



# CNC Fundamentals

## MFG- 302

### Course Information:

Semester and year: Spring 2015

Location: MT 158 Lecture, MT 159 Lab

Meeting days and times: Lecture 7:30 – 9:30  
am on Thursday

Lab 9:30 am – 11 am on Thursday

Division Chair: Josh Byrnes

Email: [byrnejos@niacc.edu](mailto:byrnejos@niacc.edu)

Phone: 641.422.4202

### Instructor contact info:

Instructor: Kevin Losee

Email: [loseekey@niacc.edu](mailto:loseekey@niacc.edu)

Phone: 641.422.4371

Office location: MT 146

Office hours: 6:30 – 7:25 am Daily,  
Afternoons by appointment M, T, W, F

### Course Description:

Covers computer numerical control (CNC) as it relates to milling machines, turning lathes, microcomputers, and related software. Emphasis on input language, codes, machine setup and operation, inspection of parts and communication of peripherals.

### Learning Materials:

1. *The Machinery's Handbook 29h* Edition by Industrial Press.
2. Hand tools as specified for Machine Tool Practices I / Machinist Pro Calculator
3. You will need to provide: Ear buds or head phones, #2 pencils, engineering paper, and a USB Thumb Drive to back up programs (2gig in size). I will provide 3.5" floppy diskettes, and program planning sheets.

### Measurable Course Objectives:

1. Describe how these letters pertain to machining: CAD, CAM, CNC, DNC, EIA, ASCII
2. Define absolute and incremental positioning systems
3. Identify A, B, C, U, W, X, Y, Z axis on machines
4. Define words, end-of-block, word address format, linear interpolation, circular interpolation, offsets, dwell, and modal

5. Demonstrate incremental positioning
6. Demonstrate absolute positioning
7. Demonstrate polar positioning
8. Find in the manufacturer's manuals the information on positioning systems needed to program parts
9. Convert the coordinates from one system to another (the polar to Cartesian)
10. Calculate starting tool points for angle cuts on the lathe and milling centers
11. Calculate drill point depths
12. Calculate depths of cut for lathe operations
13. Develop a program using an appropriate coordinate system
14. Demonstrate the use of polar and Cartesian coordinate systems in programming
15. Learn how to research data needed from the manufacturer's manuals
16. Identify the G and M codes accepted for the current machines
17. Identify the specific machine formats needed when programming
18. Identify the procedures for using canned cycles and sub programs
19. Create a list of operations
20. Compare a routing sheet to the list of operations
21. Make a list of standard procedures for programming on the lathe or the milling machine
22. Create a work holding library
23. Create a tool library
24. Evaluate work holding devices
25. Create set-up sheets for documenting the work and machine set-ups
26. Calculate cutter paths from engineering drawings
27. Analyze cuts for best sequence of cuts
28. Analyze cutter geometry and size
29. Evaluate cutter size in determining cutter path
30. Analyze prints for best sequence of cuts
31. Analyze prints for best work holding methods
32. Choose tooling for machining parts analyzed
33. Implement Electronic Industries Association standard G and M codes
34. Use common formats for machine initialization and tool numbers
35. Demonstrate how to fill out a program manuscript sheet
36. Construct a program using conversational programming
37. Picture cutter paths graphically using a simulation software or machine simulator
38. Power up machine to run part program
39. Modify tool offsets in the machine to make the correct size part
40. Make a part to specification from previously written program
41. Locate workpiece properly for machining
42. Arrange tooling in the machine properly
43. Power down CNC machine

**Grading:**

The purpose of evaluation is to determine if the student has met the course objectives.

The final grade will be determined by assessing the student's performance on attendance, homework, and tests; with a weight ratio of

75% Immersive Training Program. **DUE April 16, 2015**

10% on completion of top plate program on the Haas Machining Center.

10% Final Test.

5% Writing and Running initials on Acu-rite and Haas Mills

Grades will be awarded on the basis of the following scale:

95% to 100% = A	90% to 94% = A-
87% to 89% = B+	83% to 86% = B
77% to 79% = C+	73% to 76% = C
67% to 69% = D+	63% to 66% = D
Below 60% = Failure	60% to 62% = D-

**Attendance and Tardiness Policy:**

If a student must miss a class he / she will call the instructor at 1-641-422-4371, or toll free at 1-888-GO-NIACC ext.4371 or email him at loseekv@niacc.edu **BEFORE** missing that class in order to be able to make up any missed work, quizzes or tests. Leave a message if the instructor is not available.

If you come late to class in the morning you will not be allowed to take the quiz for that day's class, with a loss of the points for that quiz.

It is the student's responsibility to obtain materials from missed classes.

After any three (3) absences, I will need to talk with Josh Byrnes, Industrial Division Head regarding attendance.

After 5 absences, the best grade that will be given is a "C" – excused or unexcused

The time clock is the device used to keep attendance. If a student forgets to log in or out, the student is responsible to get in touch with the instructor to get it amended. The time clock if used correctly can be used for documentation for any apprenticeships so it is to your advantage to use this feature to the best of your ability.

**Late Work Policy:**

All work is due as specified by the Instructor, anything late will have a deduction of 10% for one (1) day, 20% for two (2) days late, 50% for anything later than two (2) days.

## College Policies:

If you have questions regarding issues such as grade appeals, grievance policies, and academic probation, please refer to the NIACC Student Handbook, which can be accessed at <http://www.niacc.edu/student-life/>.

## NONDISCRIMINATION POLICY

It is the policy of North Iowa Area Community College to not discriminate on the basis of age, color, creed, disability, gender identity, genetic information, marital status, national origin, race, religion, sex (including pregnancy), sexual orientation, or veteran's status in its programs, activities, or employment practices as required by the Iowa Code sections 216.9 and 256.10(2), Titles VI and VII of the Civil Rights Act of 1964 (42 U.S.C. § 2000d and 2000e), the Equal Pay Act of 1973 (29 U.S.C. § 206, et seq.), Title IX (Educational Amendments, 20 U.S.C. §§ 1681 – 1688), Section 504 (Rehabilitation Act of 1973, 29 U.S.C. § 794), and the Americans with Disabilities Act (42 U.S.C. § 12101, et seq.).

Individuals having questions or complaints related to compliance with this policy should contact Shelly Schmit, EEO/AA Officer, 500 College Drive, Mason City, Iowa 50401, or via telephone at 641-422-4211. Inquiries may also be directed to the Director of the Office for Civil Rights, U.S. Department of Education, Citigroup Center, 500 West Madison, Suite 1475, Chicago, Illinois 60661, phone: 312-730-1560, fax: 312-730-1576.

## DISABILITY SERVICES

North Iowa Area Community College strives to provide an accessible environment for students, faculty, and staff. A student needing accommodations should register with NIACC Disability Services and speak to Lisa Vance, the Disability Services Counselor, in the Student Access Office, AB106. For additional information, contact us at 1-888-466-4222, Ext. 4413, and ask for a brochure regarding Disability Services or to request a meeting with the Disability Services Counselor. You may also contact Lisa Vance directly at 641-422-4296 or [vancelis@niacc.edu](mailto:vancelis@niacc.edu). Our website is <http://www.niacc.edu/student-life/disability-services/>.

If you have concerns regarding equal access to NIACC's services, programs, and activities you may contact NIACC Disability Services or learn more about filing a grievance at <http://www.niacc.edu/student-life/disability-services/policies-procedures/grievance-procedure/>.

A Disability Services Student Handbook can be found on our website at <http://www.niacc.edu/student-life/disability-services/disability-services-student-handbook/> or can be provided in hard copy (or an alternate format), upon request, and lists contact information for NIACC's ADA Coordinator and ADA Compliance Officer, along with other helpful information.

## INCLEMENT WEATHER

NIACCAAlerts is a free service that alerts you immediately when a decision is made to close campus or delay classes due to weather conditions. This is your best and most accurate means of communication. Sign up here: <http://www.niacc.edu/about/campus-safety/niaccalerts/>

**Cancellation or Delay of Classes:** The decision to cancel, delay, or dismiss classes early will be made by the NIACC President (or designee). In these cases, the message will go FIRST on NIACCAAlerts, then to all area media by 6:00 a.m. Sometimes, due to staff availability or changing weather conditions, there may be a delay in making announcements.

All announcements will be provided to local media and posted on the Official NIACC Facebook and Twitter pages.

**Community Education Centers and Buena Vista University:** The NIACC Education Centers and BVU will follow the same announcement as on-campus, unless specified differently.

**On-Campus Evening Classes:** Any decision regarding on-campus evening classes (those starting after 6:00 p.m.) shall be made as early as possible. NIACCAAlerts will be used, as well as announcements on area media.

**Off-Campus Evening Classes:** Decisions regarding off-campus attendance centers are local decisions that are made by the local K-12 superintendents.

**Special Events and Auditorium Events:** Such events will not be included in the general announcement issued by the College, unless specified. Sponsoring organizations will be responsible for announcements of cancellations. EXCEPTION: If it is announced that the campus is closed, all activities are canceled.

All decisions on driving are left up to the student and will not be decided by the instructor.

### **Disclaimer Statement:**

I reserve the right to alter this course's syllabus, policies, grading scale, texts, and calendar as needed at any time during the semester. I will alert you to any changes.

### **Course Units:**

**These units of instruction will be in a combination of the Immersive training program and classroom lecture / instruction.**

1. Identify CNC machine tool systems
2. Describe CNC machine tool systems
3. Apply trigonometric functions to solve location problems
4. Use coordinate systems for programming
5. Locate programming information in manufacturer's manuals
6. Determine the sequence of operations for making a part
7. Organize tool information for CNC machines
8. Define cutter path
9. Plan work and tooling set-ups
10. Write manual programs
11. Verify cutter paths
12. Demonstrate safe operation of CNC machines to make a part

## **Academic Integrity Policy:**

According the Student Conduct Code, (see the NIACC Student Handbook, found at <http://www.niacc.edu/student-life/>) academic dishonesty, including but not limited to:

- cheating
- plagiarism
- knowingly furnishing false information to the college
- forgery
- alteration or misuse of college documents or records

shall be subject to disciplinary procedures.

## **Class Recording and Social Media Policies:**

**It is not permissible to record or photograph any part of this class, the instructor or other students in the class or to upload them to any website including Facebook, YouTube or similar sites, unless prior permission from the instructor and the students involved.**

## **Academic Resources:**

While some academic resources may be available Independent Student Learning Center, machining specific instruction is probably best by contacting either myself or Randy Bonde at listed office hours.

## **Technical Support:**

NIACC's Helpdesk can help with technical problems related to NIACC passwords, logging in to lab computers, MyNIACC, E-mail, ANGEL (online course management system), NIACC wireless, WebAdvisor, lab computers, office computers for staff, software issues, and more. NIACC Technology Services does not repair nor support personal computers. For many problems you may get the fastest results if you call our toll-free number below (24 hours – seven days per week).

On campus: 641-422-4357      Toll free: 866-614-5020      [helpdesk@niacc.edu](mailto:helpdesk@niacc.edu)

<http://www.niacc.edu/student-life/technology-services/help-desk/>

## **Classroom Policies:**

All safety glasses will be have clear lens and will conform to ANSI Z87.1 standards and be worn within the lab at all times.

All students will use the provided lockers to store safety glasses in. This way your safety glasses will available for your use when entering the lab.

If you fail to have safety glasses, the college bookstore has them for sale. **NO SAFETY GLASSES – NO LAB.**

There are to be no active cell phones in the classroom or lab.

## **CLASS SCHEDULE:**

Class will begin each Thursday at 7:30 am in MT 158. Immersive software may be used in this lab or at home by accessing on any computer by following link provided to you. To use this software at home your computer will need to meet certain requirements that can be seen in the additional handout. **You must install and log in by clicking on the desktop icon.**

**You do not have to go out and buy a new computer to do this class. There is plenty of time available to do this in the lab setting.**

If doing this class at home you must use Microsoft Internet Explorer.

Lab time will also include using CNC equipment located in MT 159 & MT 140