



THE COLLEGE OF PROFESSIONAL STUDIES and APPLIED SCIENCE  
DEPARTMENT OF ENGINEERING TECHNOLOGY  
COMPUTER-AIDED MANUFACTURING I

ENT 152

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**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 also meets the following Ohio Board of Regents' Essential Outcomes for OET 010:

1. Demonstrate an understanding of the interrelationships between material properties and manufacturing processes.
2. Distinguish between different manufacturing processes such as forgings, extrusions, castings, forming, and finishing.
3. Distinguish between different fabrication processes such as welding, fasteners, and adhesives.
4. Apply empirical data to determine speeds and feeds to optimize production efficiencies.
5. Demonstrate appropriate safety procedures and methods in a manufacturing setting. (Labs)
6. Demonstrate proficiency in the use of measurement instrument. (Measurement Lab and others)
7. Tour manufacturing facilities. (Videos)

This course teaches/emphasizes the following graduate characteristics:

- Apply Principles of Math and Physics
- Use of Computers
- Effective Communication
- Critical Thinking
- Leadership and Team Work
- Continue Higher Education
- Pursue Life-long Learning

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:**

WEEK	TOPIC	CHAPTERS
1	Introduction, Safety and Measurement Tech	1,2
2-5	Testing, Inspection and SPC	10,35,36
6-11	Machine Tools and Processes	20-28
11-12	Joining Processes and Adhesives	30-34 supplemental
13-15	Nano Technology, CNC Programming	38, 40, Handouts

All areas will be supplemented with handouts.

**TEXT and SUPPORTING MATERIAL:**

DeGarmo’s Materials & Processes in Manufacturing 11<sup>th</sup> edition ISBN: 978-0-470-92467-9

Black and Kohser (Macmillan, 11th ed., 2012)

Niihka, Various Handouts, Video tapes on manufacturing, Internet

[http://www.meteconline.org/engineering\\_information.php](http://www.meteconline.org/engineering_information.php)

[www.wiley.com/college/degarmo](http://www.wiley.com/college/degarmo)

[www.mmsonline.com](http://www.mmsonline.com)

[www.pqsystems.com](http://www.pqsystems.com)

[www.superfactory.com](http://www.superfactory.com)

[www.isixsigma.com](http://www.isixsigma.com)

[www.mamtc.com](http://www.mamtc.com)

<http://manufacturing.stanford.edu>

<http://labwrite.ncsu.edu/www/>

[www.sme.org](http://www.sme.org)

<http://www.matweb.com/search/searchproperty.asp>

[www.asq.org](http://www.asq.org)

[www.nano4me.org](http://www.nano4me.org)

<http://www.itl.nist.gov/div898/handbook/index.htm>

<http://roger.phy.unp.ac.za/frames/Programme2000/Physics/OnlineExercises/Vernier10/Vernier.html>

**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.

ENT Department Standard for awarding letter grades: Each faculty member will use the following scale in assigning letter grades in their courses, with the following allowances:

- the end (or ends) of any range can be adjusted by 1 point (+/-)
- the assignment of the D- or F may deviate by a few points (2-3) from the values shown
- faculty may elect to not use +/- grades

A+	A	A-	B+	B	B-8	C+	C	C-	D+	D	D-	FAIL
98-100	94-97	90-93	87-89	84-86	80-83	77-79	74-76	70-73	67-69	64-66	60-63	0-59

For this course, 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%. +/- grades are generally not used by me.

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

<b>Week</b>	<b>Discussions, Lecture Topics, and Laboratory Activities</b>	<b>Reading</b>	<b>Problems(HW) and Projects</b>
1	<p>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.</p>	Ch 1	Ch1 #1,2, Focus on how products are made. What processes are used to make various products. NOTE: FOR ALL CHAPTERS DO THE PROBLEMS NOT REVIEW QUESTIONS. History of Assembly Line and History of Machine Tools worksheets.
2	<p>Review/Questions  Internet presentations; Product life cycle; Basic manufacturing processes classified; Schematics of basic processes; manufacturing planning; manufacturing systems; characteristics of shop types.</p>	Ch 2	Ch2 # 2
3	<p>Review/Questions Overview of Ch 1 and 2; Chapter 10—Material selection; approaches to material selection; environmental and manufacturing concerns. Effect of product liability on material selection. Introduce measurement lab.</p>	Ch 10	Ch10 #1; Case Study Chapter 10 Formal Case analysis
4	<p>Review/Questions  Ch 35—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  Class of fit; Understanding variation—6 sigma; Precision vs accuracy; G.D.&amp;T.; Video—Measuring and instruments. Finish Measurement lab</p>	Ch 35	<p><b>Test #1</b>  Ch35 #1,2,6,7,9,10  Units conversion WS  Class of Fit WS  Measurement WS</p>
5	<p>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</p>	Ch 36 and Handouts	Ch 36 #6 SPC Lab Project—be prepared to cut wire
6	<p>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</p>	Ch 36 and handouts	Excel lab using Torque WS Finish analysis and write-up of SPC (wire-cutting) lab Finish Ch 36
7	<p>Review/Questions  Begin discussing Material removal processes—Ch 20-22  Machining lab handout; Lathe video</p>	Ch 20-22	Ch20 #1; Ch 22 #1,2,3,5,15 Begin Machining Project; Turn-in all HW in support of test 2
8	<p>Review/Questions  Material removal processes handout on turning; Continue to discuss Ch 20,21,22</p>	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 23,24; Machining lab handout; Mill video; Drilling/Hole Making video	Ch 23-24	Ch23 #1,2,3; Ch 24 #1,2,3,4,8 Begin Machining Lab Turning WS
11	Review/Questions Continue discussing Material removal processes handout Discuss Ch 23 and 24.	Ch 24	Finish Machining Lab Review for Test 3; Milling WS
12	Review/Questions Discuss Ch 25, 26, 27, and 28 Discuss more on Break-even; shaping, planning, etc; threading, joining, adhesives; Threading video. Read Ch 30-34 as supplemental material.	Ch 25, 26, 27, 28	<b>Test 3</b> Ch 25 #1; Ch 26 #3; Ch 27 #1; Ch 28 #1—Review question 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.	Ch 38 and Handouts	Ch 38#16—Review question. Handouts and videos.
14*	Review/Questions Handout on CNC machining. Handout/discuss worksheets in support of CNC Begin CNC programming	Ch 40 Handouts	Ch 40 #1 – 5 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

**\*Weeks 14 and 15 may include more coverage on Nano Technology and reduced coverage on CNC.**

**Schedule notes:**

Thursday, February 13, 2014 is last day to drop without a grade.

Monday, April 7, 2014 is last day to drop a course with a “W”.

March 24-30, 2014 Spring Break

Monday, May 12, 2014 final exams begin

See <http://www.units.muohio.edu/reg/calendars/index.php> for additional dates and verification of these dates.

**Ethics and Academic Conduct**

It is expected that all members of the Department of Engineering Technology (faculty, staff and students) will adhere to the highest ethical standards in all matters. The Department endorses the Code of Ethics for Engineers proposed by the National Society of Professional Engineers (<http://www.nspe.org/resources/ethics/code-ethics>) and strongly defends the rights and responsibilities that accompany academic freedom which are at the heart of the intellectual integrity of Miami University.

It is expected that students will actively conduct themselves in an ethical fashion, for example, by only possessing and using materials authorized by the instructor during examinations, submitting assignments which are the student’s original work (carefully referencing sources of information), protecting the integrity of assignments by adhering to prescribed procedures, and carefully utilizing the University’s educational resources of materials and equipment.

Any activity that tends to compromise the academic integrity of the institution or subvert the educational process is defined as academic misconduct. Cheating and other forms of academic misconduct undermine the value of a Miami education for everyone, especially for the person who cheats.

The ENT department regards the adhering to academic ethical standards as a very serious issue and will follow the procedures and penalties for academic misconduct (dishonesty) as prescribed in Part V of The Student Handbook, pp. 10-12.

### **Miami University Learning Community**

Miami University is committed to fostering a supportive learning environment for all students irrespective of individual differences in gender, race, national origin, religion, handicapping condition, sexual preference, or age. Students should expect, and help create, a learning environment free from all forms of prejudice. Disparaging comments, sexist or racist humor, or questioning the academic commitment of students based upon these individual differences are behaviors that undermine our learning community. If such behaviors occur in class, please seek the assistance of your instructor or department chair.

### **University Statement Asserting Respect for Human Diversity**

Miami University is a multicultural community of diverse racial, ethnic, and class backgrounds, national origins, religious and political beliefs, physical abilities, ages, genders, and sexual orientations. Our educational activities and everyday interactions are enriched by our acceptance of one another; and, as members of the University community, we strive to learn from each other in an atmosphere of positive engagement and mutual respect.

Because of the necessity to maintain this atmosphere, bigotry will not go unchallenged within this community. We will strive to educate each other on the existence and effects of racism, sexism, ageism, homophobia, religious intolerance, and other forms of invidious prejudice. When such prejudice results in physical or psychological abuse, harassment, intimidation, or violence against persons or property, we will not tolerate such behavior nor will we accept jest, ignorance, or substance abuse as an excuse, reason, or rationale for it.

All who work, live, study, and teach in the Miami community should be committed to these principles which are an integral part of Miami's focus, goals, and mission.

Students with disabilities are encouraged to register with the Disability Service Office in order that academic accommodations can be made.

### **Basic Computing Skills**

Incoming students to Miami University are expected to demonstrate minimum proficiencies with a personal computer, including using the Internet, sending email with attachments, basic word processing and file management. Need help in obtaining these skills? Check out CSE, CIT, and BTE courses. If you need assistance, please contact the Middletown Campus Computer Center lower level of library or Hamilton Campus Computer Center (3<sup>rd</sup> floor Mosler Hall)

### **Expectations—I expect you to:**

- Be prepared for class (do the reading, HW, etc.)
- Be on time and at every class meeting
- Complete all HW and turn-in on time
- Turn off beepers, cell phones, and other noise making devices
- Follow the provided format for all formal lab reports and case studies (see Niihka)

### **ROB SPECKERT ([speckere@miamioh.edu](mailto:speckere@miamioh.edu))**

Hamilton Office: 207C Phelps Hall, 785-1810 M,T, Th Mfg Lab 100PHE 785-3216

I encourage you to periodically visit with me throughout the semester. This can be done prior, during, or after class, or other times as needed. Your team should visit with me at least once prior to each presentation.

Updated: January 14, 2014 Subject to change as needed.