###### COURSE SYLLABUS

###### Semester:  Year: 2013

**Mission Statement:**

Richard J. Daley College provides high-quality education which leads to academic success, career development, and personal enrichment that fulfill diverse community needs.

###### Course (Discipline): Manufacturing Technology Number: 123 Section:       IAI#:

**Course Title:** CNC Milling Operations and Programming **Length of Course (Weeks):** 16

**Credit Hours:** 3 **Lecture Hours:** 1 **Lab Hours:** 4 **Contact Hours:** 5

**Meeting Day(s):**       **Times:**       **Building:**       **Classroom #:**

**Syllabus can be found on Blackboard website at** [**https://ccc.blackboard.com/webapps/login/**](https://ccc.blackboard.com/webapps/login/)**.**

###### Dean, College to Careers in Advanced Manufacturing \_\_Ray Prendergast\_\_\_\_\_\_\_

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**Course Description**:

This course introduces the programming, setup, and operation of Computer Numerical Control (CNC) machining centers. Topics include programming formats, control functions, program editing, part production, and inspection. Various projects will strengthen the students’ skills in the proper use, programming and troubleshooting of this equipment. Students will also earn the NIMS Level 1 CNC Milling Program, Setup, and Operate credential. Writing assignments, as appropriate to the discipline, are part of the course

**Course Prerequisites**:

Grade of C or better in 340MFGT 140, and 340MFGT 112-1, or consent of Department Chairperson.

**Students Course is Expected to Serve:**

Students enrolled in the Manufacturing Technology program with an interest in Computer Numerical Control (CNC) machining.

**Course Objectives**:

1. Develop applied math skills in geometry and trigonometry for CNC programming.
2. Develop knowledge of milling set up and programming.
3. Know and understand best practice in workplace safety in the operation of CNC machinery.
4. Earn NIMS Level 1 CNC Milling Program, Setup and Operate credential.

**Student Learning Outcomes:**

Upon completion of this the student will be able to:

1. Locate coordinates for CNC programs, for example bolt-hole circles, using Cartesian coordinate systems and trigonometric functions.
2. Apply the effective use of simple and multiple repetitive canned cycles.
3. Set and edit geometry and tool nose radius offsets.
4. Perform all necessary tasks to complete part from print and verify conformance to print requirements for at least two practice pieces with an external profile and at least one pocket (internal feature) with tolerances of +/-.003” for these features.
5. Write a CNC program (without using CAD or CAM software) using linear and circular interpolation, and canned cycles for a practice part similar to the NIMS CNC milling project piece).
6. Program, set up, and operate a CNC mill to produce the NIMS CNC Milling Level 1 project part.

**Recommended Texts and Course Materials:**

***Text:***

1. Machining Center Setup and Operation, by Mike Lynch., 1st edition, CNC Concepts, Inc., 2009 (CC-MCSO-M)
2. Machining Center Programming, CC-MCP-M, by Mike Lynch., 1st edition, CNC Concepts, Inc., 2009.

***Materials:***

Haas CNC Machining Centers

Haas CNC control simulators

Predator CNC Verification software

Related tooling, fixtures and measuring instruments

**Additional Course Requirements:**

N/A

**Recommended Methods of Instruction:**

The methods of instruction will include lecture, small group work in machine shop lab, and project-based learning.

**Recommended Methods of Evaluation:**

Your midterm and final course grades will be based on the following assessments.

Chapter tests

Projects

Final examination

Attendance

Earning a NIMS CNC milling credential

Grading Scale:

90-100% = A

 80-89 = B

 70-79 = C

 60-69 = D

 Below 60 = F

See the Policy on grade designations and grade appeals at:

<http://www.ccc.edu/colleges/daley/departments/Pages/Grade-Appeal-Policy-and-Procedure.aspx>

**NOTE:** Type or copy and paste the link above into a web browser to view its content.

### Topical Outline / Course Calendar:

1. CNC Milling Operation
	1. Machine start up
	2. Program storage, loading programs
	3. Workpiece holding
	4. Tool selection
	5. Program restart
2. CNC Programming for Milling
	1. Linear and Circular interpolation
	2. Speeds and feeds
	3. CNC control features
	4. Tool offsets and cutter compensation
	5. Fixture offsets
3. Subroutines and Canned Cycles
	1. Drilling cycles
	2. Tapping cycles
	3. Milling cycles
4. Advanced Programming
	1. Writing subroutines and subprograms
	2. Parametric programming
	3. Macro programming
5. Completing a production run
	1. Process planning
	2. Tasks related to the production run
	3. Size adjustments
	4. Replacing dull tools

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