

PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

CNC MILLING
MET 2700

Class Hours: 2.0

Credit Hours: 4.0

Laboratory Hours: 6.0

Revised: Fall 06

Catalog Course Description:

CNC Milling is a state-of-the-art machining course in 3-axis programming and applications. Both manual and computer-assisted methods of part programming will be taught with particular emphasis placed on laboratory projects to enhance "hands-on" operational experience. The course will include such topics as basic codes, absolute/incremental programming, canned cycles, tool data base, post processing, and program transfer.

Entry Level Standards:

Students entering this course should have basic math and writing skills, a working knowledge of WordPerfect or MS Word and AutoCAD, and basic machining skills.

Prerequisites:

MET 1020 & CID 1100

Corequisites:

MET 2310

Textbook(s) and Other Course Materials:

Textbook: *Haas VF-Series Programming & Operations Manual: June 2000.*

References: *Haas Lathe-Series Training Manual*

FeatureCAM User's Guide: Current Version, Engineering Geometry Systems.

FeatureCAM Post Processing Guide: Current Version, Engineering Geometry Systems.

I. Week/Unit/Topic Basis:

Week	Topic
1-2	Machine Set-Up Manual Operation
3-7	MDI Programming
8-14	Computer-Assisted Programming

II. MET Program Objectives & Outcomes:

Objectives:

- I. Apply basic engineering theories and concepts.
- II. Apply basic engineering theories and concepts.
- III. Identify and solve work related problems with minimum assistance.
- IV. Operate equipment and instruments with a high degree of skill.
- V. Communicate effectively, including verbal, writing, and graphical skills.
- VI. Apply the principles of good work ethics.
- VII. Obtain gainful employment in the MET discipline or matriculate to a 4-year program in engineering technology.

Outcomes:

- A. apply the knowledge of mathematics, science, and engineering technology. (I, II, IV, VI)
- B. use the techniques and modern engineering tools needed for engineering technology practices. (I – IV, VI)
- C. identify, formulate, and solve engineering technology-based problems. (I, II, VI)
- D. design and conduct experiments, as well as analyze and interpret collected data. (I– IV, VI)
- E. create or fabricate a system, subsystem, component, or process to meet specified needs. (I – IV, VI)
- F. read and extract information from manuals, journals, and other discipline related literature. (I–IV, VI)
- G. communicate effectively, including verbal, writing, and graphical skills. (IV, V, VI)
- H. function and contribute positively in team situations. (II, IV- VI)
- I. comprehend social, professional, and ethical responsibilities, including development of a respect for diversity and other contemporary issues.(II, V, VI)
- J. realize the impact of engineering technology solutions in a global and societal context. (V, VI)
- K. realize the importance of a commitment to quality, timeliness, and continuous improvement. (V, VI)
- L. recognize the importance of life-long learning.(I – VI)

III. Course Objectives*:

- A. Demonstrate their understanding of the basic principles of CNC milling. (A-C)

- B. Set-up, maintain, and functionally operate machine. (B)
- C. Create and input part program using MDI methods. (A-C)
- D. Create, post-process, and transfer part program using computer-assisted methods. (A-C)
- E. Inspect a part and analyze results. (A-C)
- F. Communicate technical information. (F, G)

*Letters after course objectives reference MET Program Outcomes (as required by ABET).

IV. Instructional Processes*:

Students will:

1. Actively listen to class lectures and participate in class activities that develop and reinforce an understanding of the theories, concepts, principles, and applications of CNC milling. *Communication Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
2. Work individually and in teams to complete lab projects and assignments related to the theories, concepts, principles, and applications covered in the lecture or demonstration portion of the course. *Communication Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
3. Collect, analyze, and tabulate data in an orderly format to prepare a college level technical report using software packages such as AutoCAD, WordPerfect/Word, Excel, Mitutoyo MCAT, and FeatureMILL. *Communication Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
4. Observe class demonstrations on CNC equipment, practice, and then demonstrate to instructor basic manipulative skills required to set-up, operate, and program equipment. *Communication Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
5. Observe class demonstrations on CAM software, practice, and then integrate manipulative and cognitive skills with assimilated knowledge to successfully complete lab projects. *Communication Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
6. Participate in technical meetings, plant tours, and seminars sponsored by local technical societies to increase student knowledge of machining and manufacturing processes and enhance awareness of required job skills and opportunities in industry. *Communication Outcome, Mathematics Outcome, Technological Literacy Outcome, Transitional Strategies, Active Learning Strategies*

*Strategies and outcomes listed after instructional processes reference TBR's goals for strengthening general education knowledge and skills, connecting course work to experiences beyond the classroom, and encouraging students to take active and responsible roles in the educational process.

V. Expectations for Student Performance*:

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

1. Define, explain, and associate the terminology used in CNC milling. A
2. Apply and associate the principles of CNC milling. A
3. Identify all safety hazards associated with CNC milling operations. B
4. Set tool length offsets and part program zero. B
5. Evaluate machining process during cutting operation and adjust settings to achieve maximum results. B
6. Construct part and information drawings. C, D
7. Differentiate absolute and incremental programming. C
8. Construct an MDI program using basic machine readable codes and canned cycles. C
9. Edit an existing program. C, D
10. Create tool data base. C, D
11. Create geometry, define tool paths, input part program information, and verify cutting operation. C, D
12. Post-process and generate a machine readable program. C, D
13. Set-up and initiate a transfer of program. C, D
14. Measure part features using standard gauging or CMM techniques. E
15. Accept/reject/rework parts based on standard or geometric tolerancing. E
16. Relate inspection results to machining process. A, B, E
17. Locate and extract needed information from operational and programming manuals. F
18. Document technical information in a neat and orderly format. F
19. Complete assignments based on oral instructions. F

*Letters after performance expectations reference the course objectives listed above.

VI. Evaluation:

A. Testing Procedures:

Evaluation of both classroom and laboratory work is required in this course. Total evaluation will be based on the following point distribution.

Quizzes (5 Points)

Two or three quizzes will be administered during the course. They will include discussion questions, short answer questions, true/false questions, programming, and problem solving.

B. Laboratory Expectations:

Programming Projects

Project 1: MDI Programming (20 Points)

Project 2: Computer-Assisted Programming (25 Points)

Project 3: Special Project (40 Points)

Guidelines and requirements for each project will be provided by the instructor.

C. Field Work:

N/A

D. Other Evaluation Methods:

Participation (10 Points)

Based on instructor observation during the course, each student will be evaluated on participation activities. Evaluation parameters to include active participation in class discussions, being prepared, efficient use of lab time, striving to achieve more than minimum requirements, and regular attendance.

E. Grading Scale:

Final grade for this course will be based on the following alphabetic/numerical scale.

A 93-100

B+ 88-92

B 83-87

C+ 79-82

C 74-78

D 65-73

F Below 65

VII. Policies:

A. Attendance Policy:

Pellissippi State Technical Community College expects students to attend all scheduled instructional activities. As a minimum, students in all courses must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course (Pellissippi State Catalog).

B. Academic Dishonesty:

Refer to the Pellissippi State Catalog & Handbook.

C. Accommodations for disabilities:

If you need accommodations because of a disability, if you have emergency medical information to share, or if you need special arrangements in case the building must be evacuated, please inform the instructor immediately. Please see the instructor privately after class or in his/her office. Students must present a current accommodation plan from a staff member in Services for Students with Disabilities (SSWD) in order to receive accommodations in this course. Services for Students with Disabilities may be contacted by going to Goins 127 or 131 or by phone: 694-6751(Voice/TTY) or 539-7153.

D. Other Policies:

Make-Up Quizzes: As a general rule, no make-up quizzes will be administered during the course.

Safety and Equipment Abuse: Repeated safety violations will result in a reduction of final grade, at the instructor's discretion. Flagrant violations which result in equipment damage or personal injury will result in automatic failure of the course.

Your instructor is available during posted office hours or by appointment.