Syllabus:
CAD/CAM

Subject Code: 172302
Course Number: GM9002
CIP Code: 48.0501
SOC Code: 51-4041

C-TEC of Licking County
150 Price Road
Newark, Ohio 43055
Instructor:
Bob Bronkar

Instructor Contact:
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Class Meeting Times:
- Monday –Thursday 5:00 p.m. - 10:00 p.m.

Class Location:
- Classroom 729 Lab 729E

Minimum Hours:
- 120 Hours

Course Prerequisites:
- WorkKeys pretesting, copy of High School Diploma or GED
- Blueprint Reading GM9003 OR test out
- CNC Programming and Operations GM9005 OR test out
- Advanced Manual Machining GM9006 OR test out

Required and Recommended Texts and Resources:

Course Description:
Students in this 75 hour course learn how to use Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) programs. Student will learn to draw complex parts on the computer and develop the CNC programs needed to manufacture these parts. Classroom instruction covers the MasterCam Beginner Tutorial. The lab portion of the class consists of projects that use the CAD/CAM program to write the CNC machining programs that will be run on the lathe and the mill.
**Course Objectives/Outcomes**
The course objectives include:

- Preparing students for post-program success, both in the work force and in their educational pursuits.
- Preparing students to process information using higher order thinking skills and to engage in sound decision-making.
- Providing a rich learning environment utilizing research-based methods of instruction, and current resources and materials.
- Maintaining high expectations for all students regardless of educational needs and providing support necessary for achievement.
- Providing a challenging, worthwhile curriculum based on current industry/academic expectations. Specifically and upon successful completion of the program/course for CNC Programming and Operations the students will be able to demonstrate proficiency with:

**Mill Level 1- Getting Started**
1) Starting Mastercam
2) How to use the Graphic User Interface
3) Navigating through Mastercam
4) How to use the Status Bar to set attributes
5) Setting the Toolbar States
6) Setting the Grid

**Mill Level 1- Tutorial #1**
1) Drawing a 2-dimensional drawing
2) Creating toolpaths consisting of:
   a. Facing
   b. Contour
   c. Circle Mill
   d. Spot Drill, Drill & Chamfer
3) Simulating a toolpath using verify and backplot
4) Mill Tutorial #1 Exercise

**Mill Level 1- Tutorial #2**
1) Designing a 2-dimensional drawing with fillets, arcs, and chamfers
2) Creating a toolpath with:
   a. Slot Mill
   b. 2D Dynamic Mill
   c. 2D HS Dynamic Contour Toolpaths & 2 Setups
3) Simulating a toolpath by defining a 3-dimensional block
4) Mill Tutorial #2 Exercise
Mill Level 1- Tutorial #3
   1) Designing a 2-dimensional drawing with fillets, arcs, and chamfers
   2) Creating a toolpath with:
      a. 2D HS Area Mill
      b. Pocket & Pocket Remachining Toolpaths
   3) Mill Tutorial #3 Exercise

Mill Level 1- Tutorial #4
   1) Designing a 2-dimensional drawing with fillets, arcs, and chamfers
   2) Creating a toolpath with Transform Toolpaths
   3) Mill Tutorial #4 Exercise

Lathe Level 1- Getting Started
   1) Graphic User Interface
   2) Navigation of Mastercam
   3) Using the Status Bar
   4) Load Workspace
   5) Setting the Grid

Lathe Level 1- Tutorial #1
   1) Designing a 2-Dimensional Drawing
   2) Creating Toolpaths for Facing, Roughing, and Finishing
   3) Simulating a Toolpath using Verify and Backplot
   4) Lathe Tutorial #1 Exercise

Lathe Level 1- Tutorial #2
   1) Designing a 2-Dimensional Drawing
   2) Creating Toolpaths for Facing, Grooving, and Drill
   3) Simulating a toolpath using verify and backplot
   4) Lathe Tutorial #2 Exercise

Solids Training Getting Started
Solids Training- Tutorial #1
   1) Design 2-D wireframe in the Top Cplane
   2) Creating a Solid using:
      a. Solid Extrude
      b. Create & Cut Body
      c. Chamfer & Fillet
   3) Solids Tutorial #1 Exercise

Solids Training- Tutorial #2
   1) Design 2-D wireframe in the Top and Front Cplane
   2) Creating the Solid using:
      a. Solid Revolve
      b. Cut Extrude
   3) Solids Tutorial #2 Exercise
**Grading:**
Evaluation of student performance is based upon pupil performance objectives relating to course competencies study. The number of competencies mastered and the degree of mastery is translated into appropriate grades consistent with the C-TEC Board of Education policy on grading guidelines, practices, and procedures.

In the process of evaluation, instructors obtain several grades for each student within the time frame of the program/course. These grades may include, but are not limited to, performance on tests, quizzes, homework, assignments, special research projects, classroom participation, lab competency mastery and/or improvement and the demonstration of positive employability traits.

**Journal Summary:** A journal summary should begin with an introductory paragraph that introduces the main topic of the article and summarizes its content. Following the introduction, a several paragraphs should be written detailing insights, implications, and how the information might be applied in your career. In addition, the summary should include your thoughts and opinions concerning the content of the article. Summaries should be approximately 1 1/2 to 2 pages in length.

**Grades:**
1. 8 Tutorial Quizzes and Exercises 50 pts.
2. Final- 30 pts.
3. Project- 20 pts.

**Grade Scale:**
90-100 pts. = A
80-90 = B
70-80 = C
<70 = unacceptable

**Credentialing:**
- With the completion of BOTH Basic and Advanced Manual Machining - NIMS Credential Machining I

**Course Policies:**
- **Disruptive Behavior** – Disruptive behavior of any type is NOT permitted and may result in dismissal from the program. Sleeping during class, tardiness to class, excessive talking during class and disrespectful behavior are examples of disruptive behavior.
• **Plagiarism** – Submitting plagiarized work for an academic requirement is considered academic misconduct. Plagiarism is the representation of another’s work or ideas as one’s own; it includes the unacknowledged word-for-word use and/or paraphrasing of another person’s work, and/or inappropriate unacknowledged use of another person’s ideas.

• **Diversity** - It is the responsibility of the instructor and the students to foster and maintain a harmonious, non-threatening and non-discriminating environment in the classroom. Therefore, all individuals are to be respected as equal and contributing partners of our society.

• **Attendance:** Must maintain at least 90% rate of attendance. You are required to attend all classes. However, you may miss up to 2 classes and still pass the course. Any other absences must be approved by the program supervisor.

**Sequence:**

**Week 1- Beginner Training Tutorial**

Mill Level 1- Getting Started

1) How to use the Graphic User Interface  
2) Navigate through Mastercam  
3) How to use the Status Bar to set attributes  
4) Set the Toolbar States  
5) Setting the Grid

Mill Level 1- Tutorial #1

1) The student will draw a 2-dimensional drawing  
2) The student will create toolpaths consisting of 2 open contours and drill holes  
3) Simulate a toolpath using Verify and Backplot

Mill Level 1- Tutorial #1 Exercise  
Mill Level #1- Tutorial #1 Quiz

Mill Level 1- Tutorial #2

1) Design a 2-dimensional drawing with fillets, arcs, and chamfers  
2) Create a toolpath with facing, contours, and drills  
3) Simulate a toolpath by defining a 3-dimensional block

Mill Level 1- Tutorial #2 Exercise  
Mill Level #1- Tutorial #2 Quiz
Week 2 - Beginner Training Tutorial

Mill Level 1- Tutorial #3

1) The student will draw a 2-dimensional drawing by using polar coordinates
2) The student will create toolpaths consisting of 2 setups
3) Simulate a toolpath using Verify and Backplot

Mill Level 1- Tutorial #3 Exercise
Mill Level #1- Tutorial #3 Quiz

Mill Level 1- Tutorial #4

1) The student will draw a 2-dimensional drawing by ellipses, arcs, and tangents
2) The student will create toolpaths using a high speed core mill
3) Simulate a toolpath using Verify and Backplot

Mill Level 1- Tutorial #4 Exercise
Mill Level #1- Tutorial #4 Quiz

Week 3 - Beginner Training Tutorial

Lathe Level 1- Getting Started

1) Graphic User Interface
2) Navigation of Mastercam
3) Use the Status Bar
4) Toolbar States
5) Setting the Grid
6) Mill Level 1- Tutorial #4 Exercise
7) Mill Level #1- Tutorial #5 Quiz

Lathe Level 1- Tutorial #1

1) The student will design a 2-dimensional drawing
2) The student will create toolpaths for facing, roughing, and finish
3) Simulate a toolpath using Verify and Backplot
4) Exercise and Quiz on tutorial #7

Lathe Level 1- Tutorial #1 Exercise
Lathe Level #1- Tutorial #6 Quiz
Lathe Level 1- Tutorial #2
1) The student will design a 2-dimensional drawing by creating polar lines, parallel lines, and delete construction geometry
2) The student will create toolpaths for facing, grooving, and drill
3) Simulate a toolpath using Verify and Backplot
4) Exercise and Quiz on tutorial #8

Lathe Level 1- Tutorial #2 Exercise
Lathe Level #1- Tutorial #7 Quiz

Week 4- Beginner Training Tutorial

Solids Training- Tutorial #1
1) The student will design 2-D wireframe in the Top Cplane
2) The student will create the solid
3) The student will learn to modify the solid using the solid manager
4) Exercise and Quiz on tutorial #8

Solids Level 1- Tutorial #1 Exercise
Solids Level #1- Tutorial #7 Quiz

Solids Training- Tutorial #2
1) The student will design 2-D wireframe in the Top and Front Cplane
2) The student will create the solid
3) Exercise and Quiz on tutorial #10

Solids Level 1- Tutorial #2 Exercise
Solids Level #1- Tutorial #8 Quiz

Week 5- Beginner Training Tutorial
1) The student will obtain approval for their final project
2) The student will design in Mastercam their final project
3) The student will obtain material for their final project
4) The student will program the toolpath for their final project
5) The student will post the toolpath for their final project
6) The student will machine the needed parts and assemble their final project

Week 6- Beginner Training Tutorial
1) The student will finalize the final project from week 5

Review for Final
Final Exam