



# North Central Michigan College

## Master Course Syllabus

### PART 1:

Course Name: Introduction to CNC (Computer-Numerically Controlled) Milling Operations

Course Number: CNC 103

Credit Hrs. 1      Lecture Hrs. 1    Lab Hrs. 0                      Clinical Hrs. 0      Variable Hrs. 0

Total Hours of Instruction: 1                      Total Contact Hours: 17.6

*(Total Contact hour's formula: (lecture hrs. + lab hrs. + clinical hrs) x 17.6)*

#### Course Description:

Provides the opportunity for the student to review shop math related to operating CNC machines and creating a basic G-code program. Learn basic responsibilities of a CNC operator for safety, personal accountability, communication, preventative maintenance, and understand manufacturing process planning when working with CNC mill. Develop proficiency in basic power-up, machine controls, communication with CNC programmer/instructor, part set-up, tool set-up, program activation and proofing for CNC mill. Understand G and M Codes, and edit basic G-code using CNC controls.

Prerequisite (s): ACT Math score of 17 or higher, or Compass Math score of 43 or higher or permission of instructor.

Co-requisite (s): None

#### Course Objectives:

Appropriate to first in sequence.

- Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment
- Demonstrate Compliance with Lock-out/Tag-out Procedures and OSHA Requirements and Guidelines
- Demonstrate proper preventative maintenance and CNC mill
- Demonstrate process to square up a block and inspect accuracy
- Demonstrate CNC mill machine controls (load tools and tool holders, select correct work offset, select, activate, proof, delete programs, and power down equipment safely).
- Comprehend process control and planning
- Analyze print for basic machining and part inspection
- Demonstrate applied shop math and prepare basic CNC mill G-code program. (follow programming protocol for specific machines, establish origin in work offset page, input tool length values, use block numbers, preparatory and miscellaneous codes, coordinate words and canned cycles);

Reasonable accommodations can be provided for students with documented disabilities. Please contact Learning Support Services to arrange for these (231)348-6687 or (231)348-6817, Room 533 SCRC.



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### **PART 2:**

#### **Lumina DQP outcomes and linked course objectives**

(Please identify all Lumina DQP outcomes supported by this course, including the complete language of each outcome as shown on Part 3 of this syllabus. Under each Lumina DQP outcome, please list any course objectives that support the prior DQP outcome.)

Lumina DQP Outcome 2: Illustrates contemporary terminology used in the field.

- Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment
- Demonstrate Compliance with Lock-out/Tag-out Procedures and OSHA Requirements and Guidelines

Lumina DQP Outcome 3: Generates substantially error-free products, reconstructions, data, juried exhibits or performances as appropriate to the field.

- Demonstrate proper preventative maintenance and CNC mill
- Demonstrate process to square up a block and inspect accuracy
- Demonstrate CNC mill machine controls (load tools and tool holders, select correct work offset, select, activate, proof, delete programs, and power down equipment safely).

Lumina DQP Outcome 6: Illustrates core concepts of the field while executing analytical, practical or creative tasks.

- Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment
- Demonstrate Compliance with Lock-out/Tag-out Procedures and OSHA Requirements and Guidelines
- Comprehend process control and planning
- Analyze print for basic machining and part inspection

Lumina DQP Outcome 13: Presents accurate calculations and symbolic operations, and explains how such calculations and operations are used in either his or her specific field of study or in interpreting social and economic trends.

- Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment
- Demonstrate applied shop math and prepare basic CNC mill G-code program. (follow programming protocol for specific machines, establish origin in work offset page, input tool length values, use block numbers, preparatory and miscellaneous codes, coordinate words and canned cycles);



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## **Suggested Methods of Instruction:**

Lecture, small-group discussion, PowerPoint presentations, video demonstrations, and hands-on lab sessions

**Suggested Methods of Assessment and Evaluation:** quizzes, exams, successful production of prototypes using CNC software.

**Adopted Text at Time of Course Adoption/Revision:** Gizelback, Richard A. CNC Machining Fundamentals and Applications.

## **Topics Covered During the Semester: NA**

*Sequence of topics and time allowance are at the discretion of the instructor*

- Week 1: Introduction to CNC Operations Course Expectations
- Week 2: Safe Work Habit / Equipment Identification
- Week 3: Reading Prings / Measuring Equipment
- Week 4: Safe Work Habits: Square a Block
- Week 5: Basic G-Code Programs, CNC Mill Controls, Group Lab Stations
- Week 6: Basic G-Code Programs, CNC Mill Controls, Group Lab Stations
- Week 7: Basic G-Code Programs, CNC Mill Controls, Group Lab Stations
- Week 8: Basic G-Code Programs, CNC Mill Controls, Group Lab Stations
- Week 9: Basic G-Code Programs, CNC Mill Controls, Group Lab Stations
- Week 10: Basic G-Code Programs, CNC Mill Controls, Group Lab Stations
- Week 11: Basic G-Code Programs, CNC Mill Controls, Group Lab Stations
- Week 12: Basic G-Code Programs, CNC Mill Controls, Group Lab Stations
- Week 13: Basic G-Code Programs, CNC Mill Controls, Group Lab Stations
- Week 14: Basic G-Code Programs, CNC Mill Controls, Group Lab Stations
- Week 15: Basic G-Code Programs, CNC Mill Controls, Group Lab Stations
- Week 16: Review and Final Exam

Section 1 & Section 2 approved by CRDAP on: 04 22 14

Section 2 approved by AD:

Date:

Section 2 approved by CRDAP Chair:

Date:



# North Central Michigan College

## Master Course Syllabus

### **PART 3:**

Use this reference sheet in Part 2 of Master Course Syllabus

#### **Specialized Knowledge**

1. Describes the scope and principal features of the field of study, citing at least some of its core theories and practices, and offers a similar explication of at least one related field.
2. Illustrates contemporary terminology used in the field.
3. Generates substantially error-free products, reconstructions, data, juried exhibits or performances as appropriate to the field.

#### **Broad Integrative Knowledge**

4. Describes how existing knowledge or practice is advanced, tested and revised
5. Describes and examines a range of perspectives on key debates and their significance both within the field and in society.
6. Illustrates core concepts of the field while executing analytical, practical or creative tasks.
7. Selects and applies recognized methods of the field in interpreting characteristic discipline-based problems.
8. Assembles evidence relevant to characteristic problems in the field, describes the significance of the evidence, and uses the evidence in analysis of these problems.
9. Describes the ways in which at least two disciplines define, address and interpret the importance of a contemporary challenge or problem in science, the arts, society, human services, economic life or technology.

#### **Intellectual Skills – Analytic Inquiry**

10. Identifies, categorizes and distinguishes among elements of ideas, concepts, theories and/or practical approaches to standard problems.

#### **Intellectual Skills – Use of Information Resources**

11. Identifies, categorizes, evaluates and cites multiple information resources necessary to engage in projects, papers or performance in his or her program.

#### **Intellectual Skills – Engaging Diverse Perspectives**

12. Describes how knowledge from different cultural perspectives would affect his or her interpretations of prominent problems in politics, society, the arts and/or global relations.

#### **Intellectual Skills – Communication Fluency**

13. Presents accurate calculations and symbolic operations, and explains how such calculations and operations are used in either his or her specific field of study or in interpreting social and economic trends.
14. Presents substantially error-free prose in both argumentative and narrative forms to general and specialized audiences.

#### **Applied Learning**

15. Describes in writing at least one substantial case in which knowledge and skills acquired in academic settings are applied to a challenge in a non-academic setting; applies that learning to the question; and analyzes at least one significant concept or method related to his or her course of study in light of learning outside the classroom.
16. Locates, gathers and organizes evidence on an assigned research topic addressing a course-related question or a question of practice in a work or community setting; offers and examines competing hypotheses in answering the question.

#### **Civic Learning**

17. Describes his or her own civic and cultural background, including its origins and development, assumptions, and predispositions.
18. Describes diverse positions, historical and contemporary, on selected democratic values or practices, and presents his or her own position on a specific problem where one or more of these values or practices are involved.
19. Takes an active role in a community context (work, service, co-curricular activities, etc.), and examines the civic issues encountered and the insights gained from the community experience.

The Degree Qualifications Profile was adopted by CRDAP: April 11, 2012