions in 1220 Bainer

Section 1 — T 09:00–11:50 am
Section 2 — W 09:00–11:50 am
Section 3 — T 02:10–05:00 pm

teaching assistants

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Synopsis: This course covers the basic principles and capabilities of modern manufacturing processes, including casting, forging, and machining of metals, injection molding of plastics, composite materials manufacturing, advanced (electrical–discharge and electrochemical) machining, computer–aided design and manufacturing, and rapid prototyping. Design for manufacturability and the economic aspects of manufacturing processes will also be briefly discussed. The practical component of the course involves completion of projects in the student machine shop that offer "hands–on" experience in the use of lathes, milling machines, finishing processes, and communication of manufacturing information through CAD models and engineering drawings.

1 enrollment

Due to the limited capacity of the student machine shop, there is a strict cap on enrollment in each section of EME 50. Only currently–registered students majoring in Mechanical Engineering, Aeronautical Science and Engineering, and Mechanical Engineering and Materials Science may enroll in EME 50.

2 prerequisites

The prerequisities for this class are ENG 4 (Engineering Graphics in Design) and PHY 9A (General Physics). The homeworks assume working knowledge of a modern CAD system, so it is not appropriate to take ENG 4 concurrently.

3 manufacturing projects

The requirements for EME 50 include the completion of two manufacturing projects in the Engineering Fabrication Laboratory, located in 1220 Bainer Hall. Attendance during the specific machine shop session you are assigned to is **mandatory**, and exceptions will only be made in extraordinary cases, with permission from the shop staff.

It is very important to arrive **promptly** for the machine shop sessions, since a roll–call must be taken before any use of the shop can begin. Also, the shop staff often have important information to convey at the beginning of each session. Arriving late at your scheduled shop session may incur a penalty on your homework grade. If you miss **two** (or more) shop sessions during the quarter, you will fail the shop component of the course, and will be required to repeat it for any future use of the shop.

The "totem pole" project involves design and manufacture of parts to given specifications and tolerances, so they can be assembled together at the end of the quarter. The gyroscope project involves manufacturing a specified design, according to a prescribed process plan, and verifying that the manufactured gyroscope spins for a minimum of 2 minutes. Further details on these projects will be made available during the course of the term.

4 course materials fee

To help defray the cost of consumables (materials/tooling) used in EME 50, a Course Materials Fee will be assessed for this class. If you feel your financial circumstances warrant a waiver of this fee, you may consult with Julie Burgal (jburgal@ucdavis.edu) in the MAE Main Office, 2132 Bainer Hall.

5 machine shop training

It is particularly important to attend the machine shop sessions during the first week of classes, since **safety training** will be conducted during these sessions. If you miss this safety training, you will have to drop the course.

If you are among the top few waited–listed students, it is advisable to attend this safety training, in case it becomes possible to admit you into the class. Decisions on the admission of wait–listed students will be made by the second week of the quarter.

During the first few weeks of class, the machine shop staff will conduct several **demonstrations** on the use of equipment in the shop. To accommodate your other course constraints, multiple sessions will be scheduled. You must sign up for, and attend, one of them. Attendance at the demonstrations is limited to about 10 students per session. To compensate for time invested in them, one lecture will be omitted during the week the demonstrations are held.

6 reference textbook

The reference text for EME 50 is *Manufacturing Engineering and Technology*, 5th Edition, by S. Kalpakjian and S. R. Schmid, Prentice–Hall. Two copies of this book will be placed on 2–hour reserve in the Shields Library. There are several other texts, of similar scope, that you may wish to consult:

- M. P. Groover, *Fundamentals of Modern Manufacturing*, Wiley.
- P. Ostwald & J. Muñoz, *Manufacturing Processes and Systems*, Wiley.
- J. A. Schey, *Introduction to Manufacturing Processes*, McGraw–Hill.
- G. Tlusty, *Manufacturing Processes and Equipment*, Prentice–Hall.

7 homeworks

Homeworks will be assigned on Tuesdays, and will be due on the following Tuesday. They should be deposited in the EME 50 drop box, opposite the main door to the student machine shop (1220 Bainer Hall). Some homeworks may require uploading to Smartsite. Your **section** & **shop box number** should be clearly indicated on each homework.

The homeworks will be primarily concerned with design and manufacturing problems for the class projects. Grades for late homeworks will be penalized at a rate of 25% for each business day they are late. Exceptions may be made

in the case of significant (e.g., medical) extenuating circumstances. Please note that other students in the class may be dependent on timely completion of your homeworks, to communicate project data.

8 exams

There will be two exams during the quarter, that test understanding of basic terminology, concepts, and methods presented during the lectures. Since the subject matter is mostly qualitative in nature, the questions on these exams will not involve detailed analyses or calculations. Correspondingly, the exams will be **closed book** and **closed notes**. For this reason, it is important to attend all the lectures and carefully study the lecture notes before the exams.

No make–up exams will be given — if you have a legitimate and documented justification (medical condition), arrangements may be made in exceptional circumstances for you to take the exam somewhat earlier or later, or for a missed exam to not count towards your grade.

9 technical paper

As an opportunity to explore a specific aspect of manufacturing that interests you, a requirement of EME 50 is to submit a brief paper (1000–1500 words + figures) describing a specific manufacturing problem, process, or technology. The paper can address a topic not covered in class, or it can explore a covered topic in greater detail. To research your topic, you should make extensive use of the library and internet, but the paper must represent your own analysis of the topic — not just a "cut–and–paste" of downloaded text/figures.

10 course goals

- Exposure to modern manufacturing processes through classroom study and hands–on projects and demonstrations.
- Exposure to design for manufacture & assembly through an open–ended project. You will design and fabricate a part that mates with the parts designed by other students — this involves use of computer–generated working drawings, design modifications, final design approval, and the machining, inspection, and assembly of parts. Design communication is critical to the success of this project.

11 ABET course outcomes

(c) Design an engineering system, component, or process to meet prescribed needs and constraints.

(g) Communicate effectively.

(h) Understand the impact of engineering solutions in a global, economic, environmental, and societal context.

(j) Stay abreast of contemporary issues.

(k) Use the techniques, skills, and modern engineering tools necessary for engineering practice.

12 grading policy

Penalties may be imposed on exams, homeworks, and papers for illegible or poorly–organized work. The overall course grade is determined as follows:

exams	40%
homeworks	20%
technical paper	15%
manufacturing projects	25%

You are expected to observe the UC Davis Code of Academic Conduct (see `http://sja.ucdavis.edu/cac.html`) concerning all aspects of this course.