

**ME 110 Manufacturing Processes**

Fall 2000

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Office hrs: Monday 2-3 pm, Tuesday 3-4 pm, Thursday, 3-4 pm, or by appointment only.

Class rooms: E-331 (Lecture), IS-124 (Lab.)

Class code/time: Lecture, section 01 (18405) - MW 12:30 - 13:20

~~Lab, section 02 (18407) - R 13:30 - 16:20 CANCELLED~~

Lab, section 03 (18411) - W 17:30 - 20:20

Lab, section 04 (18413) - M 17:00 - 19:50

**Final Exam: Friday, December 15, 2000, 12:15 - 14:30**

**COURSE DESCRIPTION:**

Introduction to a broad range of traditional and non-traditional manufacturing processes. Shop safety, basic metrology, geometric dimensioning and tolerancing, and manufacturing process planning will also be addressed. Hands-on laboratory assignments will be used to give the student a working knowledge of common manufacturing processes.

**Prerequisites:** E 20, MatE 25

**Required Text:** Kalpakjian, S., Schmid, S., *Manufacturing Engineering and Technology 4e*, Prentice-Hall, New Jersey, 2000. (ISBN: 0-201-36131-0)

**Required Equipment:** Safety glasses You are responsible for supplying your own pair of safety glasses. You ***must*** wear safety glasses at all times in the laboratory.

**Grading:** Lab projects 20%, HW & Quizzes 20%, Final Exam 20%, Presentation 20%, Final Project 20%

***COURSE SCHEDULE (tentative)***

<b>Wk.</b>	<b>Date</b>	<b>Subject</b>	<b>Read (Chap)</b>	<b>Lab</b>
1	8/28	Course introduction, syllabus, etc. GD&T: coord. systems, DOF's, geom. entities	1; 35 (esp. 35.10-11)	Safety rules, shop tour, metrology
2	9/4	GD&T: tolerance zones, feature control frame		Project 1 (begin)
3	9/11	GD&T: DRF construction, tolerancing exercise; surface finish, limits and fits		Project 1
4	9/18	Materials: ferrous alloys and non-ferrous alloys	4, 5, 6	Project 1 (finish)
5	9/25	Materials: polymers, ceramics, composites, and surface treatments	7 and 8	Project 2 (begin)
6	10/2	Material removal processes: turning, boring, milling, sawing	22 and 23	Project 2
7	10/9	Material removal processes: broaching, drilling and reaming, threading, filing	22 and 23	Project 2 (finish)
8	10/16	Joining processes: oxy-fuel welding/cutting, arc welding, resistance welding, laser and E-beam welding	27, 28	Welding A
9	10/23	Joining processes: brazing, soldering, adhesives, mechanical fasteners	30	Welding B
10	10/30	<b>Midterm exam</b> , manufacturing process planning	39	Final project (begin)
11	11/6	Abrasive machining processes: abrasives and grinding, honing and lapping	25	Final project
12	11/13	Forming processes: casting, die casting; forging, drawing, bending	11, 12, 14-16	Final project

Wk.	Date	Subject	Reading	Lab
13	11/20	<b>TOUR: Trend Technologies, Inc.</b> (plastic molding); plastic molding	7, 18	Final project
14	11/27	Non-traditional processes: EDM, wire EDM, water jet; chemical machining, hydroforming, thermal processes;	26	Final project
15	12/4	Design for manufacturability; Special Topics	38.10	Final project
16	12/11	Project Fair		

**Course goals for the student:**

1. To develop familiarity with and understanding of a broad range of manufacturing processes.
2. To gain hands-on experience with basic hand tools and basic machine tools such as lathes, mills, drill presses, etc.
3. To understand how to use machine tools and hand tools in a safe and proper manner.
4. To improve communication and research skills through by preparing and delivering a presentation on a particular manufacturing process.
5. To gain practical experience in applying knowledge gained in the course through a hands-on project.

**Learning objectives for the student:**

1. Demonstrate safe and proper use of machine and hand tools
2. Demonstrate proper use of common metrology tools such as dial calipers, micrometers, etc.
3. Set up and use the lathe to make a part to specified dimensions and tolerances
4. Set up and use the mill to make a part to specified dimensions and tolerances
5. Given a part or artifact, describe the manufacturing processes that were used in its manufacture
6. Given the drawing and requirements for a particular part, specify and be able to justify the selection of manufacturing processes to produce the part

**Notes on Safety:**

The laboratory portion of the course will involve hands-on use of tools and machinery, many of which can blind an eye, take off a finger, or do other painful damage to your body. One must **ALWAYS** take extreme care in setting up and operating equipment, follow the safety rules, and work in a *thoughtful* and *unhurried* manner. If you have not received proper instruction or are uncertain how to operate any equipment, ask for assistance from the instructor.

Some manufacturing processes are loud enough that it is recommended that you use earplugs to protect against damage to your hearing. These can be purchased in the Bookstore or at any hardware store.

No open-toed shoes or sandals are permitted in the lab.

**Lab Cleanup**

You are responsible for cleaning the machine and/or area where you have been working during the laboratory period. Plan to spend the last 10 to 15 minutes of the laboratory period cleaning up and securing the shop tools, and do a good job of it.

**Presentation Assignment:**

One of the major assignments in the class is for you and a partner to give a presentation to the rest of the

class on a particular manufacturing process. Research, in-class presentation, and a written report for this assignment will be carried out with your partner. Refer to the Presentation Assignment document for more details.

### **Final Project Assignment:**

The other major assignment in the class will be for you to demonstrate what you have learned about manufacturing processes by designing, planning the manufacturing process for, and fabricating a project of your choosing. This assignment can be done as an individual or by a group, but in all cases, prior approval of the project must be obtained from the instructor. Refer to the Term Project Assignment document for more details.

### **Additional Notes:**

All laboratory assignments are to be completed in the laboratory at SJSU unless alternate arrangements have been made with the course instructor. If you fail to attend the laboratory at your scheduled time, you probably won't be able to complete your assignments when they are due. Make-up laboratory time will ***not*** be granted at the end of the semester!

Homework and assignments will be due at the start of the respective session on the assigned date. Late homework or lab reports will not be accepted unless ***prior*** arrangements have been made.

If you are going to be absent from class, please give me a call, or send me an email prior to the class meeting. Don't just not show up!

Please make it a point to ask questions in class or in office hours whenever you don't understand something! If you don't, then you are essentially paying tuition for nothing!

**References:** (See also the references listed in the text at the end of each chapter. Many of the references below are on reserve for ME 110 in Clark Library.)

1. Allen, D. K., et. al., *Manufacturing Processes Reference Guide*, Industrial Press, Inc., April 1994, ISBN: 0831130490. [Excellent overview of a wide range of manufacturing processes. A distinguishing feature of this book is that it gives information on the capabilities of each process (such as tolerances, surface finish, etc.)]
2. Bralla, J. G. ed., *Design for Manufacturability Handbook*, 2<sup>nd</sup> ed., McGraw-Hill, NY, 1998. ISBN: 007007139X [A highly respected reference detailing the principles and procedures for designing products for easy and economical manufacture]
3. DeGarmo, E. P., Black, J. T., Kosher, R. A., *Materials and Processes in Manufacturing*, 8<sup>th</sup> ed., Prentice Hall, New Jersey, 1997. [Good alternate text on manufacturing processes]
4. Farago, F. T., Curtis, M. A., *Handbook of Dimensional Measurement* 3<sup>rd</sup> ed., Industrial Press, Inc., New York, 1994, ISBN: 0831130539. [Excellent resource to learn more about the techniques and methods of making dimensional measurements]
5. Oberg, E. et. al., *Machinery's Handbook*, 26<sup>th</sup> ed., Industrial Press, Inc., March 2000, ISBN: 0831126353. [A "must-have" book for the mechanical designer. Extensive reference material for the design of machine elements, machining, and manufacturing]
6. Society of Manufacturing Engineers web site: [www.sme.org](http://www.sme.org) [*The professional society for manufacturing*]
7. Tandler, W., "The Little Encyclopedia of GD&T", Multimetrics, Inc., Menlo Park, CA. ([www.multimetrics.com](http://www.multimetrics.com)) [This is the best reference available to explain the terms and usage of tools associated with the ANSI Y14.5M 1994 standard on geometric dimensioning and tolerancing]
8. Thomas Register: <http://www.thomasregister.com/> [Excellent source for finding a manufacturer]