

IE 1052 Manufacturing Processes and Analysis

Course Syllabus

Catalog Description

This is an undergraduate course in manufacturing processes and analysis. Topics include: manufacturing properties, casting, metal forming (rolling, forging, extrusion, and drawing), polymer processing, particulate processing (powder metallurgy and ceramic/glass forming), heat treatment, welding, and machining. Prerequisite: ENGR 0022, Materials Structures and Properties. 3 credit hours.

Instructor

Prof. Grace Chan grace.chan@scu.edu.cn

Textbook

Manufacturing Engineering and Technology, 7th ed, by Serope Kalpakjian and Steven R Schmid (published by McGraw Hill).

We will cover approximately one chapter per week. Textbook reading assignments will be posted to the class website. Read the assigned chapter BEFORE class.

Software

You will also use Microsoft Word to write up your assignments, Microsoft Excel to draw scientific curves, and Power Point to deliver presentations. Learn how to use the equation editor in Word and how to format documents, and how to draw engineering data curves.

Course Goals

- To understand the fundamental principles of materials processes and manufacturing
- To gain knowledge of various manufacturing processes and related technical analysis
- To gain proficiency in communication through written and oral reports
- To practice solving problems through teamwork
- To understand the importance of economic considerations in the selection of manufacturing processes

Topical Coverage

Week	Topic	Chapter
1	Manufacturing Properties	1, 2
2	Fundamentals of Casting	10
3	Casting Processes	11
4	Casting Analysis	12
5	Field Trip on Casting Processes	12
6	Fundamental of Metal Forming Rolling	13
7	Forging	14
8	Extrusion and Drawing	15
9	Polymer Processing	19
10	Powder Metallurgy	17
11	Ceramic/Glass Forming	18
12	Heat Treatments	4
13	Fundamentals of Welding	30
14	Welding Operations	31
15	Fundamentals of Machining	23
16	Field trip of Machining Operations	24

Class Format

Introduction to Manufacturing Processes and Analysis will be taught using a combined lecture/field trips. Each class will be run with a lecture (30-40 minute) to review material from the text and introduce new concepts. During the lecture, problems/exercises/questions will be given, and you will work in small groups (3-4 students) to address the problems and questions by applying these concepts.

There are three types of weekly assignments: homework problems, group presentations, and field trip reports. Field trips will require only a short write-up. Group presentations

will be prepared as a team and require a good team spirit. Homework problems will require considerable thought and effort outside of class.

It is imperative that you come to class prepared. This will generally involve reading one or more chapters of the textbook, viewing tutorial videos, thinking, engaging with fellow students, and performing preliminary calculations. This is a three credit hour class, which means you should expect to devote at least 9 to 12 hours of effort outside the scheduled class time every week.

Group Presentations

4-6 students of each group jointly deliver a present, follow these guidelines:

- Introduction to the importance of the technique assigned to you
- Steps of the manufacturing processing
- Explain terms of the processing
- A list of products manufactured by the technique
- Demonstrate the process with a video
- Discuss the advantages and disadvantages of the processing and alternative techniques
- Summary

Your presentation should take no more than twelve minutes. Three minutes will be allotted for questions and discussion following your presentation.

Be prepared in case of technology breakdown (e.g., use the whiteboard if the computer or projector fails).

Both the instructors, teaching assistant, and your fellow students will evaluate presentations.

Homework

Throughout the semester, homework problems will also be assigned every week. These are to be solved and turned in by Friday at 5:00pm the following week. You may work with other people on homework, but all write-ups must be individual efforts. Homework will be graded on a 0-100 point scale. Late homework will not be accepted.

All homework will be submitted electronically via the SCU email system.

Please adhere to these homework guidelines:

- Your assignment must be typeset using Word. Handwritten assignments will not be accepted.
- Put your name, ID number, and class section at the top of the first page.
- List the names of other people you've worked with on the assignment.

- All work must be shown for each solution to receive full credit. Present your solution in a logical fashion, showing and explaining all steps in detail.
- Adherence to form is an important part of this course. This includes proper English grammar, spelling, and word usage. Your computer has a spell checker, use it!
- A significant amount of the homework points is associated with obtaining the correct answer. This includes getting the correct quantity, **number of significant digits**, sign, and **unit**. Pay attention to all of these, they are important!

All of the homework scores will be used in your grade computation. Unless otherwise indicated, you can work with your fellow students in the class, but you must submit a distinct and independent write-up to receive credit.

If you're sick, or have a compelling emergency that prevents you from turning in the homework on time, email Prof. Chan.

If you believe an error has been made in the grading of an assignment, bring it to the attention of a TA or Prof. Chan within ONE WEEK of its return.

Field Trip

Safety is the fore-most important aspect during a field trip visit to any industrial companies. You must follow safety instructions. You must not touch any machines or devices without permission.

Exams and Grading

There will be a midterm exam on or around November 15, and a comprehensive final examination at the end of the semester. The test and exam are CLOSED BOOK, CLOSED NOTES, CLOSED COMPUTER. You may bring one A4 page of notes (both sides). You will also find a calculator and a straightedge helpful.

Your grade will be based on the mid-semester test (20%), homework (40%), final examination (20%), two field trip reports (10%) and two group participations (10%).

The instructor's role is to guide you in learning how to define, solve, and present materials science and engineering problems. You will not be judged on your ability to recite memorized information, but on how well you make use of information and methods we cover in class. This should already be one of your primary educational goals in coming to university. The key to your success in this class is active participation.

Office Hours

If you don't understand something, and talking to your classmates doesn't help, then you should be seeking help from one of the instructors.

Office hours are times we have specifically set aside to be available to students. During office hours, you can come to our office; you don't need an appointment. We are also available at other times; please email to schedule a time. Current office hours will be posted on the class website.

Plagiarism and Academic Misconduct

Collaboration on studio problems and homework assignments is permitted and encouraged. Studio assignments are to be done as a team, with a single solution and write-up. Your homework write-ups will be individually written and represent your independent efforts.

Plagiarism, copying, and any other form of academic misconduct or dishonesty will not be tolerated. Cite all references, including books, technical reports, and web sites you have used. You may discuss the homework with other people currently taking this class, the instructors, and teaching assistants.

Examples of disallowed sources include websites that offer homework help; course documents from previous semesters; people or agencies that do your work for you.

You are not to share materials distributed in class with people outside the University. Uploading of course materials, including homeworks, handouts, homework and test solutions, etc. to the web is prohibited.

To reiterate: use of homework or test solutions from previous semesters or the web is not allowed. Getting homework help from the instructors and fellow students in the class is ok; looking up things on the Google, Baidu, and the Wikipedia is ok; getting help from websites offering homework help and problem solutions is NOT ok.

If you have any questions about referencing material, or the boundaries of acceptable collaboration, please talk to Prof. Chan.

Class Participation

As members of an academic community, all students are expected to actively participate in and contribute to class discussions. You are expected to engage with the class during the lecture/studio time, and to be prepared to think and answer questions on your feet. There is no penalty for not knowing the answer to a question, but you need to be able to "think out loud" and demonstrate the procedure you will follow to arrive at a solution. So, if you're asked a question in class, be prepared to figure out the answer.

Other Useful Information

Although there are no formal prerequisites for this class, you are expected to know how, or learn how, to do the following:

- Use an internet browser to find things on the web.
- Use Excel to evaluate numerical results, make graphs, and do multistep calculations.
- Use Word to write up and print your assignments.
- Open, read, and print Acrobat pdf files.
- Find the logarithm of a number and understand what it is.
- Be proficient in basic pre-calculus mathematics, including plane geometry, trigonometry, algebra, and solution of simultaneous equations.