

**MIAMI UNIVERSITY
SCHOOL OF APPLIED SCIENCE
DEPARTMENT OF ENGINEERING TECHNOLOGY**

ENT 252

COMPUTER-AIDED MANUFACTURING II

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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.

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)

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.

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

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.

Prepared by: R. Speckert January 2009