

MIAMI UNIVERSITY
SCHOOL OF APPLIED SCIENCE
DEPARTMENT OF ENGINEERING TECHNOLOGY

ENT 252

COMPUTER-AIDED MANUFACTURING II

3

DESCRIPTION:

This course covers the topics related to the "Automated Factory" including: Computer Numerical Control and Computer-Assisted Part Programming (CNC and APT), Distributive Numerical Control (DNC), Computer-Assisted Process Planning, Flexible Manufacturing Systems and Robotics.

Periods per week: 2 lectures, 1 laboratory

Prerequisites: ENT 152

Recommended Pre-/Co-requisites: MTH 151 and CSA 163 or CSA 153

GENERAL OBJECTIVES:

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

- Demonstrate knowledge of good safety practices.
- Develop programs for CNC lathes and mills using manual programming techniques.
- Develop programs for CNC lathes and mills using computer-assisted techniques.
- Discuss and evaluate the applications of adaptive control and cnc machining systems.
- Identify robot types, applications and operating envelopes.
- Discuss and evaluate the equipment, philosophy and applications of flexible manufacturing systems.
- Use computer programs related to manufacturing.

The following table shows the graduate characteristics this course teaches/emphasizes:

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	PRIMARY CHAPTERS	SECONDARY CHAPTERS
1	Introduction, safety, CNC programming	1 (review) ,26 CIMTEXT.DOC	30
2-9	CNC programming continued	CIMTEXT.DOC	
9-11	Computer-assisted part programming Computer aided manufacturing	CIMTEXT.DOC Handouts	34

11	Manufacturing Systems	37	35
12	DNC, Adaptive control	Handouts	39
13-14	Robotics	37-38	
14-15	Production Systems	38	

All areas will be supplemented with handouts. See Blackboard.

TEXT and SUPPORTING MATERIAL:

DeGarmo's Materials and Processes in Manufacturing ISBN: 978-0470-05512-0

Black, Kohser (Macmillan, 10th ed., 2008)

CIMTEXT.DOC along with various handouts.

Video tapes on Lathes, Mills, Robots, CIM, FMS etc.

Help with Windows, Excel, Word available in computer center

Blackboard contains all course

materials)

<http://www.ent.muohio.edu>

www.wiley.com/college/degarmo

www.pqsystems.com

www.isixsigma.com

www.bobcadcam.com

<http://manufacturing.stanford.edu>

www.mmsonline.com

www.superfactory.com

www.sme.org

www.asq.org

www.mamtc.com

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

METHOD OF PRESENTATION:

Class lectures, video tapes, laboratory and demonstrations.

METHOD OF EVALUATION:

Exams, homework, lab reports, computer projects, and term paper/project.

Approximate Weights:

Exams 60%

Labs, Programs, and Project 30%

Homework 10%

- 2 Tests at 100 points each and a comprehensive final exam at 100 points
- 3 Lab assignments/Formal Reports at 20 points each (15 for report and 5 for running it). Formal lab reports must be submitted using appropriate software (e.g., word processing, spreadsheets, CAD, etc.)
- 1 Case at 10 points. Case must be submitted using appropriate software (i.e., word processing and spreadsheets)
- 1 Term Project at 100 points (5 proposal; 20 mid-term presentation; 75 final project/presentation)
- Homework, worksheets, and CNC programs at 5 points each. These are to be turned in 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%

NOTE: Term paper/presentation/project will be discussed in class. More details will follow. This outline is subject to change.

Project

This project is meant to enhance the learning of the material presented in the classroom. This project must be selected by your team by the fifth week of classes. At that time, submit a paragraph describing your team's project.

- Teams will consist of 2-3 members.
- Your team project grade is approximately equal in weight to one test.
- Project reports (term papers) are to be printed from a wordprocessor and are expected to be 5-10 pages plus attachments. All teams are required to submit a written report. Attachments should include graphs, charts, and drawings (done with ACAD, EXCEL, etc.). Program listings should also be included here. Papers **must** include a bibliography and proper references--including at least one periodical reference and one Internet reference. All teams are required to submit a formal report/paper.
- Team based multimedia oral presentations will occur on the 8th week and 15th week of the semester. Also submit written reports.

Projects will be selected from the following:

- Design and manufacture grippers for one of the robots in 103 Phelps—Hamilton campus. Program the robot to perform the task for which the grippers were designed.
- ACAD to CNC or BOB CAD-CAM to CNC, or ACAD to BOB CAD-CAM to CNC, or Solid Edge to BOB CAD-CAM to CNC
- CNC Canned Cycles
- Others...?

Miami University
Department of Engineering Technology
Computer Aided Manufacturing II
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. CIMTEXT.DOC History of NC/CNC, CNC Operation, Stepping Motors. Measurement and Gaging Video	Ch 1,26	Ch 26 1,2,4,5 Also, work Problem 6 as a Case Study—Formal Case Report--Excel required. Begin planning term project
2	Review/Questions Set Point, Machine zero, Abs/Inc programming, Program formats; ASCII Code; Sample incremental program Lathe video.	CIMTEXT. DOC	Abs/Inc WS; ASCII Code WS Stepping Motors WS CNC Inc Program in class Term project written proposal required.
3	Review/Questions Program storage (bits, bytes, etc.) Number systems (decimal, binary, octal, hexadecimal). Absolute sample program	CIMTEXT. DOC	ASCII Code WS CNC Programs as HW Plan for CNC Lathe lab
4	Review/Questions Other programming methods; tooling; tool changes; tool compensation. Drilling video.	CIMTEXT. DOC	CNC Programs CNC Lathe Lab—formal lab report required
5	Review/Questions More CNC programming and applications. Tool compensation continued. Mill video.	CIMTEXT. DOC	Test 1 Finish CNC Lathe lab Plan for CNC Mill Lab
6	Review/Questions; Review Test 1 Milling. More on tool compensation; arc programming methods including partial arcs	CIMTEXT. DOC	Mill Topics WS CNC Milling Lab Project CNC milling worksheets
7	Review/Questions Milling continued	CIMTEXT. DOC	CNC Milling Lab Project
8	Review/Questions Continue lab work on milling and term project	CIMTEXT. DOC	Complete Milling Lab Project Mid-term project updates (oral and written report required)
9	Manual CNC Programming completed. Begin discussing other methods (APT, CAD/CAM, etc.) Introduction to Bob CAD-CAM.Using Bob CAD-CAM to generate part programs	CIMTEXT. DOC and Bob-CAD- CAM web site.	Review sample test 2 Finish CNC Milling Lab Project Begin planning CAD/CAM Lab Project
10	CAD/CAD Programming	CIMTEXT. DOC and Bob-CAD- CAM web site.	Test 2 CAD/CAM Lab Project Work on term project
11	Manufacturing and Production Systems Classifications and Introduction to Lean Manufacturing	Ch 37-38 and handouts	CAD/CAM Lab Project
12	DNC, Adaptive control	Ch 37-38 and handouts	CAD/CAM Lab Project Adaptive control worksheet Ch 42 1 from 9 th edition to be handed out. Work on term project
13	Robotics	Ch 37-38 and handouts	Robotics worksheets. Term project.
14	Lean Manufacturing	Ch 37-38 and handouts	Ch 43 4 from 9 th edition to be handed out. Complete term project.

15	Term project presentations		Term project presentations (oral and written report required) Review sample final.
16	Final Exam		Final Exam

Also worth reading—Chapter 30, 34, 35, and 39

All cases, formal labs, and term projects must be printed from a word processor; graphs, charts and drawings must be done using computer software; and all cases and reports must follow the format provided on Blackboard under Handouts. Homework and worksheets are normally due one week after assigned but NO LATER than the day of the test covering the material.

Schedule notes:

Monday, September 1, 2008 is Labor Day—no classes

Monday, September 15, 2008 is Last Day to Drop a Course w/out Grade (full-term courses)

Tuesday, October 31, 2008 is Last Day to Drop Course with a W (full-term courses)

Monday, December 15, 2008 final exams begin

See your schedule booklet 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/ethics/eh1-code.asp>) 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.

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 these courses and resources -- CSA101 Computing Skills: Getting Started, Computing Skills: Using the Internet, BTE181 Computers and Business, SmartForce computer-based training, and Computer Center workshops. If you need assistance, please contact the Middletown Computer Center (Room 6 Gardner-Harvey) or the Hamilton Computer Center (3rd 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
- Turn off beepers, cell phones, and other noise making devices
- Complete all HW and turn-in on time
- Follow the provided format for all formal lab reports and case studies (see BlackBoard)

ROB SPECKERT (speckere@muohio.edu)

Hamilton Office: 207C Phelps Hall, 785-1810 T,W

Mfg Lab 100PHE 785-3216

Middletown Office: 109Johnston Hall, 727-3244 R

Mfg Lab 8 THH 727-4010

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.

(E252Syllabus--REVISED Fall 2008 subject to change as needed)