

Mechanical Engineering and Mechanics
MEM438 MANUFACTURING PROCESSES II

Winter 2006-2007

Course (catalog) description

This course is a continuation of manufacturing processes I, and will introduce advanced manufacturing processes to students. The course is a combined lecture and laboratory teaching. The course will cover Concurrent Engineering and Computer Integrated manufacturing System; Bulk Deformation Processes for Forging, Rolling and Extrusion; Sheet Metal Forming processes; Grinding processes and Electrical-Discharge Machining; Fabrication of Microelectronic and Micromechanical Devices; and Powder Metallurgy. Three hands-on lab projects will be assigned to student teams, they are: 1. Electric discharge machine programming and operation; 2. Precision Instrumentation and Metrology using Program Controllable 3D Coordinate Measuring Machine; and 3. Integrated Concurrent and Reverse Engineering using Laser Scanner..

Prerequisite(s)

MEM 220 Basic Fluid Mechanics, MEM 230 Mechanics of Materials I

Textbook(s) and/or other required material

Required : "Manufacturing Processes for Engineering Materials," Forth Edition, Serope Kalpakjian and Steven Schmid, Prentice Hall, 2003.

Reference Texts: "*Fundamentals of Modern Manufacturing*," *Second Edition*, Mikell Groover, John Wiley & Sons, 2003.

Course Objectives

1. Understanding the Concurrent Engineering and Computer Integrated Manufacturing System including its advantages, methodology and real applications.
2. Know the equipment, methodology and applications of Reverse Engineering and Computer Integrated Manufacturing System.
3. Understanding Material Remove Processes: Abrasive and Grinding, and Electrical Discharge Machining (EDM) processes including their general principles, characters and basic calculations.
4. Familiar with bulk deformation processes, especially forging process including analysis methods and stress distribution and force equations.
5. Acquire fundamentals of sheet metal forming processes including sheet metal characteristics and shearing and bending methods.
6. Understanding properties and processing of metal powders including metal powder production, compaction and sintering.
7. Acquire basics of Fabrication of Microelectronic and Micromechanical Devices, their main characters and applications.

Topics Covered

1. Concurrent Engineering and Computer Integrated Manufacturing System I
2. Reverse Engineering and Computer Integrated Manufacturing System II, and Laser Based Reverse Engineering Project Assignment
3. Material Remove Processes: Abrasive and Grinding, Electrical Discharge Machining (EDM), Programming and EDM Lab project assignment
4. Bulk Deformation Processes-Forging, Rolling & Extrusion
5. Sheet Metal Forming Processes
6. Powder Metallurgy
7. Fabrication of Microelectronic and Micromechanical Devices

Class/laboratory schedule, i.e., number of sessions each week and duration of each session

Three hour lectures, once a week, and additional three labs

Contribution to Professional Component

The course builds upon the principles learned in MEM 220 Basic Fluid Mechanics, MEM 230 Mechanics of Materials I and MEM437 as their professional course. The knowledge taught in MEM 438 can be used by students in their capstone senior design project, and future engineering career.

RELATION TO ABET CRITERIA 3 OUTCOMES:

0 = No content; 1 = Some content; 2 = Significant content

Outcomes a - k	Content	Explanation	Evidence*
a. An ability to apply knowledge of mathematics, science and engineering	2	This course requires the students to develop a general understanding of materials and its processing and manufacturing technologies. The students learn how to apply and synthesize their knowledge of mathematics, science, and engineering.	Homework, team projects and Exams
b. An ability to design and conduct experiments as well as to analyze and interpret data	2	Students have three experimental labs and need to write lab report and deal with various data.	Lab reports.
c. An ability to design a system, component or process to meet desired needs	1	The assigned design problems are always required to meet societal and industrial needs.	Homework, projects and text book
d. An ability to function on multidisciplinary teams	0	NA	NA
e. An ability to identify, formulate and solve engineering problems	2	The homework problems and exams require students to identify, formulate and solve engineering problems.	Homework, exams,
f. An understanding of professional and ethical responsibility	1	This is emphasized as part of the engineer's overall responsibility.	Classroom discussion; text book
g. An ability to communicate effectively	0	Students need to answer questions in the class, write project reports, discuss in the team projects	Lecture, Team project discussion and report
h. The broad education necessary to understand the impact of engineering solutions in a global/societal context	1	The impact of engineering design and manufacturing on the economy and society are covered.	Classroom discussion, text book
i. A recognition of the need for and an ability to engage in lifelong learning	0	NA	
j. A knowledge of contemporary issues	0	NA	
k. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice	1	Students can use computer aided design, manufacturing and analysis software to solve design and engineering analysis problems.	Homework, exam and projects

Prepared by: Jack Zhou 05/14/2007