

MEMS0040 –Manufacturing Processes and Analysis

Course Syllabus

Catalog Description

This is an undergraduate course in manufacturing processes and analysis. Learn the technologies used to manufacture products we use every day, and the fundamental principles required to take processes to scale. Topics include: manufacturing properties, casting, metal forming, machining, advanced machining, 3D printing, particulate processing (polymer processing, ceramic/glass forming and powder metallurgy), heat treatment, welding, and quality assurance.

Prerequisite: Materials Structures-Properties. 3 credit hours.

Mode of Delivery On Campus

Workload 3 hours of lectures/tutorials and 8 hours of private study per week.

Prerequisites ENGR 0022

Campus Zone 3 Room 104

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Teaching Assistant

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ACADEMIC OVERVIEW

Course Goals

- Learn the fundamentals and applications of a variety of manufacturing processes involving different formation physics and materials.
- Apply quantitative and qualitative analysis to assess process performance and enable process selection.
- Learn how to estimate the cost of a manufacturing process versus production volume, and how design and process choices influence cost.
- To gain proficiency in communication through written and oral reports.
- To practice solving problems through teamwork.

Teaching and Learning Method

The unit consists of lectures and problem classes. Learning in the unit is mainly through attending the lectures, problem classes and completing the assignments and field trip reports.

Textbook

1. *Manufacturing Engineering and Technology*, 7th ed, by Serope Kalpakjian Steven R Schmid (published by McGraw Hill).
2. *Fundamentals of modern manufacturing*_4th ed by MP Groover

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.

Topical Coverage

Week	Topic	Chapter
1	Manufacturing Properties and Process Planning	1,2
2	Fundamentals of Casting	10
3	Casting Processes	11
4	Casting Analysis (Experiment Report/Group Presentation)	12
5	Fundamentals of Metal Forming	13,14
6	Rolling, Forging and Sheet-metal Forming	15,16
7	Fundamentals of Machining	21
8	Machining Processes: Turning, Milling	23,24
9	Abrasive Machining and Finishing Operations	26
10	Field Trip of Manufacturing Operations	1-40
11	Advanced Machining Processes and 3D Printing	27,20
12	Polymer Processing, Glass Forming and Powder Metallurgy	17,18,19
13	Heat Treatments	4
14	Fundamentals of Welding	30
15	Welding Operations	31
16	Variation and Quality	36

Grading Policy

Assessment Task Value

1. Attendance and Answer Questions in Class 5 %
2. Homework 25 %
3. Mid-Semester Examination 20 %
4. Group Presentation 10 %
5. Field Trip Report 10 %
6. Final Examination 30 %

The instructor reserves the right to moderate the assessment policy. This process may occur at the end of the semester.

Prepared by: Ruifei Hu, Yanyan Li

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