

**MIAMI UNIVERSITY  
SCHOOL OF APPLIED SCIENCE  
DEPARTMENT OF ENGINEERING TECHNOLOGY  
COMPUTER-AIDED MANUFACTURING I**

**ENT 152**

**3**

**DESCRIPTION:**

An introduction to manufacturing processes and the use of the computer as a tool in those processes. Students will be introduced to computer numerical control programming, statistical process control, and related manufacturing technologies. Co-requisites: MTH 125 (Pre-Calculus) Periods per week: 2 lectures, 1 laboratory

**GENERAL OBJECTIVES:**

Upon completion of this course the student should be able to:

- ◆ Demonstrate a working knowledge of good safety procedures
- ◆ Use simple linear machine shop measuring devices.
- ◆ Apply basic SPC techniques to a manufacturing process.
- ◆ Use empirical data about materials to select input parameters for manufacturing processes.
- ◆ Operate a lathe and a mill to make simple parts.
- ◆ Identify and explain some of the processes used in the manufacture of parts and identify and explain various joining and assembly methods/processes.
- ◆ Identify fundamental principles of nano manufacturing.
- ◆ Write CNC programs for lathes to manufacture parts.
- ◆ Use personal computers and software.

This course is used to assess the following outcome for Mechanical Engineering Technology:

**Outcome 4** - Fundamental knowledge of modern manufacturing methods, especially in the areas of machining, quality control, and process control.

**TOPICAL OUTLINE:**

<b>WEEK</b>	<b>TOPIC</b>	<b>CHAPTERS</b>
1	Introduction, Safety and Measurement Tech	1,9
2-5	Testing, Inspection and SPC	10,36
6-11	Machine Tools and Processes	20-25
11-12	Joining Processes and Adhesives	27, 29,30, 34
13-15	Nano Technology, CNC Programming	26, Handouts

All areas will be supplemented with handouts.

**TEXT and SUPPORTING MATERIAL:**

DeGarmo's Materials & Processes in Manufacturing 10<sup>th</sup> edition ISBN: 978-0470-05512-0  
Black and Kohser (Macmillan, 10th ed., 2007)  
Blackboard, Various Handouts, Video tapes on manufacturing, Internet

**METHOD OF PRESENTATION:**

Class lectures, videotapes, laboratory, recitation, and demonstrations.

**METHOD OF EVALUATION:**

- 3 Tests at 100 points each.
- 2 Lab assignments/Formal Reports at 20 points each. Formal lab reports **must** be submitted using appropriate software (e.g., word processing, spreadsheets, CAD, etc.) and follow the format provided under Handouts.
- 1 Case at 10 points. Case **must** be submitted using appropriate software (e.g., word processing, spreadsheets, CAD, etc.) and follow the format provided under Handouts.
- 1 Final Exam at 100 points.
- Homework/worksheets at 5 points each. Homework is expected one week after assigned and no later than the test covering that homework.

Grades will be calculated as follows: Start by taking the highest points possible averaged with the highest points earned in the class. This average is then broken into four, grade cut off ranges: A is 90%; B is 80%; c is 70%; and D is 60%

**Miami University**  
**Department of Engineering Technology**  
**Computer Aided Manufacturing I**  
**Reading and Homework Assignments**

Week	Discussions, Lecture Topics, and Laboratory Activities	Reading	Problems(HW) and Projects
1	Introductions and Expectations Review of Syllabus, web sites, IVDL, etc. What is manufacturing?; Examine/discuss how things are made...; What are costs of manufacturing?; Manufacturing is a value added process—WHY?; Types of manufacturing shops, characteristics, applications, products. Examine various manufacturing processes such as forging, casting, forming, etc. and the products/parts that can be made.	Ch 1	Ch1 #1,2, Internet assignment (oral presentations and site summary report)
2	Review/Questions Internet presentations; Product life cycle; Basic manufacturing processes classified; Schematics of basic processes; Levels of automation and manufacturing planning	Ch 9	Ch9 #1,2, Case Study p.212 (Select only one product from the list or of your own choosing.)
3	Review/Questions Overview of Ch 9 Ch 10—Measurement and quality Mass production; interchangeable parts; Standardization of sizes and shapes; Inspection/QC are important to make it work.; Attributes vs Variable type inspection; Units of measure; Allowance and tolerance Measuring instruments, gages, gage blocks, attribute gages, etc. Measurement lab	Ch 10	Ch10 #1,2,6,7,12,13,14,15 Units conversion WS Class of Fit WS Micrometers WS
4	Review/Questions Class of fit; Understanding variation—6 sigma; Precision vs accuracy; G.D.&T.; Finish Ch 10; Surface finish—see chart in book; Also see sample surface finish guide.; Ch 10—testing Non-destructive an destructive—applications, example, GE Video—Measuring and instruments. Finish Measurement lab	Ch 10	<b>Test 1</b> SPC Lab Project assigned. Begin preparing for Wire-cutting lab. Work on Torque WS

5	Review/Questions. Review Test 1. Ch 36; SPC Handouts; Process Capability and Quality Control; Variation—Common/natural or assignable/special; Process capability—how done Cp, Cpk, etc. How and why to perform a PC study; What to do with the results of the PC study; Preparing X-bar and R charts.; Using Excel for SPC Perform Wire-cutting lab	Ch 36 and Handouts	Ch 36 #4,5,6 SPC Lab Project—be prepared to cut wire
6	Review/Questions How to interpret X-bar and R charts. Why it works this way. Understanding the applications of control charts. Understanding Cp and Cpk; Pareto Charts; Finish Ch 36 and SPC Handout	Ch 36 and handouts	Excel lab using Torque WS Finish analysis and write-up of Wire-cutting lab Finish Ch 36
7	Review/Questions Begin discussing Material removal processes—Ch 20-22 Machining lab handout; Lathe video	Ch 20	Ch20 #1,3,4,5; Ch 22 #1,2,3,5,8 Begin Machining Project ;Turn-in all HW in support of test 2
8	Review/Questions Material removal processes handout on turning; Continue to discuss Ch 20,21,22	Ch 20-22	<b>Test 2</b> Turn-in all HW in support of test 2
10	Review/Questions; Review Test 2 Continue discussing Material removal processes handout; Discuss Ch 22, 23; Machining lab handout; Mill video; Drilling/Hole Making video	Ch 23-24	Ch23 #1,2,3,4,5; Ch 24 #1,2,3,4,8 Begin Machining Lab Turning WS
11	Review/Questions Continue discussing Material removal processes handout Discuss Ch 23, 24; and 27.	Ch 24	Finish Machining Lab Review for Test 3
12	Review/Questions Discuss Break-even; shaping, planning, etc; threading, joining, adhesives; Threading video.	Ch 27, 29, 30, 34	<b>Test 3</b> Ch 27 #1,5,7; Ch 29 #1; Ch 30 #1; Ch 34 #1 Turn-in Machining Lab—formal report and all HW in support of Test 3
13	Review/Questions Review Test 3 Nano technology; Nano manufacturing ; Nano assembly.	Handouts	Handouts and videos.
14*	Review/Questions Handout on CNC machining. Handout/discuss worksheets in support of CNC Begin CNC programming	Ch 26 Handouts	Ch 26 #1 – 6 CNC Lathe worksheets (time permitting)
15*	Review/Questions Continue discussion of Handout on CNC machining Handout/discuss worksheets in support of CNC Continue CNC programming	Handouts	Finish CNC Worksheets(time permitting) Finish CNC lab(time permitting)
16			Final Exam