

## MFG\* 105 – Manufacturing Math II

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 105	Manufacturing Math II	3	4/12

**Prerequisite:** Completion of Machine Technology Level I Certificate or with consent of instructor, MFG\* 051: Manufacturing Math I

### CHANGES IN PREREQUISITES

**Date of Change:**

- Eligible for MAT\* 095 or Higher
- Eligible for MAT\* 095 or Higher and Instructor Permission.

12/13

5/3/18

### Catalog Description

Second course in manufacturing mathematics. A further study of arithmetic and trigonometric operations applied to manufacturing circumstances. The following geometric entities are studied in detail: the circle, regular and irregular polygons, the right triangle and oblique triangles. The application of angular arithmetic including the study of: angle decimal conversion, the Pythagorean Theorem, Sin, Cos, and Tan functions, and the Law of Sines and Law of Cosines.

### CHANGES IN CATALOG DESCRIPTION

**Date of Change:**

### Course Content Objectives – MFG\* 105

The student who completes this course will be able to:

- Identify and make use of various geometric entities, including the circle, regular and irregular polygons, the right triangle and oblique triangles;
- Apply trigonometric functions to physical situations;
- Solve triangles using the Law of Sines and Law of Cosines;
- Perform conversions from degrees-seconds to radians and back.

### CHANGES IN CONTENT OBJECTIVES

**Date of Change:**

**QUINEBAUG VALLEY COMMUNITY COLLEGE**

**COURSE RECORD  
MFG 109 Introduction to MasterCAM**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 109	Introduction to MasterCAM	3, 3 contact hours	

**Prerequisite:** Completion of MAT\*085 or higher with a C or better, or Accuplacer Arithmetic score of 230 or better.

CHANGES IN PREREQUISITES	Date of Change:

<b>TAP Competency:</b> Competency satisfied
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**Catalog Description:**

This course introduces the student to computer-based CAD/CAM (Computer-Aided Drafting/ Computer-Aided Manufacturing) using MasterCAM software, an industry standard. CAD/CAM uses CAD drawing tools to describe geometries of an object. The CAM portion of the program defines the toolpath that directs the motion of a machine tool to create a product that is the exact shape that was drawn. This introductory course familiarizes the student to MasterCAM using mill, lathe, and solids tutorials. (3 credits)

CHANGES IN CATALOG DESCRIPTION	Date of Change:

**Course Content Objectives:**

Upon completion of this course, students will be able to:

- use appropriate terminology relating to CAD/CAM software and machining operations
- navigate through MasterCAM
- use the Status Bar to set up attributes
- create 2-D and 3-D drawings
- identify milling, and turning operations
- use MasterCAM software to set up milling and turning operations
- select the correct machine and set up the material for the assigned task
- select the appropriate tooling to perform milling and turning operations
- run milling and turning simulations and
- use the software to write programs to fabricate parts

CHANGES IN CONTENT OBJECTIVES	Date of Change:

QUINEBAUG VALLEY COMMUNITY COLLEGE

## MFG\* 110 - Solidworks

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Dept. & Course No.	Course Name	No. of Credits	No. of Contact Hrs.	Date of Approval
MFG* 110	Solidworks	3	3	11/13/019

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**Prerequisite:** Completion of MAT\* 085 or higher with a C or better, or Accuplacer Arithmetic score of 230 or better

**CHANGES IN PREREQUISITES**

**Date of Change:**

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### Catalog Description

SolidWorks design focuses on parametric modeling while introducing the student to the paperless computer-based design process utilizing the modern parametric 3-D design software SolidWorks. The course reviews the following topics: design process, design engineering, assembly modeling, mechanism analysis, rapid prototyping, team design, geometric dimensioning and tolerancing, and the analysis of tolerance stackups. Students will participate in individual and team design projects.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

### Course Content Objectives – MFG\* 110

The student will:

- Demonstrate a basic understanding of the fundamentals of Part Modeling.
- Demonstrate an understanding of the extrude and resolve features.
- Demonstrate an understanding of the fundamentals of drawing.
- Demonstrate an understanding of Sweep, Loft, Wrap, and Additional Features.
- Demonstrate an understanding of the fundamentals of assembly modeling.
- Demonstrate an understanding of top-down assembly modeling.
- Demonstrate an understanding of Rapid Prototyping.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**

## MFG\* 115 – Safety in the Workplace

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 115	Safety in the Workplace	1	4/5/18

**Prerequisite:** Eligible for MAT\* 095 or Higher

<b>CHANGES IN PREREQUISITES</b>	<b>Date of Change:</b>
Eligible for MAT* 095 or Higher and Instructor Permission	5/3/18

### Catalog Description

This course provides an introduction to the safety and health issues encountered in a manufacturing environment. This course introduces students to the concepts of personal and work environment safety requirements of manufacturers as well as the governmental oversight agencies such as OSHA.

<b>CHANGES IN CATALOG DESCRIPTION</b>	<b>Date of Change:</b>
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### Course Content Objectives – MFG\* 115

The student who completes this course will be able to:

- Demonstrate an understanding of Personal Protective Equipment (PPE);
- Demonstrate an understanding of the Occupational Safety & Health Act (OSHA);
- Demonstrate an understanding of lockout/tagout safety systems;
- Demonstrate an understanding of safe operation of lathes, drill press, saws and milling machines;
- Demonstrate an understanding of MSDS;
- Demonstrate an understanding of Blood-borne Pathogens;
- Demonstrate an understanding of Confined Space Entry;
- Demonstrate an understanding of Walking and Working Surfaces.

<b>CHANGES IN CONTENT OBJECTIVES</b>	<b>Date of Change:</b>
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QUINEBAUG VALLEY COMMUNITY COLLEGE

***COURSE RECORD***

**MFG\* 120 – Metrology**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 120	Metrology	3	2/19/13

**Prerequisite:** MFG\* 105 which may be taken concurrently, or MAT\* 137

**CHANGES IN PREREQUISITES**

**Date of Change:**

**Catalog Description**

This course is designed to develop dimensional measurement ability for inspectors, technicians, quality control personnel, and others who require this skill in their manufacturing environment. This course will emphasize open inspection methods.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\* 120**

The student who completes this course will be able to:

- Determine which measurement technique is appropriate to measure to a required precision;
- Measure lengths and positions using common tools, such as calipers, micrometers, and gage blocks;
- Measure angles using common tools, such as protractors and sine bars;
- Operate a coordinate measuring machine (CMM);
- Measure a part using an optical comparator

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**



**COURSE RECORD**

**MFG\* 124 – Blueprint Reading I**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 124	Blueprint Reading I	2	4/12

**Prerequisite:** Completion of Manufacturing Foundations or permission of instructor

<b>CHANGES IN PREREQUISITES</b>	<b>Date of Change:</b>
Eligible for MAT* 095 or Higher and Instructor Permission	5/3/18

**Catalog Description**

An initial course in Blueprint Reading. The study of orthographic projection. Topics include, lines and their uses, auxiliary views, sectional views, basic and special dimensioning, dimensioning practices for holes, chamfers, angle, tapers, keyways diameters, radii, and geometric tolerancing.

<b>CHANGES IN CATALOG DESCRIPTION</b>	<b>Date of Change:</b>
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**Course Content Objectives – MFG\* 124**

The student who completes this course will be able to:

- Understand lines and their uses in orthographic projections;
- Understand auxiliary and sectional views;
- Be able to read and use dimensioning on drawings;
- Understand geometric dimensioning and tolerancing and surface texture requirements.

<b>CHANGES IN CONTENT OBJECTIVES</b>	<b>Date of Change:</b>
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**COURSE RECORD**

**MFG\* 125 – Blueprint Reading II**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 125	Blueprint Reading II	3	4/12

**Prerequisite:** Completion of Machine Technology Level I Cert, or with consent of instructor,  
MFG\* 124: Blueprint Reading I

**CHANGES IN PREREQUISITES**

MFG\* 124: Blueprint Reading I

**Date of Change:**

11/7/14

**Catalog Description**

Second course in blueprint reading. A further study of simple and complex drawings for machining or assembly purposes. Topics include the application and meaning of geometric characteristics and controls, the metric system, weldment, forging and casting drawings and procedures, communication with freehand sketches, blueprint terms and abbreviations.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\* 125**

The student who completes the course will be able to:

- Understand weldment, forging and casting drawings and procedures;
- Communicate with freehand sketches;
- Demonstrate proficiency with blueprint terms and abbreviations;
- Apply geometric characteristics and controls.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**

**COURSE RECORD**

**MFG\* 126 – Drafting**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 126	Drafting	3	4/06

**Prerequisite:**

**CHANGES IN PREREQUISITES**

**Date of Change:**

**Catalog Description**

This course is an introduction to the standard practices of drafting. Emphasis will be placed on interpreting and generating different component views and projections. Topics include dimensioning, drawing scales, multi-view drawings, auxiliary views, sectional views, and drawing layout information.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\* 126**

The student will:

- Demonstrate an understanding of dimensioning and drawing layout standard practices;
- Demonstrate an understanding of selecting appropriate scale for drawing layouts;
- Demonstrate an ability to use mechanical drawing tools to accurately represent a component in a two-dimensional planer drawing.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**



**COURSE RECORD**

**MFG\* 133 – Mathematics for Electricity and Electronics**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 133	Mathematics for Electricity and Electronics	3	3/22/17

**Prerequisite:** Eligible for MAT\* 095 or Higher

**CHANGES IN PREREQUISITES**

**Date of Change:**

**Catalog Description**

Mathematics for Electricity and Electronics is intended for the student who needs in-depth knowledge of the mathematics of electronics and electricity. It will review several areas that the student may be familiar with and move into advanced areas that are necessary for the understanding of electronics functions and analysis of complex circuits, including: the basic laws of arithmetic, the powers of numbers, scientific notation, literal equations, trigonometry of the right triangle, basic geometric concepts of angles, fractional exponents, and frequency distribution.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\* 133**

At the end of the course the student will:

- Demonstrate an understanding of the basic laws of arithmetic;
- Demonstrate an understanding of the decimal numbering system
- Demonstrate an understanding of the powers of numbers;
- Demonstrate knowledge of scientific notation;
- Demonstrate knowledge of the meaning of a literal equation;
- Demonstrate knowledge of various computer number systems;
- Demonstrate an understanding of the trigonometry of the right triangle;
- Translate verbal problems into mathematical equations and solve them;
- Demonstrate knowledge of the basic geometric concepts of angles;
- Demonstrate how to work with reference angle and reference triangles;
- Demonstrate knowledge of fractional exponents and how they are applied;
- Demonstrate knowledge of a histogram by graphing a frequency distribution.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**



QUINEBAUG VALLEY COMMUNITY COLLEGE

**COURSE RECORD**  
**MFG 137 Circuit Theory I**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 137	Circuit Theory	3 / 3 contact hrs	

**Prerequisite:** Completion of MAT\*085 or higher with a C or better, or Accuplacer Arithmetic score of 230 or better.

CHANGES IN PREREQUISITES	Date of Change:

<b>TAP Competency:</b> Competency satisfied
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**Catalog Description:**

The circuit is the fundamental building block for all electrical and electronic devices that make our life comfortable and efficient. There are several principles that determine the flow of electricity that any student of electricity or electronics must learn in order to understand the nature and abilities of electrical and electronic equipment.

Circuit Theory I is an introduction to direct current (DC) circuits. Circuit Theory I will introduce the student to electrical/electronic components; the nature of electricity (voltage, current, and resistance); Ohm's Law of measurement; the concept of energy and power; types of circuits (series, parallel, and series-parallel); Thevenin's and Norton's Theorems of circuit simplification, and magnetism and electro magnetism.

CHANGES IN CATALOG DESCRIPTION	Date of Change:

**Course Content Objectives:**

At the end of this course the student will:

- Demonstrate an understanding of electrical components, electrical and magnetic quantities and their units, scientific and engineering notations, and metric conversion.
- Demonstrate an understanding of the theory of electrical structure, voltage, current, resistance, and electrical circuit and their measurement.
- Demonstrate an understanding of Ohm's Law and apply Ohm's Law to the measurement of current, voltage, and resistance in a circuit.
- Demonstrate an understanding of the concepts of energy and power, power in circuits, resistance, and power supply.
- Demonstrate an understanding of the concept of a series circuit and of its physical construction, and demonstrate an understanding of the application of Ohm's law and Kirchhoff's voltage law to a series circuit.
- Demonstrate an understanding of a concept of a parallel circuit and of its physical construction, and demonstrate an understanding of the application Ohm's and Kirchhoff law to a parallel circuit.
- Demonstrate an understanding of the concept of a series-parallel circuit and of its physical construction, and demonstrate an understanding of the application of Ohm's and Kirchhoff's laws to a series-parallel circuit.
- Demonstrate an understanding of superposition theorem to circuit analysis and an understanding of Thevenin's and Norton's theorems of circuit simplification.
- Demonstrate an understanding of the principles of magnetism and of electromagnetism.

CHANGES IN CONTENT OBJECTIVES	Date of Change:

**COURSE RECORD**

**MFG\* 138 – Digital Fundamentals**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 138	Digital Fundamentals	3	3/22/17

**Prerequisite:** Eligible for MAT\* 095 or Higher

**CHANGES IN PREREQUISITES**

**Date of Change:**

**Catalog Description**

Digital circuitry is the foundation of computers and automated control equipment in our industries. Digital circuitry is the basis for many of our appliances, alarm systems and heating systems. Our newer automobiles utilize digital circuits and devices to make them safer and more energy-efficient. Consequently, a basic understanding of the elemental nature, design, theory, and operation of digital circuits is necessary for any electronics student.

This course provides the foundation necessary for the understanding of digital logic. The student is introduced to the concepts of digital vs. analog waveforms, digital and other numbering systems, digital codes, and Boolean algebra. The student is then introduced to the various logic gates that are incorporated into all logic systems from that of a computer to a microprocessor in a household appliance. This course explores the combination circuits, data control devices, sequential logic (flip-flop and counters) circuits and shift registers, communications protocols, and finishes with an interface with the world of analog.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\* 138**

At the end of the course the student will:

- Demonstrate an understanding of several number systems and codes that are the foundation of digital theory and digital applications;
- Demonstrate an understanding of the various logic gates, their role in an integrated circuit (IC) and their role in digital devices, such as a switch;
- Demonstrate an understanding of combinational logic circuits, an understanding of Boolean algebra laws and rules for the simplification of logic circuits, and an understanding of DeMorgan's theorem and Karnaugh's mapping procedures;
- Demonstrate an understanding of the design and function of fixed-function IC's that are utilized by data control devices, such as comparators, encoders, decoders, multiplexers and demultiplexers.
- Demonstrate an understanding of data storage circuitry represented by various types of flip-flops and latches;
- Demonstrate an understanding of the design and application of sequential logic of the counter circuits and of the shift register;
- Demonstrate an understanding of common protocols;
- Demonstrate an understanding of the conversion of analog data/signal to digital data/signal and of digital to analog.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**



QUINEBAUG VALLEY COMMUNITY COLLEGE

**COURSE RECORD**  
**MFG\* 140 Robotics**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG*140	Robotics	3	3/22/17

**Prerequisite:** Eligible for MAT\* 095 or Higher, MFG\*143 Industrial Motor Controls, MFG\*146 Programmable Logic Controllers, and MFG\*138 Digital Fundamentals. MFG\*138 Digital Fundamentals may be taken concurrently.

CHANGES IN PREREQUISITES	Date of Change:

<b>TAP Competency:</b>
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**Catalog Description:**

Robotics provides the student with a brief history of the application of robotics to the manufacturing process to date and a vision of future applications of robotics. Robotics provides an overview of the robotic hardware, software, and programming necessary to specific applications. Robotics reviews the following: electromechanical systems, fluid power systems, sensing systems, end-of-arm tooling, programmable logic controllers (PLC's), digital electronics, programming, and industrial applications.

CHANGES IN CATALOG DESCRIPTION	Date of Change:

**Course Content Objectives:**

At the end of this course, the student will:

- Demonstrate an understanding of robotics history, early robots, and the role of the robot in industry;
- Demonstrate an understanding of the complex robotic system by breaking the system down into subsystems.;
- Discuss the concepts and methods of programming the robot;
- Explore industrial applications of robots through the integration of robotics into the manufacturing process;
- Discuss the role of robotics in today's customer-driven manufacturing;
- Discuss the electromechanical system and its role in automation and the use of robots;
- Demonstrate an understanding of the role of fluid power systems in manufacturing;
- Demonstrate a basic understanding of robotics maintenance, including hydraulic, pneumatic, electrical power systems, and electronic control systems;
- Demonstrate an understanding of the use of sensors to give robots a higher level of intelligence by improving decision-making capabilities;
- Explore the use of end-of-arm tooling as a tool for robot grasping, lifting, transporting, and maneuvering;
- Demonstrate an understanding of the digital electronics used to store information, count, encode, and decode as it applies to robotics;
- Explore the use of the programmable logic controller as a device for controlling the robot;
- Demonstrate an understanding of robot interfacing with other production equipment;
- Explore the future of robotics including computer-integrated manufacturing.

CHANGES IN CONTENT OBJECTIVES	Date of Change:

**QUINEBAUG VALLEY COMMUNITY COLLEGE**

**COURSE RECORD**  
**MFG\* 142 Electronic Circuits & Devices**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG*142	Electronic Circuits & Devices	3	3/22/17

**Prerequisite:** Eligible for MAT\* 095 or Higher.

CHANGES IN PREREQUISITES	Date of Change:

<b>TAP Competency:</b>
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**Catalog Description:**

Electronic circuits and devices are commonplace in the industrial manufacturing process; consequently, a complete understanding of control circuits and devices is necessary for anyone who intends to have a career in manufacturing control, maintenance, or engineering.

Electronic Circuits & Devices provides an introduction to electronic materials, components, circuits, devices and their applications. The course will provide an overview of semiconductors, diodes, transistors (bi-polar, field-effect and unijunction), applications of silicon-controlled rectifiers (SCR's) and triodes for alternating current (TRIAC's) to circuits, and application of components to rectifiers, amplifiers, and relays.

CHANGES IN CATALOG DESCRIPTION	Date of Change:

**Course Content Objectives:**

At the end of this course, the student will:

- Demonstrate an understanding of the construction of semiconductor devices and the material from which they are constructed;
- Demonstrate an understanding of the significance of heat to semiconductors and the devices and materials used to address this issue;
- Demonstrate an understanding of basic diode operation and testing;
- Demonstrate the use of the diode in a variety of rectifier applications;
- Apply the filtering process to a variety of rectifiers;
- Select and apply bi-polar transistors to amplifier applications;
- Select and apply Field Effect Transistors to amplifier applications;
- Apply unijunction transistors to timing applications;
- Utilize the silicon-controlled rectifier (SCR) in alternating current (AC) and direct current (DC) circuits;
- Apply phase shifting circuitry to the SCR;
- Select and apply a TRIAC to AC circuits including phase shifting;
- Select and apply solid-state relays;
- Explore oscillator applications;
- Utilize off-delay and on-delay solid-state timers;
- Select and utilize various operational amplifiers.

CHANGES IN CONTENT OBJECTIVES	Date of Change:



**QUINEBAUG VALLEY COMMUNITY COLLEGE**

***COURSE RECORD***

**MFG\* 143 Industrial Motor Control**

<b>Dept. &amp; Course No.</b>	<b>Course Name</b>	<b>No. of Credits</b>	<b>Date of Approval</b>
MFG*143	Industrial Motor Control	3	3/22/17

**Prerequisite:** Eligible for MAT\* 095 or Higher

<b>CHANGES IN PREREQUISITES</b>	<b>Date of Change:</b>

<b>TAP Competency:</b>
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**Catalog Description:**

In the global economy of today, it is imperative that the manufacturing of each product is as cost-efficient as is physically possible. This efficiency is brought about through the application of the latest technology to the manufacturing process.

The process of motor control is integral to the flow of the product from raw material to finished product. Industrial Motor Control will familiarize the student with the following: principles of solid-state control devices and their components (such as semiconductors, p-n junction, Zenor diodes, and transistors); alternating current (AC) and direct current (DC) motor controls; motor drives; control circuits; motor starters and pilot devices.

<b>CHANGES IN CATALOG DESCRIPTION</b>	<b>Date of Change:</b>

**Course Content Objectives:**

At the end of this course, the student will:

- Demonstrate an understanding of the general principles of Electric Motor Controls;
- Discuss the family of pilot devices used in motor control and install and troubleshoot them;
- Select, install and troubleshoot push-button stations, relays and contactors;
- Demonstrate an understanding of specialized sensing devices, as well as install and troubleshoot them;
- Select, install and troubleshoot fractional and integral horsepower manual motor starters and magnetic line voltage starters;
- Select, install and troubleshoot hand-off automatic control circuitry, multiple-push-button stations, and methods of interlocking to include mechanical and electrical;
- Select, install and troubleshoot systems for sequence control, jogging, and plugging;
- Demonstrate an understanding of timing relays, pressure switches, and regulators and demonstrate the ability required to select, install and troubleshoot same;
- Discuss "across the line starting" circuitry and identify this method of motor starting from diagrams;
- Identify and discuss the various systems of reduced voltage starting; identify the systems from diagrams; and install and troubleshoot systems;
- Describe synchronous motor operation and methods of controlling the synchronous motor;
- Describe various systems used in industry to control the speed of AC motors, magnetic clutches and drives, and install a variety of AC motors;
- Describe methods of solid-state motor control including digital logic, PC-based controls, and programmable logic controllers (PLC's);
- Identify and discuss solid devices making up solid-state motor control circuitry including diodes, Zenor diodes, and transistors;
- Identify and discuss solid-state devices making up solid state motor control circuitry including the unijunction transistor, silicon-controlled rectifiers (SCR's), diodes for alternating current (DIAC's), and triodes for alternating current (TRIAC's).

<b>CHANGES IN CONTENT OBJECTIVES</b>	<b>Date of Change:</b>





## MFG\* 144 – Hydraulics & Pneumatics

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 144	Hydraulics & Pneumatics	3	4/5/18

**Prerequisite:** Eligible for MAT\* 095 or Higher

### CHANGES IN PREREQUISITES

Date of Change:

### Catalog Description

This course is an introduction to the fundamentals of hydraulics and pneumatics, which involves both theoretical and practical study, including problem solving. Topics will include valves, pumps, circuits, system troubleshooting, and controllers for major processing equipment.

### CHANGES IN CATALOG DESCRIPTION

Date of Change:

### Course Content Objectives – MFG\* 144

The student will:

- Explain the theoretical concepts of hydraulics and pneumatics;
- Understand hydraulic and pneumatics system safety;
- Understand the construction and function of basic fluid power components;
- Understand how hydraulic and pneumatic components are selected and integrated in to systems;
- Explain the operation of basic hydraulic and pneumatic systems;
- Understand basic fluid power symbols and how to interpret simple schematics;
- Troubleshoot simple hydraulic and pneumatic systems

### CHANGES IN CONTENT OBJECTIVES

Date of Change:

**QUINEBAUG VALLEY COMMUNITY COLLEGE**

***COURSE RECORD***

**MFG\* 145 Electronic Variable-Speed Drive Systems**

<b>Dept. &amp; Course No.</b>	<b>Course Name</b>	<b>No. of Credits</b>	<b>Date of Approval</b>
MFG*145	Electronic Variable-Speed Drive Systems	3	3/22/17

**Prerequisite:** Eligible for MAT\* 095 or Higher.

<b>CHANGES IN PREREQUISITES</b>	<b>Date of Change:</b>

**TAP Competency:**

**Catalog Description:**

The flow of product in the manufacturing process can be as simple as an on/off motor control switch or as complex as a variable speed drive that incorporates a feedback system. Most large and small companies utilize the more technologically advanced systems, hence they incorporate one or more variable-speed drive(s) in their production process.

Electronic Variable-Speed Drive Systems will introduce the student to alternating current (AC) and direct current (DC) drive fundamentals, switching amplifier field current controllers, silicon-controlled rectifier (SCR) armature voltage controllers, brushless DC motor controllers, chopper circuits, voltage inverters, and flux vector drives.

<b>CHANGES IN CATALOG DESCRIPTION</b>	<b>Date of Change:</b>

**Course Content Objectives:**

At the end of this course, the student will:

- Demonstrate an understanding of DC drive fundamentals and applications;
- Demonstrate an understanding of switching amplifier field current controllers;
- Demonstrate an understanding of SCR armature voltage controllers;
- Explain the operation of a brushless DC motor and brushless DC motor controller;
- Compare and contrast different types of motor braking methods;
- Describe the operation of chopper circuitry;
- Discuss the operation of a four-quadrant chopper;
- Develop a troubleshooting procedure for troubleshooting DC drives;
- Demonstrate an understanding of AC drive fundamentals and principles;
- Discuss the operation of a variable voltage inverter;
- Explain the operation of a pulse-width modulated variable voltage inverter;
- Explain the operation of current source inverters and compare them to other types;
- Develop and implement a troubleshooting procedure for inverter drives;
- Install a variety of DC and AC electronic drive systems.

<b>CHANGES IN CONTENT OBJECTIVES</b>	<b>Date of Change:</b>



QUINEBAUG VALLEY COMMUNITY COLLEGE

**COURSE RECORD**  
**MFG\* 146 Programmable Logic Controllers**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG*146	Programmable Logic Controllers	3	3/22/17

**Prerequisite:** Eligible for MAT\* 095 or Higher

CHANGES IN PREREQUISITES	Date of Change:

<b>TAP Competency:</b>
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**Catalog Description:**

The incorporation of the Programmable Logic Controller (PLC) is one of the fastest growing sectors in the field of electronics as the PLC replaces electromechanical control systems, such as electromagnetic relays and programmable logic devices (PLD's).

Programmable Logic Controllers provides the student with an overview of the PLC, its hardware, numbering systems and codes, logic fundamentals, programming timers and counters, program control and data manipulation instructions, math instructions, sequencer and shift register instructions, and PLC installation, editing and troubleshooting.

CHANGES IN CATALOG DESCRIPTION	Date of Change:

**Course Content Objectives:**

At the end of this course, the student will:

- Demonstrate familiarity with the PLC system and its role in industry;
- Demonstrate an understanding of the hardware and the role of each major component making up a PLC system;
- Demonstrate an understanding of several numbering systems utilized by a PLC system;
- Demonstrate an understanding of digital logic gates and of the role Boolean algebra plays in writing digital gate diagrams;
- Demonstrate the ability to design basic programming using ladder logic and demonstrate the understanding of basic principles involved in programming;
- Develop PLC wiring diagrams and ladder logic programs;
- Design, develop, and program a variety of timer instructions;
- Design, develop, and program a variety of counter instructions;
- Design, develop, and program a variety of control instructions;
- Design, develop, and program data manipulation instructions;
- Design, develop, and program math instructions;
- Design, develop, and program sequencer and shift register instructions;
- Perform PLC installations and troubleshoot PLC installations;
- Demonstrate an understanding of process control and data acquisition systems;
- Demonstrate an understanding of computer-controlled machines and processes.

CHANGES IN CONTENT OBJECTIVES	Date of Change:



# MFG\* 150 – Introduction to Machine Technology

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 150	Introduction to Machine Technology	4	4/5/18

**Prerequisite:** Eligible for MAT\* 095 or Higher.

## CHANGES IN PREREQUISITES

Eligible for MAT\* 095 or Higher and Instructor Permission.

**Date of Change:**

5/3/18

## Catalog Description

Introduction to Machine Technology introduces the student to fundamentals of machining practices. The student will learn to operate the machine tools used in today's manufacturing environment. This will include drill press, cut-off saws, surface grinders, lathes and milling machines. The lab portion includes various projects using all of the machines listed. Extensive practice in Metrology is an important part of this class so the student completely understands blueprint interpretation as well as the ability to measure projects to meet print specifications.

## CHANGES IN CATALOG DESCRIPTION

**Date of Change:**

## Course Content Objectives – MFG\* 150

The student will:

- Demonstrate and understand the use of most measuring devices used in the manufacturing environment. This includes steel rules, micrometers, dial calipers, gage blocks and indicators;
- Understand and use various work holding devices in a lathe;
- Set up and operate manual lathes performing facing, turning, cutting tapers and drilling and tapping;
- Understand and demonstrate the ability to sharpen drills and grind high speed tool bits;
- Set up and operate manual milling machines performing facing, squaring, drilling and tapping, milling slots, tramming heads and indicating vises;
- Set up and operate a surface grinder to achieve surface finish and precision tolerances. The student will dress wheels and use appropriate tooling to spin grind and grind angles using a sine plate;
- The student will understand basic materials and determine cutting speeds for different operations.

## CHANGES IN CONTENT OBJECTIVES

**Date of Change:**

**COURSE RECORD**

**MFG\* 151 – Manufacturing Machinery – Drill Press and Saw**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 151	Manufacturing Machinery – Drill Press & Saw	1	4/12

**Prerequisite:** Completion of Manufacturing Foundations or permission of instructor.

**CHANGES IN PREREQUISITES**

Eligible for MAT\* 095 or Higher and Instructor Permission.

**Date of Change:**

5/3/18

**Catalog Description**

Course on Sawing and Drilling Machines. Topics covered include, use of cutoff saws, use of drill presses, using the vertical band saw, drilling tools, countersinking, reaming and counterboring.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\* 151**

The student who completes the course will be able to:

- Setup and operate a horizontal band saw;
- Setup and operate a vertical band saw;
- Setup and operate a drill press;
- Grind drills using the pedestal grinder;
- Drill, counterbore, ream, and countersink using the drill press.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**

**COURSE RECORD**

**MFG\* 152 – Manufacturing Machinery – Grinding**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 152	Manufacturing Machinery – Grinding	2	4/12

**Prerequisite:** Completion of Manufacturing Foundations or permission of instructor.

**CHANGES IN PREREQUISITES**

Eligible for MAT\* 095 or Higher and Instructor Permission.

**Date of Change:**

5/3/18

**Catalog Description**

Course on the use of various grinding machines. Topics covered include, selection and identification of grinding wheels, truing, dressing and balancing wheels, grinding fluids, using the horizontal spindle reciprocating table surface grinder, and using the tool and cutter grinder.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\* 152**

The student who completes the course will be able to:

- Select the proper grinding wheel;
- True, balance and dress a grinding wheel;
- Know the value and use of cutting fluids;
- Be able to use a surface grinder;
- Be able to use a cutter grinder.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**

QUINEBAUG VALLEY COMMUNITY COLLEGE

**COURSE RECORD**

**MFG\* 153 – Manufacturing Machinery – Benchwork**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 153	Manufacturing Machinery – Benchwork	2	4/12

**Prerequisite:** Completion of Manufacturing Foundations or permission of instructor.

**CHANGES IN PREREQUISITES**

Eligible for MAT\* 095 or Higher and Instructor Permission.

**Date of Change:**

5/3/18

**Catalog Description**

A basic course in the fundamentals, principles, practices, and tools used in semi-precision and precision layout and in the various tools, methods and procedures for common machine shop benchwork. Topics will include, measurement systems, layout principles, hand tools and power tools.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\* 153**

The student who completes the course will be able to:

- Use units of measure;
- Identify various types of fasteners;
- Understand fits and tolerances;
- Understand the difference between semi-precision and precision layout;
- Understand the proper use of arbor presses;
- Identify and understand the use of hand tools;
- Use tools to layout semi-precision and precision layout work.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**

**COURSE RECORD**

**MFG\* 154 – Manufacturing Machinery – Lathe I**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 154	Manufacturing Machinery – Lathe I	2	4/12

**Prerequisite:** Completion of Manufacturing Foundations or permission of instructor.

**CHANGES IN PREREQUISITES**

Eligible for MAT\* 095 or Higher and Instructor Permission.

**Date of Change:**

5/3/18

**Catalog Description**

First course in the use of the lathe. Topics include, identification of major components of the lathe, tool holders and tool holding, cutting tools, operating the controls, facing and center drilling.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\* 154**

The student who completes the course will be able to:

- Identify the most important parts of a lathe and their functions;
- Do simple preventive maintenance on a lathe;
- Make simple adjustments to the lathe;
- Identify tool holders;
- Understand tool geometry for lathe cutting tools;
- Know the uses and care of chucks, collets and face drivers;
- Know how to shift speeds and feeds and use controls on the lathe;
- Set up parts and face and center drill.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**

# MFG\* 155 – Manufacturing Machinery – Milling I

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 155	Manufacturing Machinery – Milling I	2	4/12

**Prerequisite:** Completion of Manufacturing Foundations or permission of instructor.

**CHANGES IN PREREQUISITES**

**Date of Change:**

## Catalog Description

First course on the vertical and horizontal milling machines. Topics to include, cutting tools and holders, setups, spindles and arbors, work holding methods.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

## Course Content Objectives – MFG\* 155

The student who completes the course will be able to:

- Identify the major components of the vertical milling machine;
- Identify the major components of the horizontal milling machine;
- Understand the use of different cutting tools and cutter holders for the vertical milling machine;
- Understand the use of arbor driven milling cutters for the horizontal milling machine;
- Understand setups for both the horizontal and vertical milling machines.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change**

# MFG\* 156 – Manufacturing Machinery – CNC I

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 156	Manufacturing Machinery – CNC I	2	4/12

**Prerequisite:** Completion of Manufacturing Foundations or permission of instructor.

## CHANGES IN PREREQUISITES

Eligible for MAT\* 095 or Higher and Instructor Permission.

**Date of Change:**

5/3/18

## Catalog Description

First course in Computer Numerical Controlled machinery and programming. Topics include, Cartesian coordinates, safe use of CNC equipment, setup and operate a two axis CNC lathe and a three axis CNC machining center, programming and runoff of parts.

## CHANGES IN CATALOG DESCRIPTION

**Date of Change:**

## Course Content Objectives – MFG\* 156

The student who completes the course will be able to:

- Understand the Cartesian coordinate system as it relates to a CNC lathe and a CNC milling machine;
- Understand the safe use of the CNC equipment;
- Setup and operate a two axis CNC lathe;
- Setup and operate a three axis CNC vertical machining center;
- Program simple parts for a CNC lathe using a conversational control;
- Program simple parts in G code language for a CNC vertical machining center.

## CHANGES IN CONTENT OBJECTIVES

**Date of Change:**

QUINEBAUG VALLEY COMMUNITY COLLEGE

**COURSE RECORD**  
**MFG\* 159 Industrial Maintenance**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG*159	Industrial Maintenance	3	3/22/17

**Prerequisite:** Eligible for MAT\* 095 or Higher

CHANGES IN PREREQUISITES	Date of Change:

<b>TAP Competency:</b>
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**Catalog Description:**

The industrial maintenance course is designed to give the student an overview of the mechanical nature of industry. Even though electronic devices have made great inroads in industry, the mechanical nature of production remains nearly unchanged over the years. The expression the "wheels of industry" remains as true today as it did yesterday. This course will provide the skills necessary to install and to maintain the mechanical parts and machines that provide the ability of manufacturers to produce our manufactured products e.g., automobiles, appliances, etc.

The course covers the following areas: safety, tools, fasteners, industrial print reading, belts and sheaves, chains and sprockets, gears and gearboxes, bearings, shafts, lubrication, seals and packings, pumps and compressors, fluid power, piping systems, and preventive maintenance.

CHANGES IN CATALOG DESCRIPTION	Date of Change:

**Course Content Objectives:**

At the end of this course, the student will:

- Demonstrate an understanding of maintaining a safe working environment;
- Demonstrate an understanding of the common hand and power tools used in industry today;
- Demonstrate an understanding of the common fasteners used in industry today;
- Demonstrate an understanding of electrical, welding, and mechanical prints and schematics;
- Demonstrate an understanding of the methods used to transmit mechanical energy from one point to another point in an industrial setting;
- Demonstrate an understanding necessary to select, install, remove and troubleshoot bearings in the industrial setting;
- Demonstrate an understanding of the methods used to align shafts;
- Demonstrate an understanding of the need for lubrication, methods of lubrication, and the types of lubrication;
- Demonstrate an understanding of the need for seals and packings, types of seals and packings, and demonstrate an understanding of installing and of troubleshooting seals and packings in an industrial setting;
- Demonstrate an understanding of the pumps and compressors used in industry today and troubleshoot common problems encountered by industrial pumps and compressors;
- Demonstrate an understanding of the basics of a fluid power system, several of the components used in a fluid power system, and several applications of fluid power;
- Demonstrate an understanding of the types of piping systems and understanding of the installation of piping systems;
- Demonstrate an understanding of the necessity for and installation of a preventive maintenance program;
- Implement a preventive maintenance program through visual inspections.

CHANGES IN CONTENT OBJECTIVES	Date of Change:



**QUINEBAUG VALLEY COMMUNITY COLLEGE**

**COURSE RECORD  
MFG 160 Intro to GD&T**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG 160	Introduction to Geometric Dimensioning & Tolerancing	3, 3 contact hours	

**Prerequisite:** MFG 124 Blueprint Reading I

CHANGES IN PREREQUISITES	Date of Change:

<b>TAP Competency:</b> Competency satisfied
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**Catalog Description:**

Geometric Dimensioning and Tolerancing (GD&T) is a language used on mechanical engineering drawings composed of symbols used to communicate accurately and efficiently geometry requirements for associated features on components and assemblies. GD&T is, and has been, successfully used for many years in the automotive, aerospace, electronic and the commercial design and manufacturing industries. In today's modern and technically advanced design, engineering and manufacturing world, effective and accurate communication is required to ensure successful end products. Topics include the following: introduction to symbols and terms, limits to size, data reference frame, form tolerance, geometric system functionality, orientation tolerances, position tolerances, profile tolerances, coaxial tolerances, tolerance analysis, and applications.

CHANGES IN CATALOG DESCRIPTION	Date of Change:

**Course Content Objectives:**

At the end of this course the student will:

- Demonstrate an understanding of all the symbols used in GD&T.
- Demonstrate an ability to determine the acceptability of manufactured parts based on GD&T requirements.
- Demonstrate an ability to use GD&T symbols on an engineering drawing to completely specify the form and limits of variation of features.
- Demonstrate an ability to use GD&T symbols to specify the form and limits of variation of mating parts to insure that they will assemble properly
- Demonstrate an understanding of datums and datum reference frames.
- Demonstrate an understanding of virtual conditions and their application to tolerancing mating parts.

CHANGES IN CONTENT OBJECTIVES	Date of Change:

**QUINEBAUG VALLEY COMMUNITY COLLEGE**

**COURSE RECORD**  
**MFG\* 162 CNC Maintenance & Repair I**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG*162	CNC Maintenance & Repair I	3	3/22/17

**Prerequisite:** Eligible for MAT\* 095 or Higher.

CHANGES IN PREREQUISITES	Date of Change:

<b>TAP Competency:</b>
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**Catalog Description:**

CNC Maintenance & Repair I provides the student with an introduction to computer numerical control (CNC) machinery including the CNC mill & CNC lathe. Topics include: CNC safety, basic CNC components, basic operations of a CNC, overview of the control unit and operator's unit, CNC part programming, CNC operation and interfacing (programmable machine controller (PMC) system), measurement devices, and troubleshooting techniques. CNC Maintenance & Repair I is designed to give the student an in-depth overview of the design, programming, and operation of CNC machinery, thereby providing the foundation for CNC maintenance & repair.

CHANGES IN CATALOG DESCRIPTION	Date of Change:

**Course Content Objectives:**

At the end of this course, the student will:

- Demonstrate the ability to safely operate CNC equipment;
- Demonstrate a basic understanding of the CNC mill, lathe and grinder;
- Demonstrate the ability to utilize the function/soft keys and to view the function screens;
- Demonstrate the ability to utilize the Manual Data Input (MDI) controls to enter basic commands;
- Demonstrate the ability to use correctly the manual pulse generator;
- Demonstrate a basic ability to use the operator panel to control operations on a CNC machine;
- Demonstrate the ability to identify the components of a CNC Part Program;
- Demonstrate the ability to enter correctly a part program into the CNC controller's memory;
- Demonstrate the ability interact with the PMC control system menu;
- Demonstrate the ability to read, interpret, and modify a PMC ladder program;
- Demonstrate the ability to upload and download a ladder program utilizing remote devices and the controller;
- Demonstrate the ability to edit an existing ladder program using the MDI panel;
- Demonstrate the ability to identify and explain the function of the major components of a CNC axis and spindle control system;
- Demonstrate the ability to identify & explain the automatic tool changer control system;
- Demonstrate the ability to utilize the operator's interface to monitor the CNC systems;
- Demonstrate an understanding of several common measurement devices used in machine technology;
- Demonstrate the ability to use correctly part zero & tool offset measurement devices.

CHANGES IN CONTENT OBJECTIVES	Date of Change:

# MFG\* 165 – Intermediate Machine Technology

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 165	Intermediate Machine Technology	3	4/5/18

**Prerequisite:** MFG\* 150, Introduction to Machine Technology and Instructor Permission.

## CHANGES IN PREREQUISITES

Eligible for MAT\* 095 or Higher and Instructor Permission.

**Date of Change:**

5/3/18

## Catalog Description

Intermediate Machine Technology builds on the successful completion of the Intro to Machine Technology. The student understands the operation of the various machine tools used in the industry. The student also has demonstrated the ability to perform machining practices to complete a project with step-by-step instructions. The Intermediate program pushes the student by allowing them to make the necessary choices to take a project from beginning to conclusion.

## CHANGES IN CATALOG DESCRIPTION

**Date of Change:**

## Course Content Objectives – MFG\* 165

The student will:

- Understand and perform the following lathe applications: single point threading both external and internal, drill, bore, undercut, knurl, cut both O-rings and snap rings. Remove tapers and machine outside diameters to .0005;
- Understand and perform the following milling applications: facing, squaring, drilling, tapping, boring, cut slots, fly cutting. Indicating parts and perform many ProtoTRAK functions via canned cycles. This includes circular interpolation, pocket milling, bolt hole circles, island and profiles as well as mirror and repeat commands;
- Use a surface grinder to achieve surface finish and tolerances to .0002;
- Understand various types of fits such as clearance, slide fits or interference;
- Demonstrate the ability to check perpendicularity, parallelism and flatness with the use of surface gages, squaring blocks and tenth indicators.

## CHANGES IN CONTENT OBJECTIVES

**Date of Change:**

# MFG\* 168 – Computer Numerical Control I

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 168	Computer Numerical Control I	3	4/5/18

**Prerequisite:** Eligible for MAT\* 095 or Higher.

## CHANGES IN PREREQUISITES

Eligible for MAT\* 095 or Higher and Instructor Permission.

**Date of Change:**

5/3/18

## Catalog Description

This course is the first step in understanding Computer Numerical Control and the commands needed to perform lathe and milling operations with conversational programming. It covers the Cartesian coordinate system and basic programming practices. It covers all the canned cycles that can be performed in both the ProtoTRAK lathe and milling machine. The student gains confidence by being able to control the 3<sup>rd</sup> axis by hand operating the quill in the milling machine.

## CHANGES IN CATALOG DESCRIPTION

**Date of Change:**

## Course Content Objectives – MFG\* 168

The student will:

- Understand the Cartesian coordinate system as it relates to CNC lathes and milling machines;
- Operate ProtoTRAK milling machines to manufacture jobs as projects using various commands for pocket milling both circular and rectangular. Utilize features such as mirror, repeat, bolt hole circles, connecting radius, arcs, islands and profiles, circular interpolation and cutter compensation;
- Operate the ProtoTRAK lathe to do simple conversational programming to face, turn, drill and tap as well as cutting tapers and some single point thread cutting;
- Understand and learn the beginning stages of a 3 axis machining center to set offsets for various tools. The students begin to understand the various G codes and M functions to feel confident in operating a 3 axis machining center.

## CHANGES IN CONTENT OBJECTIVES

**Date of Change:**

**COURSE RECORD**

**MFG\* 171 – Introduction to Lean Manufacturing**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 171	Introduction to Lean Manufacturing	3	

**Prerequisites:**

**CHANGES IN PREREQUISITES**

**Date of Change:**

**Catalog Description**

The purpose of this course is to provide the student with the fundamental knowledge of current continuous process improvement methodologies in use today within competitive manufacturing environments. This introductory course will expose the student to the basic concepts of Lean Manufacturing theory and the various tools and techniques involved with a lean implementation. This course will be presented following the lean-six sigma process methodology of DMAIC (Define, Measure, Analyze, Improve, Control) to ensure that at the completion of the course, the student will be competent to participate effectively as a team member in lean implementation projects.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\* 171**

**The student who completes this course will be able to:**

- Identify and utilize DMAIC problem solving methodology components;
- Effectively participate in kaizen events within manufacturing environments;
- Appreciate value in a process and identify and eliminate wasteful activities within a process;
- Calculate and analyze process related data to help drive improvement;
- Maintain and sustain improvements within the manufacturing process area;
- Understand the principles of continuous improvement and the culture associated with it.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**

**COURSE RECORD**

**MFG\* 172 – Introduction to Lean Supply Chain Management**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 172	Introduction to Lean Supply Chain Management	3	

**Prerequisites:**

**CHANGES IN PREREQUISITES**

**Date of Change:**

**Catalog Description**

The course is an introduction to the basic principles and methodologies of Supply Chain Management. The course reviews the lean manufacturing principles needed to understand and maintain the supply chain. Key concepts are covered such as Value Stream Mapping, customer/supplier roles, supplier types, metrics, quality systems, quality audits, communication, and information flow. Class activities, group assignments, and case studies are emphasized for real-world learning experiences.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\* 172**

**The student who completes this course will be able to:**

- Understand the basic SCM principles;
- Demonstrate how to Value Stream Map the SCM;
- Understand the supplier / customer roles and responsibilities;
- Demonstrate how to describe the supplier base and types;
- Understand supplier evaluations and metrics;
- Understand the role of quality;
- Understand the application of quality audits;
- Understand the role of communication and collaboration;
- Understand the importance of information flow;
- Demonstrate the application of SCM in real-world situations.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**

**COURSE RECORD**

**MFG\* 177 – Machine Technology Fundamentals**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 177	Machine Technology Fundamentals	4	12/5/18

**Prerequisites:**

**CHANGES IN PREREQUISITES**

**Date of Change:**

Eligible for MAT\* 095 or higher

**Catalog Description**

This course is a combination of classroom theory and hands on lab experiences. This course is split with 3-hours classroom and 5-hours lab each week to machine various projects. MFG\* 177 introduces a student to the fundamentals of Metal Machining Technology. The student will learn how to operate Lathe, Milling Machine, Drill Press, Surface Grinders and various Saws. Students perform basic Lathe operations including turning, facing, drilling, reaming and tapping. This will be done in both collets and 3-jaw chucks. The students will also identify the major parts of a knee mill. They will indicate a vise, tram a head and use an edge finder. They will learn how to square a block, and drill tap holes on location. Speeds and feeds are covered in all disciplines. National Institute of Metalworking Skills credentials in both Measurement, Materials & Safety and Job Planning Bench Work and Layout will be tested in this course.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Objectives Lathe portion:**

The student who completes this course will be able to:

- Identify all parts of the lathe and their functions;
- Understand lathe safety precautions;
- Do simple maintenance on a lathe;
- Identify and care for 3 and 4 jaw chucks, collets and centers;
- Identify tool holders;
- Understand feeds and speeds;
- Understand tool types, clearances and rakes;
- Set up parts, turn, face, center drill and drill;
- Understand tapers and perform turning tapers with offset tailstock.

**Course Objectives Milling portion:**

- Identify all parts of a milling machine;
- Understand mill safety procedures and practices;
- Indicate a vise and tram a milling head square to the table;
- Conventional and climb mill to parts dimensions;
- Use and edge finder, drill holes on location;
- Drill & Tap holes;
- Conversational program a ProtoTRAK to mill contours, radius, angles.

**Course Objectives Grinding portion:**

- The student will learn safety practices in a Surface Grinder;
- Mount and dress a wheel;
- Grind surfaces flat and parallel and to specific dimensions;
- Demagnetize parts;
- Grind tool bits and cutters on a bench grinder.

**CHANGES IN CONTENT OBJECTIVES****Date of Change:**

**COURSE RECORD****MFG\* 178 – CNC Fundamentals**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 178	CNC Fundamentals	3	12/5/18

**Prerequisites:****CHANGES IN PREREQUISITES****Date of Change:**

Eligible for MAT\* 095 or higher

**Catalog Description**

This course is a combination of classroom theory and hands on lab experiences. This course is split with 3-hours classroom and 3-hours lab each week to machine various projects. MFG\* 178 introduces a student to the fundamentals of Computer Numerical Controlled machines. The student will learn conversational programming to operate ProtTRAK lathes and milling machines. This is the first step to understand the Cartesian Coordinate System and basic steps and processes to machine parts to blueprint specifications. The students will also learn to operate Haas CNC machines to understand and set tool offsets as well as loading programs. This also includes proper tool and cutter mounting for best performance. Cutter compensation is covered in both areas of conversational and G code language. This includes set up of vises and other work holding devices or fixtures. Indicating surfaces and datum identification is an important part of this class. Basic Geometric Dimensions and Tolerances are explained to meet business and industry standards. This course also includes basic maintenance and care of machines and work areas.

**CHANGES IN CATALOG DESCRIPTION****Date of Change:****Course Objectives:**

The student who completes this course will be able to:

- Understand the Cartesian Coordinate System to program both conversational and G code format;
- Use conversational programming to machine parts using canned cycles for bolt hole circles, pocket milling both circular and rectangle, island milling, and irregular pockets;
- Program and operate both ProtoTRAK Mills and Lathes to cut contours, radiuses, angles and tapers;
- Run an existing program in both Haas Mills and Lathes with tool setting offsets and tool changes;
- Set up all machines with various work holding devices;
- Mount cutting tools in appropriate tool holders;
- Perform basic machine care and maintenance to meet industry standards;
- Understand some of the common G codes and M functions used in CNC;
- Perform downloading and copying of programs in and out of machines;
- Calculate speeds and feeds for different materials and cutter characteristics.

**CHANGES IN CONTENT OBJECTIVES****Date of Change:**

## MFG\* 239 – Geometric Dimension and Tolerancing

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 239	Geometric Dimension & Tolerancing	3	8/7/07

**Prerequisite:** MFG\* 126

**CHANGES IN PREREQUISITES**

**Date of Change:**

### Catalog Description

This course focuses on the interpretation of engineering drawings beginning with the basics of dimensional tolerances and tolerance systems. Topics include: the mathematics of interpreting and specifying tolerances on dimensions, the system of geometric tolerancing, the basic nomenclature and standard symbols conforming to ANSI (American National Standards Institute) standards.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

### Course Content Objectives – MFG\* 239

The student will:

- Demonstrate an understanding of the interpretation of engineering drawings;
- Demonstrate an ability to calculate acceptable tolerance limits;
- Demonstrate an understanding of the nomenclature and symbols associated with specifying geometric tolerances.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**

**COURSE RECORD**

**MFG\* 254 – Manufacturing Machinery – Lathe II**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 254	Manufacturing Machinery – Lathe II	3	4/12

**Prerequisite:** Completion of Machine Technology Level I Certificate or with consent of instructor, MFG\* 154: Manufacturing Machinery – Lathe I

**CHANGES IN PREREQUISITES**

MFG\* 154: Manufacturing Machinery –Lathe I

**Date of Change:**

11/7/14

**Catalog Description**

Second course on lathe setup, operation and practices. Topics covered include alignment, turning between centers, and other operations. The student will cut 60 degree external threads, internal threads, tapers, and other thread forms. Use of steady rests and follower rests.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\* 254**

The student who completes this course will be able to:

- Setup, align, and operate lathes using best practices;
- Cut 60 degree external threads, internal threads, tapers, and other thread forms;
- Understand the use of steady rests and follower rests.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**

**COURSE RECORD**

**MFG\* 255 – Manufacturing Machinery – Milling II**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 254	Manufacturing Machinery – Milling II	3	4/12
<b>Prerequisite:</b> Completion of Machine Technology Level I Certificate or with consent of instructor, MFG* 155: Manufacturing Machinery – Milling I			
<b>CHANGES IN PREREQUISITES</b>			<b>Date of Change:</b>
MFG* 155: Manufacturing Machinery – Milling I			11/7/14

**Catalog Description**

Second course on milling setup, operation, and practices. Topics covered include use of Offset Boring Head, side milling cutters, face milling cutters on the horizontal mill, setup and operation of index heads, simple and direct angular indexing, and inspection of gears.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\* 255**

The student who completes the course will be able to:

- Setup, align, and operate mills using best practices;
- Use face milling cutters on the horizontal mill;
- Setup and operate index heads;
- Inspect gears;
- Use offset boring head and side milling cutters.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**

QUINEBAUG VALLEY COMMUNITY COLLEGE

COURSE RECORD

## MFG\* 256 Manufacturing Machinery-CNC II

Dept. & Course No.	Course Name	No. of Credits	No. of Contact Hrs.	Date of Approval
MFG* 256	Manufacturing Machinery – CNC II	3	6	

**Prerequisite:**

**CHANGES IN PREREQUISITES**

**Date of Change:**

Completion of Machine Technology Level I certificate, or with consent of instructor,  
MFG\*156: Manufacturing Machinery - CNCI

**Catalog Description**

Second course in Computer Numerical Controlled Programming. A further study of CNC programming for the Lathe and Vertical Machining Center. Topics include setup and tooling, programming simple parts, canned drilling cycles, circular interpolation, special milling cycles, cutter compensation, looping and macros, and special features.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\* 256**

The student who completes this course will be able to:

- Setup CNC Lathe VMC using best practices
- Program tooling paths for simple parts
- Understand cutter compensation
- Use macros and loops in CNC process

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**

**COURSE RECORD**

**MFG\* 271 – Advanced Lean Manufacturing**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 271	Advanced Lean Manufacturing	3	

**Prerequisites:** MFG\* 171: Introduction to Lean Manufacturing

**CHANGES IN PREREQUISITES**

**Date of Change:**

**Catalog Description**

The purpose of this course is to provide the student with the knowledge to implement lean improvements within the production environment using a systematic approach. This course will follow an improvement project (from the student's current employer or case study) through the five stages of the DMAIC problem solving methodology. At the completion of the course, the student will be competent to effectively lead a lean implementation project within a company.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\* 271**

**The student who completes this course will be able to:**

- Serve as project team leader for a kaizen event;
- Manage / facilitate team dynamics;
- Determine proper tool usage from the lean toolset for a given project;
- Analyze process / project using lean tools;
- Develop plans for improvements of process / project;
- Document team project improvements for sustainability.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**

**COURSE RECORD**

**MFG\* 272 – Implementing Lean Supply Chain Management**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 272	Implementing Lean Supply Chain Management	3	

**Prerequisites:** MFG\* 172 (Introduction to Lean Supply Chain Management)

**CHANGES IN PREREQUISITES**

**Date of Change:**

**Catalog Description**

The course covers the benefits and elements needed for implementing supply chain management. Team building and communication skills are shown as crucial factors in supply chain management. Topics emphasized in the course are measuring the velocity of the supply chain, developing partnerships, logistics, software tools, hardware, and continuous improvement. Class activities, group assignments and case studies are emphasized for real-world learning experiences.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\* 272**

**The student who completes this course will be able to:**

- Understand the benefits of SCM;
- Understand the composition and interactions of a SCM team;
- Understand the concepts of quality improvement programs;
- Understand the concept of velocity of a supply chain;
- Understand the importance of partnerships with customers and suppliers;
- Understand the logistics for supply chain management;
- Understand the utilization of software and hardware;
- Understand the need for continuous improvement programs;
- Complete an application related to a supply chain.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**

**COURSE RECORD****MFG\* 277 – Advanced Machine Technology**

<b>Dept. &amp; Course No.</b>	<b>Course Name</b>	<b>No. of Credits</b>	<b>Date of Approval</b>
MFG* 277	Advanced Machine Technology	4	12/5/18

**Prerequisites:****CHANGES IN PREREQUISITES****Date of Change:**

Successful completion of MFG\* 177, Machine Technology Fundamentals

**Catalog Description**

This course is a combination of classroom theory and hands on lab experiences. This course is split with 3-hours of classroom theory and 5-hours of lab each week to machine various projects. MFG\* 277 follows up the Intro by providing an in-depth exposure to Metal Machining Technology. The student will learn advanced operations in Lathe, Milling Machine and Surface Grinders. Students perform advanced techniques in the lathe with external and internal single point threading, snap ring, o-ring grooves and boring. The milling portions includes proficiency in the ProtoTRAK conversational programming to machine complex parts. This includes various techniques and fixtures. The importance of machining parts square and parallel becomes apparent with advanced operations in the surface grinder. Tolerances of +- .0002 are measured and confirmed in perpendicularity, parallelism and centrality. This combined with the CNC I and CNC II courses provided yield a student with the skills and disciplines to be an entry-level machinist.

**CHANGES IN CATALOG DESCRIPTION****Date of Change:****Course Objectives Lathe portion:**

The student who completes this course will be able to:

- Understand the Unified National Thread System, cut single point internal and external threads;
- Precision measure all threads with 3 wire, plug gages, ring gages;
- Perform both internal and external grooving and face grooving operations;
- Remove taper from lathes to hold tolerances of +- .0005 in 8 inches, maintain concentricity of .0005;
- Perform parting operations.

**Course Objectives Milling portion:**

- Perform milling operations to create a part from Blueprint without instruction;
- Create personal process sheets to meet blueprint specification;
- Understand precision measuring;
- Perform boring operations to .0005 tolerances;
- Conversational program a ProtoTRAK to mill contours, radius, and angles;

**Course Objectives Grinding portion:**

- The student will understand all portions of surface grinding tools and components, this includes magnetic squaring blocks, magnetic sine plates, compound magnetic sine plates, grinding vises, spin fixtures, precision surface gages;
- The student utilizes a radius dresser to create various contours and angles;
- The student confirms tolerances of .0005 in perpendicularity, parallel and central.

**CHANGES IN CONTENT OBJECTIVES****Date of Change:**

**COURSE RECORD**

**MFG\* 278 – Rapid Prototyping**

Dept. & Course No.	Course Name	No. of Credits	Date of Approval
MFG* 278	Rapid Prototyping	3	

**Prerequisites:** CAD\*271 (CAD Solids Mechanical Pro-Engineer)

**CHANGES IN PREREQUISITES**

**Date of Change:**

**Catalog Description**

Students will be introduced to the emerging technologies of rapid prototyping. This course will review the many different rapid prototyping technologies including their fundamentals, terminology, categories, pros-and-cons, etc. Students in the course will design and prototype in the engineering / manufacturing laboratory with the solid modeling software and the rapid prototyping equipment. Methods and technologies of post production finishing operations will be included in the course curriculum.

**CHANGES IN CATALOG DESCRIPTION**

**Date of Change:**

**Course Content Objectives – MFG\*278**

**The student who completes this course will be able to:**

- Demonstrate an understanding of different rapid prototyping technologies;
- Demonstrate an understanding of the advantages and disadvantages of prototyping techniques;
- Demonstrate an understanding of design-for-manufacture principles;
- Design solid models and construct prototypes in the lab;
- Complete post-production processes and finishes to prototype;
- Demonstrate an understanding of the evaluation techniques of design and prototype.

**CHANGES IN CONTENT OBJECTIVES**

**Date of Change:**