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# Manufacturing Technology - Associate in Science Program

## Description

This resource includes the program revision proposal, narrative and grid, as well as course descriptions for all courses required in the degree program.

This associate degree program was revised to align with national standards. The changes represent curriculum design that supports national and statewide skills standards from MSSC-CPT (Manufacturing Skills Standards Council - Certified Production Technician) and MACWIC (Massachusetts Career Workforce Innovation Collaborative -- Applied Manufacturing Technology Certification).

### Industry:

[Advanced Manufacturing](#)  
(/taxonomy/term/14)

### Program Area:

[Associated Degree](#)  
(/taxonomy/term/38)

### Curriculum Area:

[Engineering](#)  
(/taxonomy/term/48)  
[Technology](#)  
(/taxonomy/term/50)

## Resources

Manufacturing Technology AS -- Revision Proposal, Grid, and Narrative PDF | 293 KB

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(/taxonomy/term/55)

### Type:

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### Campus or Organization:

[Quinsigamond Community College](#)  
(/campus/quinsigamond-community-college)

### Developer(s)/Author(s):

Lee Duerden



# QUINSIGAMOND

Community College

## Manufacturing Technology – Associate in Science: Program Narrative & Grid

Author/Originator: Lee Duerden

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2012-2013  
**QUINSIGAMOND COMMUNITY COLLEGE**

**DEGREE PROGRAM OR CERTIFICATE REVISION PROPOSAL**

Program: Manufacturing Technology
Division: Business And Technology
Degree type: Associate In Science
Provide a detailed list of the proposed changes to the program. 1. Move ENG 101 from semester 1 to semester 2 2. Move MNT 101 from semester 2 to semester 1 3. Remove ELT 103 from program (semester 2) 4. Move MNT 115 from semester 3 to semester 2 and reflect new course title 5. Move ENG 102 from semester 2 to semester 3 6. Remove MAT 122 as an option (semester 2) 7. Remove MNT 105 from semester 2 and replace with MNT 106 8. Add MNT 100 to semester 1 9. Add MNT 108 to semester 2
Attachments: <input checked="" type="checkbox"/> Current program grid <input checked="" type="checkbox"/> Proposed program grid
Submit separate proposals for any new courses or revised courses in the program.  MNT 106 Manufacturing Quality Assurance & Control Techniques – New course MNT 100 Manufacturing Safety – New Course MNT 115 Instrumentation in Manufacturing – Course Revision
Provide a rationale for the proposed changes.  These changes reflect industry need for nationally recognized skill standards - Manufacturing Skill Standards Council – Certified Production Technician program, ACT, Society of Manufacturing Engineers, National Association of Manufacturers. 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.  No

## MANUFACTURING TECHNOLOGY - Associate in Science

### Program Goals

The Manufacturing Technology program is designed to prepare graduates to enter the field of advanced manufacturing. Students will gain an understanding of materials and manufacturing processes as well as the quality systems in place in modern industry. Using safe working practices, students will learn to operate and maintain a variety of production equipment. Since there is a strong focus on applied mathematical and scientific knowledge in advanced manufacturing, students will obtain an advanced understanding of electrical, pneumatic, and hydraulic systems. Use of PC's, communication skills, CNC machine tools, and CAD/CAM software will allow successful graduates to enhance their ability to add value to any manufacturing environment. Graduates will be able to apply lean principles and automation techniques to improve process and product efficiency and quality.

### 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.
- Understand the process of product development through design and experimentation.
- Supervise and manage a variety of manufacturing systems.
- Work in multicultural and multidisciplinary teams to assess and improve system performance.
- 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/CAM software to improve quality and production.
- Identify problems before they occur and design a solution.
- Understand and manage product variability as defined by quality systems.
- Apply advanced methods of analysis, synthesis, and control of manufacturing systems.
- Safely operate, program, and setup a variety of CNC equipment.
- Measure manufacturing process variables and draw credible technical conclusions.
- Apply lean principles in the operation and development of production systems.

### Admissions Process

Admissions inquiries should be directed to [admissions@gcc.mass.edu](mailto:admissions@gcc.mass.edu). Prospective students may apply to the program of their choice by following the enrollment steps at the following link: [http://www.gcc.edu/pages/Enrollment\\_Steps.html](http://www.gcc.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.

### COR, SORI, Finger Printing & Drug Testing

A Criminal Offenders Record Information (COR) and Sexual Offenders Record Information (SORI) are not required. Finger printing and drug testing are not required. However, COR/SORI, finger printing and drug testing may be required of students enrolled in MINT 299.

### Additional Cost

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

Graduates may be required to meet at locations off campus and are expected to provide their own transportation to these venues. Types of venues used vary each semester, but may include company tours outside of class and/or training at other local educational facilities.

### Location

This program may be completed at the QCC Worcester campus. Please note that other local locations may be used to enhance the educational experience of the student.

This program may be completed face-to-face.

This program may be completed less than 50% on-line.

### 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@gcc.mass.edu](mailto:careerservices@gcc.mass.edu), 508.854.4439, Room 272 A. To evaluate technical prior learning credit the student should contact the program coordinator.

### 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](mailto:Manufacturing@qcc.mass.edu)

**Additional Program Information:** For the most up to date information, go to the program website at [www.QCC.edu](http://www.QCC.edu).

- The courses in this program are aligned with national standards as set by National Association of Manufacturers (NAM), Manufacturing Skills Standards Council (MSSC), and the statewide standards as defined by the Massachusetts Advancement Center Workforce Innovation Collaborative (MACWIC).
  - Students that successfully complete curriculum requirements may elect to register for the following certification examinations: MACWIC Level 1 and Level 2; SME CmtgT exam.
  - Students will take the Solidworks CSWA certification exam as part of curricular requirements in MNT 103.

### 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/>

Society of Manufacturing Engineers - Certified Manufacturing Technologist (SME - CMfgT). <http://www.sme.org/certified-manufacturing-technologist-certification.aspx>

Certified Solidworks Associate - (CSWA). [http://www.solidworks.com/sw/support/796\\_ENU\\_HTML.htm?pid=446](http://www.solidworks.com/sw/support/796_ENU_HTML.htm?pid=446)

**MANUFACTURING TECHNOLOGY - Associate in Science (Program Code: MP)**

Course Title	Course #	Offered	Plan to Take	Grade	Credits	Prerequisites
<b>Semester 1</b>						
Introduction to Computer Applications	CIS 111	F/S/SU			3	
College Mathematics I: Pre-Calculus	MAT 123	F/S/SU			3	MAT 100 or approp place score
Mechanical CAD I	MNT 101	F/S			3	
Manufacturing Processes I	MNT 110	F			3	
Manufacturing Safety	MNT 100	F			3	
<b>Semester 2</b>						
English Composition and Literature I	ENG 101	F/S/SU			3	ENG 100 or approp place score
College Mathematics II: Trigonometry	MAT 124	F/S/SU			3	MAT 123
Manufacturing Quality Assurance & Control Techniques	MNT106	S			4	MNT 101
Liberal Arts Elective	---	F/S/SU			3	
Maintenance & Instrumentation in Manufacturing	MNT 115	S			3	MNT 110
<b>Semester 3</b>						
English Composition & Literature II	ENG 102	F/S/SU			3	ENG 101
Solid Modeling	MNT 103	F/S			3	MNT 101
Process Automation & Robotics	MNT 217	F			3	CIS 111, MNT 110
Physics I	PHY 101	F/S/SU			4	Coreq: MAT 124
Computer Numerical Control or Elective*	MNT 210	F			4	MNT 101
<b>Semester 4</b>						
Fundamentals of Computer-Aided Manufacturing	MNT 215	S			4	MNT 102 or MNT 103, MNT 210
Manufacturing Processes II	MNT 216	S			4	MNT 102 or MNT 103, MNT 210, Coreq: MNT 215
Lean Manufacturing & Six Sigma	MNT 218	S			3	CIS 111, MNT 110
Cooperative Work Experience and Seminar** or Elective*	MNT 299	F/S/SU			3	Approval of Program Coordinator
Physics II	PHY 102	S			4	PHY 101
<b>Total Credits Required</b>					<b>65-66</b>	

**Program Notes:**

• Students should note that many required courses have ENG and/or MAT prerequisites.

\*Suggested electives: Students must select from the following list of courses: BIO, CHM, MAT, MNT, PHY, PSY, or SPH; or the following suggested courses: MGT 211, MGT 221, MRK 201, MRK 221; or a course approved by the Program Coordinator.

\*\*It is recommended that students register for MNT 299 in their final semester to gain vital work experience prior to program completion.



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**Manufacturing Technology – Associate in Science**  
**Course Descriptions**

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**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 123 College Mathematics I: Precalculus**

**Credits:** 3

**Prerequisites:** MAT 100 or appropriate Placement score

This course focuses on the knowledge and skills necessary for advanced mathematics. Students expand binomial expressions using the binomial theorem; solve non-linear, and rational inequalities and write their solutions using interval notation; determine and write linear equations in several forms; explain the concept of function; graph functions using symmetry test; recognize and graph functions, including constant, linear, quadratic, polynomial, rational, exponential, and logarithmic functions; use function transformation techniques; perform composition and arithmetic operations on functions; find and graph inverses of functions; use properties of logarithms; and solve logarithmic and exponential equations.

**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 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.

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**ENG 101 English Comp & Lit I****Credits:** 3**Prerequisites:** ENG 100

This course focuses on how to develop essential writing skills including organization, correctness, and support of ideas. A research project is required to produce a documented essay that integrates materials from Internet and traditional sources according to standard disciplinary format. Students develop and sharpen the interpretive and analytical skills necessary to evaluate the soundness and appropriateness of sources for their work.

**MAT 124 College Mathematics II: Trigonometry****Credits:** 3**Prerequisites:** MAT 123 or appropriate placement score

Students solve right and oblique triangles and related applications; perform vector computations and use vector concepts to solve applications; determine the values of trigonometric ratios of angles and the values of inverse trigonometric ratios of real numbers; work with angles measured in degrees-minutes-seconds or radians; solve uniform circular motion problems; learn the traditional trigonometric identities and use them to prove other identities; perform transformations of basic trigonometric graphs; write equations to describe specific instances of harmonic motion; and solve trigonometric equations.

**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.

**ENG 102 English Comp & Lit II****Credits:** 3**Prerequisites:** ENG 101

This course employs literary texts to provide examples for students to continue and refine writing and reading skills. Assigned readings include plays, poems, novels, short stories, epic narratives, personal essays, and satire. Writing assignments emphasize students close reading skills and their interpretation and analysis of creative works.

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### **MNT 103 Solid Modeling (SolidWorks)**

**Credits:** 3

**Prerequisites:** MNT 101

This course focuses on computer aided design topics needed to produce parts, assemblies and drawings using Industry prevalent Solid Modeling software. Students become familiar with screen layout, cursor feedback symbols, feature manager, constraint geometry, editing functions, and template creation. Extensive hands-on exercises allow students to create complex 3D extrusions from a series of 2D sketches and apply fillets, rounds, chamfers, and patterns. Additional topics include revolving sketches and extruding using shelling, ribbing, sweeping and lofting. Upon completion of this course, students are proficient in creating and animating drawing assemblies and associated part drawings, and producing a bill of materials, and have functional understanding of 3D parametric modeling software.

### **MNT 217 Process Automation & Robotics**

**Credits:** 3

**Prerequisites:** CIS 111, MNT110

This course provides students with an overview of the systems and concepts involved in today's highly automated manufacturing environments. Robotic systems, an important component of an automated system, are also studied. Topics include automation design, robotic systems, manufacturing execution systems (MES), statistical process control (SPC), and Visual Basic programming. Students learn and practice systematic troubleshooting, using a highly automated manufacturing system as well as robotic systems.

### **PHY 101 Physics I**

**Credits:** 4

**Prerequisites:** Coreq MAT 124

This course focuses on the basic concepts of measurement, kinematics, dynamics, work, energy, power, momentum, rotational motion, thermodynamics, and waves through working with problems and laboratory experiments. Students perform related laboratory experiments and write research-quality laboratory reports. This course is not required for Basic Engineering but may be recommended for students who have not yet completed calculus.

### **MNT 210 Computer Numerical Control**

**Credits:** 4

**Prerequisites:** MNT 101

This course introduces the essential concepts of computer numerical control (CNC) and its impact on manufacturing and productivity. The course focuses on manual programming of different types of CNC systems, with a strong emphasis on the understanding of G and M codes used in current applications. Students learn to write a variety of part programs for both milling and turning operations. **Three hours lecture, three hours laboratory.**

### **MNT 215 Fundamentals of Computer-Aided Manufacturing**

**Credits:** 4

**Prerequisites:** MNT 102 or MNT 103, MNT 210

This course explores the fundamental concepts of computer-aided manufacturing through lectures and laboratory experience. Topics include machining using a graphical software package to generate part programs for a CNC mill and a thorough review of manual part programming with emphasis on how to use the CNC program. Students learn how to integrate the program with the machine to fabricate the part. Students develop proficiency in editing graphics and using turning software to create part programs for full-size CNC turning centers. **Three hours lecture, three hours laboratory.**

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**MNT 216 Manufacturing Processes II****Credits:** 4**Prerequisites:** MNT 102 or MNT 103, MNT 210, Coreq MNT 215

This course develops and expands skills learned in previous manufacturing courses. Students solve problems in manufacturing through analysis, measurement, and implementation of computer aided design (CAD), computer aided manufacturing (CAM), statistical process control (SPC), and computer numerical control (CNC) applications. Students participate in group projects to gain proficiency in various methods and tools. Students gain competency in critical thinking, working in teams, and project management skills applicable to process creation, maintenance, and development. **Three hours lecture, three hours laboratory.**

**MNT 218 Lean Manufacturing and Six Sigma****Credits:** 3**Prerequisites:** CIS111, MNT 110

This course focuses on entry-level knowledge of the "Lean Manufacturing" methodology and includes the fundamentals of "Six Sigma". It familiarizes students with the fundamental philosophy of "Lean Manufacturing" and provides them with the tools that enable the identification, measurement, and elimination of non-value-added activities in a manufacturing setting. Students gain the understanding that "Lean Manufacturing" maximizes product profit, has a positive effect on product quality, and reduces overhead costs. Students develop a working knowledge of the best practices in quality and process management.

**MNT 299 Cooperative Work Experience & Seminar****Credits:** 3**Prerequisites:** Approval of Program Coordinator

This course provides students with a structured learning experience while applying classroom theory to a practical work experience. Students participate in a seminar to exchange information about their work experience. The number of credits earned is determined by the number of weeks and hours per week required by the cooperative work experience and the established learning objectives.

**PHY 102 Physics II****Credits:** 4**Prerequisites:** PHY 101

This course focuses on selected topics in the areas of waves, optics, and electromagnetism. Students learn how to apply the basic principles of problem-solving techniques. Students perform related laboratory experiments and write research-quality laboratory reports.

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MT AS Q.C.C

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

MT AS Q.L.C.

Comments:

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:

Provides clear path to degree  
It is organized in a thought full manner

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

**D. Instructional Materials**

Specify which module or lab reviewed

D1	The instructional 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 materials

MT AS OCC.

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, well organized degree courses layed out to keep students engaged

Overall Comments:

Degree is presented, similar to one Fam. developing. I have taken a few best practices from this