

Course Proposal: MET 490/IT 490 Micro and Nano Manufacturing

Initial offering: Spring 2004 requested

Instructor: Dr. Mark Jackson

Pattern: Class 3, Credit 3.

Course Description:

Nano manufacturing, silicon micro machining and fabrication, laser materials processing of microstructures, abrasive micro machining, mechanical micro machining, micro rapid prototyping and sintering, case studies. Pre-requisites: MET 141, MET 242.

An open-ended manufacturing project will be completed as part of course requirements.

Proposed Core Learning Objectives:

Upon completion of this course, the student will be able to:

1. Analyze nano manufacturing processes as bottom-up and top-down processes.
2. Understand rapid micro manufacturing processes and how computer aided design principles can contribute to producing layered microstructures.
3. Analyze and apply laser-based manufacturing processes at the micro scale.
4. Understand how micro abrasive and mechanical micro manufacturing techniques can produce robust micro components for use in complex machine systems.
5. Review case studies of manufactured micro components and systems.

Text:

Fundamentals of Microfabrication, by Marc Madou, published by CRC Press, 2002.

References:

MEMS & MICROSYSTEMS – Design and Manufacture, by Tai-Ran Hsu, published by McGraw-Hill, 2002.

MEMS Handbook, Edited by Mohammed Gad el-Hak, CRC Press, 2002.

Tentative Syllabus:

Day	Topic	Reading Assignment
1	Introduction	Chapter 7
2	T1 Nano Manufacturing	Chapter 7
3	T1 Nano Manufacturing/fabrication	
4	T2 Microcasting/Micromolding	Handout
5	T2 Micro Stereolithography	Handout
6	T2 Micro Stereolithography	Chapter 1
7	T3 Selective laser sintering	Chapter 1
8	T3 Selective laser sintering	Chapter 1
9	T4 Micro S.L.S.	
10	T3 Micro Shape Deposition Modelling	Chapter 1
11	T2 Rapid Micromanufacturing	
12	T5 Bulk Micromanufacturing	Chapter 4
13	T5 Surface Micromachining	Chapter 5
14	T6 LIGA Processes	Chapter 6
15	T6 Photolithography	Chapter 1
16	T7 Chemical Vapor Deposition	Chapter 1
17	T7 Physical Vapor Deposition	Chapter 2
18	T5 Silicon Micromachining	Chapter 5
19	T5 Wet and Dry Etching	Chapter 4 and 5
20	T9 Diamond Microgrinding	
21	T9 Mechanical Micro Machining	Handout
22	T9 Abrasive Microgrinding	Handout
23	T8 Laser micro machining	Handout
24	T9 Ultrasonic micromachining	
25	T9 Electrochemical micromachining	
26	T9 Electron beam micromachining	
27	T8 High Resolution lithography	Handout
28	T10 Manufacturing Case Studies	Chapter 9 and 10
29	T10 Manufacturing Case Studies	Chapter 9 and 10
	Plus 3 hour exams and a comprehensive final	