**ADVANCED CNC**

 **IMT 155-** **Section: 002**

 **Credit Hours:** 2.00 **Lab Hours:** 2.00 **Lecture Hours:** 3.00

 **IAI Core:** **IAI Majors: PCS: 1.2 Articulated**

 **Semester: Summer** **Course Begins: May 20** **Course Ends: August 5**

 **Days: Tu** **Times: 5:00pm-9:20pm** **Room: Building D Room 167**

**Instructor:** Jerry Miller

**E-mail:** jmiller8140@mchenry.edu

**Phone:** 815-566-2361

**Office Hours:** M, W, F 3pm-7pm

**Required Course:**

 **Textbook(s):** Advanced CNC Mill & Lathe Programming Workbook

 **Supplies (if desired):** Safety Glasses, 2-8gb Flash Drive, 2" 3-ring Binder

**Course Description:**

Advanced CNC provides experience with G-code programming and CNC (Computer Numerical Control) fundamentals. Programming and operations planning are used to reproduce various 3D CAD drawings. Students learn how to determine the proper tooling, programming and set up of specific numerical control operations. Students program operations and integrate the computer-controlled system with other procedures, such as computer-aided manufacturing (CAM) and/or computer integrated manufacturing (CIM). Both lathe and mill work are included in this course.

**Course Prerequisite: IMT-105 with a grade of C or higher.**

**Course Objectives**

1. Explain the use of MasterCAM and computer aided manufacturing relative to current and future job opportunities locally and regionally.

2. Create, modify, rotate, and translate lines, points and geometry needed to define part contours and tool paths.

3. Compare and contrast the methods of manual machining versus CNC machining as well as G and M Code programming and Conversational Programming.

4. Assemble a portfolio of CNC program files created in class.

5. Explain and demonstrate the use of Job Setup Module, Tool Manager Module, tool definition and parameters.

6. Demonstrate the ability to recognize generic G and M codes and how to use them.

7. Demonstrate ability to set tooling in CNC machine.

8. Establish Work Reference Point and build programs which make use of Reference Return Point.

**Course Outline**

1. Safety
2. Coordinate system linear interpolation
3. Circular interpolation auxiliary coding
4. G and M coding
5. Drilling cycles subprograms
6. Safety line CNC setup
7. Program entry and editing
8. Graphic verification program check
9. Tooling
	1. Tool setup
	2. Tool selection
	3. Roughing
	4. Finish passes
	5. Multiple passes
	6. Tool Offset Programming
	7. Tool change
	8. Feeds and speeds
10. Edge location

**Assignments and Grading Criteria**

 Points Possible:

In Class Attendance 12 possible 10 points each = 120

Homework/Tooling U 35 possible 5 points each = 175\*

Lathe/Mill Projects 2 possible 100 points each = 200\*\*

 Total = 495

\*Must have 85% (149 pts) of Tooling U “Advanced CNC “lessons completed to qualify for NIMS tests

 Students who complete 100% of Tooling U can earn additional classes.

\*\* Violation of Safety and/or Equipment and Materials damage will result in point deductions

|  |  |  |
| --- | --- | --- |
| A | 90% | 445.5 Points |
| B | 80% | 396 Points |
| C | 70% | 346.5 Points |
| D | 60% | 297 Points |
| F | 59% | 292.05 Points |

**Policies**

**Attendance policy:** Students are encouraged to attend class, arriving on time and fully utilizing the class and/or lab period. Absence from class without prior contact will be noted. The college requires that the instructor certify a student as attending class. Students are responsible for their learning experience. Excellent attendance will be used to round up a marginal grade. NOTE: Due to the 12 week format, missing any class is not recommended and missing more than one class may result in difficulty passing the class due to in class points missed. If a student misses 3 classes, they will be automatically dropped from the class and fail the course.

**Late work/make-up policy:** All e-learning and projects are due by the last day of class

**Weekly Course Schedule**

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| --- | --- | --- | --- | --- | --- |
| **Week** | **Chapters** | **In Class Topics** | **Assignment** | **Due Date** | **Tooling U** RecommendedDue Date |
| 1 | 5/20 | Introduction **Mill** pg. 8**Lathe** pg.8-9 | Syllabus Mill Positioning ExerciseLathe Positioning Exercise | Tooling U Login**Tooling U** Section 1 “Safety” **Mill** pg. 39 Interpolation Exercise**Lathe** pg.33 Linear Interpolation Exercise | 5/27 |  |
| 2 | 5/27 | **Mill** pg. 39**Lathe** pg.33 **Mill** pg. 53**Lathe** pg. 38-40 | Mill InterpolationLathe Linear Interpolation Circular Pocket Milling& Circular Interpolation | **Mill** pg. 53 Circular Pocket Milling Exercise**Lathe** pg. 38-40 Circular Interpolation Exercise**Tooling U** Section 2 “CNC”**Mill** pg. 64,67 Cutter Compensation Exercise 1&2**Lathe** pg. 45 Circular Interpolation | 6/3 | **Section 1** Safety |
| 3 | 6/3 | **Mill** pg. 64,67**Lathe** pg. 45**Mill** pg.79**Lathe** pg 87 | Cutter Compensation & Lathe Circular Interpolation Canned Cycle & G71/G70 with Tool nose Compensation | **Mill** pg.79 Canned Cycle Exercise 1**Lathe** pg 87 G71/G70 with Tool nose Compensation Exercise #1**Tooling U** Section 3 “Work Holding”**Mill** pg. 86,87 Canned Exercise #2**Lathe** pg. 93 G71/G70with Tool nose Compensation Exercise #2 | 6/10 |  |
| 4 | 6/10 | **Mill** pg. 86,87**Lathe** pg. 93**Mill** pg. 101**Lathe** pg. 98,99 | Canned Exercise #2 & G71/G70with Tool nose Compensation Exercise #2 Canned Exercise #3 & G72/G70 Type 1 Exercise | **Mill** pg. 101 Canned Exercise #3**Lathe** pg. 98,99 G72/G70 Type 1 Exercise**Tooling U** Section 4 “Haas CNC”**Mill** pg. 128-133 Final Exercise**Lathe** pg. 102,103 G73/G70 with TNC | 6/17 | **Section 2**CNC |
| 5 | 6/17 | **Mill** pg. 128-133**Lathe** pg. 102,103**Lathe** pg.117 | Final Exercise & G73/G70 with TNC G76 OD Threading Exercise & Shop/Lab | **Lathe** pg.117 G76 OD Threading Exercise**Tooling U** Section 5 “Inspection” | 6/24 |  |
| 6 | 6/24 | Shop/Lab |  | Anyone with 100% Tooling U “Advanced CNC” Completion by each due date, has earned 150 points, and has the option for more lessons opened | 7/29 | **Section 3**Work Holding |
| 7 | 7/1 | Shop/Lab | Lathe/Mill ProjectShop Time | Lathe/Mill ProjectShop time | 7/8 |  |
| 8 | 7/8 | Shop/Lab | Lathe/Mill ProjectShop Time | Lathe/Mill ProjectShop time | 7/15 | **Section 4**Haas CNC |
| 9 | 7/15 | Shop/Lab | Lathe/Mill ProjectShop Time | Lathe/Mill ProjectShop time | 7/22 |  |
| 10 | 7/22 | Shop/Lab | Lathe/Mill ProjectShop Time | Lathe/Mill ProjectShop time | 7/29 | **Section 5**Inspection |
| 11 | 7/29 | Shop/Lab | Lathe/Mill ProjectShop Time | Lathe/Mill ProjectShop time | 8/5 |  |
| 12 | 8/5 | Shop/Lab | Lathe/Mill ProjectShop Time | Lathe/Mill ProjectShop time | 8/5 |  |

**Tooling U**

**Objective:** Upon completionof the Tooling U exercises, the student will:

1. Understand the terminology and content presented in Tooling U.
2. Work through presented lesson in Tooling U.
3. Be able to pass a quiz with 80% on any given lesson in Tooling U.

**Introduction:** Toolingu.com is the leading provider of online training for today's manufacturers. Manufacturers compete by leveraging their expertise and training is a essential component in this effort. Training should not be cumbersome. Tooling U has developed a range of products and services to simplify your training initiative and help you achieve your goals. With more than 400 unique titles, Tooling U offers a full range of content to train machine operators, welders, assemblers, inspectors, and maintenance professionals.

 **Procedure:**

1. Log into Toolingu.com
2. Select a given lesson (provided by instructor)
3. Read the information provided on the lessons offered be Tooling U below.
4. Take the quiz on the given lesson.

**Presented Lessons in Tooling U for Advanced CNC Program**

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| **Section 1 Safety** |
| Fire Safety and Prevention 115 | Safety for Metal Cutting 115 |
| Personal Protective Equipment 120 | Machine Guarding 140 |

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| **Section 2 CNC** |
| Basics of the Machining Center 130 | CAD/CAM Overview 160 |
| Optimizing Insert Life 305 | ANSI Insert Selection 250 |
| CNC Coordinates 140 | CNC Offsets 210 |
| Part Program 150 |  |

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| **Section 3 Work Holding, Support, and Fluids** |
| Fixture Design Basics 210 | Cutting Fluids 210 |
| Fixture Body Construction 200 | Cutting Variables 200 |
| Supporting and Locating Principles 106 | Clamping Basics 108 |
| Intro to Work Holding 104 | Locating Devises 107 |

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| **Section 4 Haas CNC** |
| Haas Mill: Control Panel Overview 250 | Haas Lathe: Locating Program Zero 275 |
| Haas Lathe: Control Panel Overview 255 | Haas Mill: Program Execution 280 |
| Haas Mill: Entering Offsets 260 | Haas Mill: Program Storage 310 |
| Haas Lathe: Entering Offsets 265 | Haas Lathe Program Storage 315 |
| Haas Mill: Locating Program Zero 270 |  |
| **Section 5 Inspection** |
| Intro to GD&T 200 | Hole Inspection 240 |
| Interpreting GD&T 310 | Thread Inspection 250 |
| Calibration Fundamentals 210 | Hardness testing 260 |
| Inspecting with CMM’s 220 |  |

**Withdrawals:** The last day to drop this course is **6/3/14 according to** [www.mchenry.edu/academiccalendar.asp](http://www.mchenry.edu/academiccalendar.asp) **].** Failure to attend class does not constitute official withdrawal. If students are considering a withdrawal, they should consult directly with the instructor and an academic advisor. Students may withdraw from a class through the Registration Office, either in person or by fax: (815) 455-3766. In their request, students should include their name, student ID number, course prefix, number and section, course title, instructor, reason for withdrawing, and their signature. Withdrawal from a course will not be accepted over the telephone.

Please refer to the following link for other important college dates: [www.mchenry.edu/academiccalendar.asp](http://www.mchenry.edu/academiccalendar.asp)

**General Education Goals:**

1. Critical Thinking: To identify, define, analyze, synthesize, interpret, and evaluate ideas.

2. Information Literacy: To locate, evaluate, and use resources effectively.

3. Effective Communication: To develop, articulate, and convey meaning.

4. Ethical Awareness: To identify and make responsible choices in a diverse world.

5. Technological Literacy: To use tools skillfully.

**Assessment:**

Some student work may be collected for the purpose of assessment, including student competency in the general education goals, the program, or the course.

**Effective Fall 2014: Student E-Portfolio:**

The instructor of the course will designate at least one graded assignment for possible inclusion in the student E-portfolio. Students applying for an AA, AS, AFA, AES, or AGE degree must document their learning outcomes with a graded assignment for each of the five general education goals by the time of graduation. These five assignments and a cover letter will be in the student E-portfolio in Canvas.

**Academic Support for Special Populations Students**

McHenry County College offers support services for students with special needs. It is the student's responsibility to meet with the Special Needs Coordinator and provide current documentation regarding his/her disability and receive information about the accommodations that are available.

In addition, as a student enrolled in a career or technical education program at McHenry County College, you may be eligible for services and assistance under the Carl D. Perkins III Grant. Grant funds are used, in part, to assist students who are at risk of not succeeding in their educational pursuits.

The traits that often prevent students from succeeding are: economic disadvantage, academic disadvantage, disability/disabilities, single parent, displaced homemaker, nontraditional, and limited English proficiency (LEP). The definitions of each trait are available in the Special Needs Office. Students with one or more of these traits are referred to as **Perkins Special Populations Students.** If you would like to know if you are eligible for services at anytime during the semester, please do not hesitate to contact the Special Needs Coordinator. The office is Room A260, and phone number is (815) 455-8676.

**Academic Integrity**

As an educational community, McHenry County College values the pursuit of academic excellence and integrity. In accordance with this philosophy and Chapter 10, Act 5 of the 1994 Illinois Community College Act, academic dishonesty in any form, including cheating, plagiarism, and all other acts of academic theft, is considered intolerable. Appropriate sanctions, up to and including suspension from the College will be imposed by authorized College personnel.

**Copyright Policy**

MCC will maintain current procedures and guidelines to ensure that all staff and students comply with applicable copyright laws and other intellectual property protection laws. The College will encourage staff and students to engage in the development of intellectual property and facilitate ownership protections with respect to such development of intellectual property.

The College expects that staff and students will act responsibly and ethically in a manner consistent with all copyright laws and College copyright procedures and guidelines. This policy authorizes the College to adopt and maintain such procedures and guidelines necessary to ensure compliance with copyright laws and to facilitate ownership protection with respect to the development of intellectual property.

**Student Code of Conduct and the Judicial Process**

Consistent with the MCC mission is an expectation that students will govern themselves in terms of appropriate behavior with emphasis on self-respect and respect for others. It is the practice of the College to respect the properly exercised rights of its students. The College recognizes a student’s rights within the institution to freedom of speech, inquiry and assembly; to the peaceful pursuit of education; and to the reasonable use of services and facilities at MCC.

MCC has adopted a Student Code of Conduct and judicial process to maintain a learning environment of respect, civility, safety, and integrity for all members of the MCC community.

Whenever possible, sanctions for violations of the Student Code of Conduct may be educational in nature. However, violations affecting the health and safety of members of the MCC community are deemed to be the most serious. Therefore, acts of violence, threats or dangerous behavior are most likely to result in a suspension from the College. Violations of the academic dishonesty policy may also result in suspension or expulsion from the institution and/or reduced or failing grade.

**Children on Campus**

For the safety of children on campus, children (i.e., less than 16 years of age) are not permitted on campus unattended by a parent/guardian, except when they are attending classes offered by MCC for children. The College requires that no children be allowed into a classroom/laboratory environment, including the Testing Center, Learning Center and computer labs, solely for the purpose of a parent/guardian to provide direct supervision of his/her child.

**Teaching Schedule**

The scheduling of the activities and teaching strategies on this syllabus, but not the objectives or content, may be altered at any time at the discretion of the instructor.

**Resources**

The following are useful resources available to you as a student at McHenry County College:

**Advising and Transfer Center:**

**Phone (815) 479-7565; Office A257**

[www.mchenry.edu/atc](http://www.mchenry.edu/ATC/Index.asp)

**Counseling:**

**Phone (815) 455-8765; Office A257**

[www.mchenry.edu/counseling](http://www.mchenry.edu/counseling)

**Financial Aid:**

**Phone (815) 455-8761; Office A262**

[www.mchenry.edu/financialaid](http://www.mchenry.edu/financialaid)

**Library:**

**Phone (815) 455-8533; Office A212**

[www.mchenry.edu/library](http://www.mchenry.edu/library)

**Special Needs:**

**Phone (815) 455-8676; Office A260**

[www.mchenry.edu/specialneeds](http://www.mchenry.edu/specialneeds)

**Tutoring and Study Skills (Sage Learning Center):**

**Phone (815) 455-8579; Office A247**

[www.mchenry.edu/sage](http://www.mchenry.edu/sage)

This workforce solution was funded by a grant awarded by the U.S. Department of Labor’s Employment and Training Administration. The solution was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timelines, usefulness, adequacy, continued availability, or ownership. This solution is copyrighted by the institution that created it. Internal use, by an organization and/or personal use by an individual for  non-commercial purposes, is permissible. All other uses require the prior authorization of the copyright holder.