Massachusetts Community Colleges

# Manufacturing Technology Certificate

## Description

This resource includes the program narrative, curriculum grid, as well as course descriptions for all required courses in the program.

The purpose of this certificate revision is "to align the Manufacturing Technology Certificate with national standards. These changes represent curriculum design that supports national and statewide skills standards from MSSC-CPT (Manufacturing Skill Standards Council - Certified Production Technician) and MACWIC (Massachusetts Career Workforce Innovation Collaborative -- Applied Manufacturing Certification)."

## Resources

| | | |
|---|---|---|
| Manufacturing Technology Certificate -- Proposal, Narrative, and Grid | PDF \| 296 KB | \| DOWNLOAD (HTTP://OERMACC.EDC.ORG/SITES/OE 20CERT%20-PROPOSAL%20NARRATIV |
| Manufacturing Technology Certificate -- Courses | PDF \| 225 KB | \| DOWNLOAD (HTTP://OERMACC.EDC.ORG/SITES/OE 20TECHNOLOGY%20%20CERTIFICATI |

**Industry:**
Advanced Manufacturing (/taxonomy/term/14)

**Program Area:**
Certificate Program (/taxonomy/term/37)

**Curriculum Area:**
Technology (/taxonomy/term/50)
Other (/taxonomy/term/55)

**Type:**
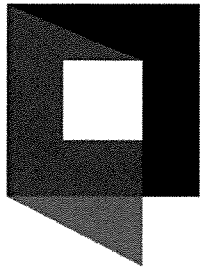Curriculum (/taxonomy/term/27)
Certificate Information (/taxonomy/term/28)

**Audience:**
Instructor (/taxonomy/term/18)
Administrator (/taxonomy/term/15)
Coordinators (/taxonomy/term/17)

**Campus or Organization:**
Quinsigamond Community College (/campus/quinsigamond -community-college)

**Developer(s)/Author(s):**
Lee Duerden

# QUINSIGAMOND
## Community College

# Manufacturing Technology – Certificate:

# Program Proposal, Narrative, & Grid

Author/Originator: Lee Duerden

August 2012

| |
|---|
| Program:<br>Manufacturing Technology |
| Division:<br>Business And Technology |
| Degree type:<br>Certificate |
| Provide a detailed list of the proposed changes to the program.<br><br>1. Remove MAT 123 from Semester 1<br>2. Add MAT 100 or MAT 108 to Semester 2<br>3. Remove ENG 101 from program<br>4. Move MNT 101 from Semester 2 to Semester 1<br>5. Add MNT 100 in Semester 1<br>6. Replace MNT 105 with MNT 106 in Semester 2<br>7. Remove MAT 122/MAT 124 from program<br>8. Add Elective in Semester 2<br>9. Add MNT 108 in Semester 2 |
| Attachments:<br>Current program grid<br>Proposed program grid |
| Submit separate proposals for any new courses or revised courses in the program.<br><br>• MNT 105 Geometric Dimensioning and Tolerancing – replaced with MNT 106<br>  Manufacturing Quality Assurance & Control Techniques<br>• MNT 100 Manufacturing Safety – new course<br>• MNT 108 Basic Machine Operation – new course |
| Provide a rationale for the proposed changes.<br><br>These changes reflect industry need for value added training in a one year program. The intent of the new program is to provide an accelerated and credentialed certificate, supporting student entry into a variety of positions within the manufacturing industry. These changes represent curriculum design that supports national and state wide skills standards from MSSC-CPT (Manufacturing Skill Standards Council- Certified Production Technician) and MACWIC (Massachusetts Career Workforce Innovation Collaborative – Applied Manufacturing Technology Certification). |
| Do any of the proposed changes affect the program goals, the program student learning outcomes, or the course mapping of the General Education Learning Outcomes? If so please provide the revisions.<br><br>No |
| Do any of the proposed changes affect another department? Examples include the deletion or addition of program courses that are offered by other departments. Please confer with the coordinators of affected departments. |

| |
|---|
| Department(s) Affected: Math |
| Do any of the proposed changes affect articulation agreements? Consult with the Transfer Coordinator.<br><br>No |
| For an associate degree program, are there any changes in the number of general education credits that could affect MassTransfer?   N/A<br><br>If yes please provide a rationale. |
| Will any of the following be required:<br>   Additional staff _NO__        Additional space _NO___    Additional equipment _NO__<br>Provide a rationale for any needs indicated and include approximate cost of equipment. |

# MANUFACTURING TECHNOLOGY CERTIFICATE

## Program Goals
The Manufacturing Technology Certificate is designed to introduce the principles of engineering and manufacturing. The program prepares students to apply basic engineering principles and technical skills to the identification and resolution of production problems in the manufacture of products. The student will gain basic knowledge of material properties and identify a variety of production processes to assist in a production environment. Along with enhanced computer skills, the student will be able to communicate effectively in a manufacturing environment and use industry standard software to operate as an entry level manufacturing/engineering technician.

## Student Learning Outcomes
Upon completion of the program graduates will be able to:
* Be able to apply mathematical and scientific concepts to solve manufacturing problems.
* Practice safe working protocols to nurture ethical responsibilities.
* Communicate technical information both verbally and in written form.
* Use modern tooling, skills, and techniques for effective manufacturing systems practice.
* Understand the behavior of a variety of material properties as they relate to manufacturing processing.
* Apply accurate design methodology and use industry standard CAD software to improve quality and production.
* Identify problems before they occur and design a solution.

## Admissions Process
Admissions inquiries should be directed to admissions@qcc.mass.edu. Prospective students may apply to the program of their choice by following the enrollment steps at the following link: http://www.qcc.edu/pages/Enrollment_Steps.html.

## Admissions Requirements
High School Diploma or GED/High School Equivalency

Students should note that some first semester courses carry minimum prerequisites. Refer to the program grid.

## CORI, SORI, Finger Printing & Drug Testing
A Criminal Offenders Record Information (CORI) and Sexual Offenders Record Information (SORI) are not required for admission. Finger printing and drug testing are not required for admission.

## Additional Cost
See page 30 for program fees for this program. (Note: Not all programs have program fees).

## Location
This program may be completed at the QCC Worcester campus.
This program may be completed face-to-face.
This program can be completed 50% or more online.

## Technical Performance Standards
See page 17 for technical standards for this program. (Note: Not all programs have technical performance standards).

## Credit for Prior Learning
Students enrolled in this program may be able to earn academic credit for prior learning. Please contact the office of Career Placement Services at careerservices@qcc.mass.edu, 508.854.4439, Room 272 A.

## Career Outlook
Please consult The Massachusetts Career Information System at http://masscis.intocareers.com/ or The Occupational Outlook Handbook at http://www.bls.gov/oco/ for specific occupational information. The CIP code for this program is 15.0613.

## Transfer Articulations & Opportunities
Prospective students may learn more about transfer articulation agreements at the following link: http://www.qcc.mass.edu/transfer/ArticPathways.html. More information regarding transfer opportunities is available at: http://www.qcc.mass.edu/transfer.

Program Contact: Manufacturing@qcc.mass.edu

## Additional Program Information: For the most up to date information, go to the program website at www.QCC.edu.
* If a successful graduate wishes to continue his/her education, the courses required for the certificate in Manufacturing Technology apply to the Associate Degree in Manufacturing Technology.

- The courses in this program are aligned with national standards as set by the National Association of Manufacturers (NAM), Manufacturing Skills Standards Council (MSSC), and statewide standards as defined by the Massachusetts Advancement Center Workforce Innovation Collaborative (MACWIC).
  - o Students that successfully complete curriculum requirements may elect to register for the following certification examination: MACWIC Level 1.

Certifications:

Manufacturing Skills Standards Council - Certified Production Technician (MSSC - CPT). http://www.msscusa.org/production-certification-cpt/

National Association of Manufacturers (NAM). http://www.nam.org/

Massachusetts Advancement Center Workforce Innovation Collaborative (MACWIC). http://www.macwic.org/

## MANUFACTURING TECHNOLOGY CERTIFICATE (Program Code: MPC)

| Course Title | Course # | Offered | Plan to Take | Grade | Credits | Prerequisites |
|---|---|---|---|---|---|---|
| **Semester 1** | | | | | | |
| Manufacturing Safety | MNT 100 | F | | | 3 | |
| Mechanical CAD I | MNT 101 | F/S | | | 3 | |
| Manufacturing Processes I | MNT 110 | F | | | 3 | |
| Basic Machine Operation | MNT 108 | F | | | 3 | |
| **Semester 2** | | | | | | |
| Introduction to Microcomputer Applications | CIS 111 | F/S/SU | | | 3 | |
| College Algebra or | MAT 100 | F/S/SU | | | 3-4 | MAT 099 with a "C" or better on the MAT 099 departmental final exam or approp place score |
| Applied Technical Math | MAT 108 | | | | | MAT 095 or approp place score |
| Manufacturing Quality Assurance & Control Techniques | MNT 106 | S | | | 4 | MNT 101 |
| Maintenance and Instrumentation in Manufacturing | MNT 115 | S | | | 3 | MNT 110 |
| **Total Credits Required** | | | | | 25-26 | |

# Manufacturing Technology – Certificate
## Course Descriptions

### MNT 100 Manufacturing Safety
**Credits:** 3
This course provides an introduction to the principles of safety, guidelines for the design of equipment, and explanations of why certain practices should or should not be followed in the manufacturing environment. Students evaluate human reactions in normal and abnormal conditions, and compare features required for safe working conditions to industry standards.

### MNT 101 Mechanical CAD I
**Credits:** 3
This course introduces computer-aided design (CAD) software. Students develop an understanding of the commands needed to produce a two-dimensional drawing. Topics include drawing setup, geometry creating, editing functions, layer techniques, dimensioning, model and paper space, title block creation, and plotting a completed drawing. Other related topics include multi-view drawings, selection and arrangement of orthographic views, section and auxiliary views, and isometric and oblique drawings. Students gain proficiency in the operation of a PC-based CAD system and a functional understanding of basic computer-aided drafting techniques.

### MNT 110 Manufacturing Processes I
**Credits:** 3
This course examines present day manufacturing processes and occupations. Students learn various manufacturing processes including precision inspection and measurement, forging and casting, and powder metal processing. Students gain an understanding of the properties of metal, process automation, and the basics of cost estimating. In addition, students learn a practical approach to managing a project to provide the technical experience necessary in current manufacturing industries.

### MNT 108 Basic Machine Operation
**Credits:** 3
This course introduces some of the fundamentals of machine tool technologies. It is focused on hands-on activities that are essential to a successful career in a manufacturing industry. Students learn from highly qualified instructors how to use bench working practices as well as operate lathes and milling machines. A variety of assignments challenge students to produce high precision parts while learning mechanical inspection techniques. Finally, students are introduced to the fundamentals of CNC programming and CNC equipment.

### CIS 111 Intro to Microcomputer Applications
**Credits:** 3
This course focuses on basic working knowledge and hands-on experiences in word processing, spreadsheet processing, database processing, and presentation software. Students acquire an overview of computer concepts, the most common business office operating systems, the Internet, and the World Wide Web.

**MAT 100 College Algebra**
**Credits:** 3
**Prerequisites:** MAT 099 with a "C" or better on the MAT 099 departmental final exam or appropriate placement score
This course continues the areas of study presented in Intermediate Algebra with more advanced treatment. Students perform arithmetic operations on rational expressions; solve equations with fractions; factor expressions; simplify complex fractions; simplify exponential expressions, roots, radicals, and rational exponents; solve linear systems using several techniques; use the midpoint and distance formulas; recognize and graph the equation of a circle; solve linear and absolute value inequalities; solve quadratic equations by completing the square and by using the quadratic formula; solve equations containing radicals or absolute values; and perform arithmetic operations on radical expressions and complex numbers.

**MAT 108 Applied Technical Mathematics I**
**Credits:** 4
**Prerequisites:** MAT 095 with a grade of "C" or better on the MAT 095 departmental final exam or by appropriate Placement score
This course covers major topics in the study and applications of algebra and trigonometry. Students will review fundamental concepts of algebra and approximate numbers with problem-solving strategies. Students will learn to graph and write linear equations in several forms; graph functions; solve and apply systems of linear equations; apply perimeter, area, and volume to basic geometric shapes; factor polynomials; perform arithmetic operations on algebraic fractions; solve and apply quadratic equations; solve and apply right triangle trigonometry; be introduced to vectors. Technology tools are utilized in this course.

**MNT 106 Manufacturing Quality Assurance & Quality Control Techniques**
**Credits:** 4
**Prerequisites:** MNT 101
This course enhances the use of blueprint reading skills through the study of geometric dimensioning and tolerances. Students analyze the dimensional and performance requirements of individual parts or components. Students utilize industry-standard practices in the field of inspection to qualify component part conformance to a given blueprint. Quality control techniques drive the success of engineering and manufacturing companies. This course provides students with an understanding of the critical nature of quality, and recognizing potential problems before they appear. Students use high precision measuring equipment and statistical process control (SPC) methods to determine and support quality control requirements. Three hours lecture, three hours laboratory.

**MNT 115 Maintenance and Instrumentation in Manufacturing**
**Credits:** 3
**Prerequisites:** MNT110
This course covers practical applications of instruments that are frequently used in current manufacturing industries. Students learn an overview of basic electronic theory with an emphasis on the operational aspect components such as programmable logic controllers (PLCs), pressure gauges, transducers, strain gauges, electronic recorders, and controllers. Class projects help students develop the analytical ability necessary for using manufacturing instrumentation.

SME Name

SME Email Address

SME Phone Number

Name of Material Reviewed

## Syllabus, Course and/or Module Evaluation Rubric

**1: Evident; 0: Not Evident; N/A = Not applicable**

### A. Syllabus

| | | | | |
|---|---|---|---|---|
| A1 | Syllabus includes basic elements of the course (e.g., course title, credits, goals/objectives, learning outcomes, pre-requisites, course description) | (0) | 1 | N/A |
| A2 | Course outcomes are clearly stated and aligned to occupational focus and industry standards. | (0) | 1 | N/A |
| A3 | Course texts (required and optional) are listed on syllabus; supplementary materials and resources are provided if appropriate. | (0) | 1 | N/A |
| A4 | Evidence of capstone assessment (licensure, industry certification, capstone project or TSA) | (0) | 1 | N/A |
| A5 | Assessment methods, grading policies and scale, and/or other student measurement practices are described within the syllabus. | (0) | 1 | N/A |
| A6 | The Course Outline/Schedule includes major topics, and activities. | (0) | 1 | N/A |

**Comments:**

No syllabus

**1: Evident; 0: Not Evident; N/A = Not applicable**

### B. Learner Objectives & Interaction

| | | | | |
|---|---|---|---|---|
| B1 | The course learning objectives are measurable. | 0 | (1) | N/A |
| B2 | Learning objectives are stated clearly and easily understood from the student's perspective. | 0 | (1) | N/A |
| B3 | The learning objectives are appropriately designed for the level of the course. | 0 | (1) | N/A |

**Comments:**

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## 1: Evident; 0: Not Evident; N/A = Not applicable

### C. Instructional Design

| | | | | |
|---|---|---|---|---|
| C1 | The course organization and design is clear, coherent, and structured in an appropriate way. | 0 | (1) | N/A |
| C2 | Concepts and skills build logically and purposefully throughout the course, with transitions to support development and understanding from skill to skill. | 0 | (1) | N/A |

**Comments:**

Design is well thought out
Best practice is used here
Strong template to be adapted to

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## 1: Evident; 0: Not Evident; N/A = Not applicable

### D. Instructional Materials

**Specify which module or lab reviewed**

| | | | | |
|---|---|---|---|---|
| D1 | The instuctional materials contribute to the achievement of the stated course objectives. | 0 | (1) | N/A |
| D2 | The materials meet/reflect current industry practices and standards. | 0 | 1 | N/A |
| D3 | The instructional materials are current. | 0 | 1 | N/A |
| D4 | The learning activities and/or labs promote the achievement of the stated learning objectives. | (0) | 1 | N/A |
| D5 | Learning activities and/or labs provide opportunities for interaction that support active learning. | (0) | 1 | N/A |
| D6 | The module design organizes the course into stages of introduction, development, and assessment. | (0) | 1 | N/A |
| D7 | The module includes learning objectives, activities, and all classroom materials for each session. | (0) | 1 | N/A |

**Comments:**

No instructional materials

**1: Evident; 0: Not Evident; N/A = Not applicable**

### E. Assessment & Measurement

| | | | | |
|---|---|---|---|---|
| E1 | The types of assessments selected measure the stated learning objectives and are consistent with module activities and resources. | 0 | (1) | N/A |
| E2 | The assessment instruments selected are varied and appropriate to the student work being assessed. | 0 | (1) | N/A |

**Comments:**

A & M meet C.C. Standards

**1: Evident; 0: Not Evident; N/A = Not applicable**

### F. Innovative or Enhanced Strategies

| | | | | |
|---|---|---|---|---|
| F1 | Program/course/module reflects design or strategies that accelerate the time to completion. | 0 | (1) | N/A |
| | Program/course/module design or enhancements increase accessibility for lower-skilled students (e.g. those assessed at "pre-college" levels for English or math). | 0 | (1) | N/A |
| F2 | Program/course/module design or enhancements are designed to improve retention and completion for adult learners. support the adult learner. | 0 | (1) | N/A |
| | | | **TOTAL** | 10 |

**Is this program, course or module foundational, intermediate or advanced in terms of preparing students for employment in the specified industry? Please elaborate.**  Yes, Certificate brings student knowledge inline with industry standards for employment.

**Overall Comments:**

Strong concept for Man. Cert, includes all needed subjects