

Burlington County Institute of Technology

Medford Campus

Westampton Campus

CAREER MAJOR PROGRAMS

Course Title: Advanced Manufacturing

Curriculum Area: CTE

Credits: 5

Board Approved: January, 2022

Prepared by: Frank Staff

Advanced Manufacturing Curriculum

I. Course of Study:

A. Introduction to Manufacturing & Safety	(9th)	S1 B4
B. Quality Control & Machine Tool Math	(9th)	S2 B4
C. Manufacturing Processes	(9th)	S2 B4
D. Machining Processes I w/Lab	(10th/11th)	S1 B1
E. Machining Processes II w/Lab	(10th/11th)	S2 B1
F. Introduction to CAD/CAM	(10th/11th)	S1 B2
G. Introduction to Manufacturing Maintenance	(11th/10th)	S1 B1
H. CNC Lathe Operation & Programming	(11th)	S2 B1
I. CNC Mill Operation & Programming	(11th)	S2 B2
J. Blueprint Reading & Solid Modeling	(12th)	S1 B3
K. Advanced CNC Machine Processes	(12th)	S1 B4
L. Properties of Materials	(12th)	S2 B3
M. Welding Technology I	(12th)	S2 B4

II. Program Descriptor:

Advanced Manufacturing is a program designed for students interested in pursuing careers in the fields of Machine Tool Technology such as Tool and Die Makers, CNC Programming, Mechanical Engineering, Industrial Engineering, and Metallurgical Engineering as well as other related fields. The course includes theory and practical application of the following: Proficiency in safely operating machine tools of various types (manual, automatic, and computer controlled).

Knowledge of the working properties of metals and nonmetals. The academic skills, such as: mathematics, science, English, print reading, and metallurgy, needed to make precision layouts and machine setups.

III. Program Outcome:

Graduates of the Advanced Manufacturing program will possess the skills and competencies required for entry-level employment as well as a foundation for pursuing post-secondary education. Upon completion of the course, students can receive certification through the National Institute of Metalworking Skills in the field of Materials, Measurement, and Safety.

IV. Course Descriptions:

A. Introduction to Manufacturing & Safety

The purpose of this course is to introduce the history of Machine Tool Technology. The course will detail the responsibilities of a machinist and the various careers in the field of Advanced Manufacturing. The proper procedures of accident prevention will be reviewed as well as the proper use of hand tools and portable power tools.

B. Quality Control & Machine Tool Mathematics

This course explores the science of metrology covering the following manufacturing inspection methods: layout, surface plate techniques, tool and instrument reading and uses, and floor and receiving inspection. Also discusses surface finish measurement, introduction to SPC techniques, and GDT.

C. Manufacturing Processes

An introduction to the use of basic machine tools such as belt sanders, drill presses, saws & cutoff machines, pedestal & tool grinders along with speeds and feeds and inspection techniques in relation to operations. Safety is an integral part of the course. Laboratory activities.

D. Machining Processes I with Lab

An introduction to the terminology and setup of lathes and turning machines including the identification of the various parts of a lathe, the safe setup and operation of the lathe using various work-holding devices, correct cutting speeds and feeds for lathe operations, performing basic operations on the lathe and the sharpening of lathe cutting tools.

E. Machining Processes II with Lab

The purpose of this course is to describe how milling machines operate, identify the various types of milling machines, selection of proper tooling for the job to be done, the calculation of cutting speeds and feeds and the demonstration of the following: knowledge of holding and driving cutters, and milling work-holding attachments.

F. Introduction to CAD/CAM

This is an introductory course that demonstrates the integration of Computer-Aided-Design (CAD) and Computer-Aided-Manufacturing (CAM). It is a study of modern prototyping and machining methods, teaching the use of CAM software. This program converts 2D and 3D CAD drawing geometry directly into tool path information that is used to drive numerically controlled turning and milling machines.

G. Introduction to Manufacturing Maintenance

This course provides operators with the basic engineering skills necessary to perform routine product line changes and maintenance tasks, including the removal and replacement of components, cleaning, lubrication, and inspection.

H. CNC Lathe Operation & Programming

This course introduces the programming, setup, and operation of CNC turning centers. Topics include programming formats, control functions, program editing, part production, and inspection. Upon completion, students should be able to manufacture simple parts using CNC turning centers.

I. CNC Mill Operation & Programming

This course introduces the manual programming, setup, and operation of CNC machining centers. Topics include programming formats, control functions, program editing, part production, and inspection. Upon completion, students should be able to manufacture simple parts using CNC machining centers.

J. Blueprint Reading & Solid Modeling

This course introduces more complex industrial blueprints. Emphasis is placed on auxiliary views, section views, violations of true project, special views, applications of GD&T, and interpretation of complex parts. Upon completion, students should be able to read and interpret complex industrial blueprints as well as the key skills and knowledge needed to design models using solid modeling software, starting with conceptual sketching, through to solid modeling, assembly design, and drawing production.

K. Advanced CNC Machine Processes

This course expands on the machining skills presented in the CNC Lathe & Mill courses. This course will include 3-D and solid modeling, programming, machine setup, and operating procedures. Tool selection, quality measurement/control, and operator maintenance are also topics covered.

L. Properties of Materials

This course is an introduction to the terminology and techniques of physical metallurgy exploring the classifications of metals, heat treatment of metals, finishing of metals and various quality control techniques.

M. Welding Technology I

This course teaches the principles of MIG welding, and flame cutting with emphasis on mastering basic welding techniques.

Course: Introduction to Manufacturing**Length: 2 Weeks****Unit: Exploratory**

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12	How does modern machine technology affect the workforce?	History of machine tool technology	Basic measuring	Quizzes
RST.9-10.2	What is the role of a machinist?	Basic machine tools	Identification of basic hand tools and machines	Self assessment
RST.9-10.3				
RST.9-10.4				
9.2.12.C.1	Why is it important to develop safe work habits?	Shop safety	Application of mathematics to convert fractions	Demonstration of mechanical aptitude through written test/hands-on application
9.2.12.C.3				
9.2.12.C.4				
9.2.12.C.6				
9.3.MN.1	How are measurement tools used?			
9.3.MN.2				
9.3.MN.3				
9.3.MN.4				
9.3.MN.5				
9.3.MN.6				

Course: Introduction to Manufacturing & Safety

Length: 1 Week

Unit: Shop Safety

	Essential Questions	Content	Skills	Assessments	
CRP1-12	Why is it important to develop safe work habits?	Shop safety	Recognition of correct and unsafe work practices	Safety Test	
RST.9-10.2	What is appropriate shop behavior?		Shop safety	Dressing in appropriate attire	Self assessment
RST.9-10.3					Peer assessment
RST.9-10.4	Completion of review and workbook questions				
8.2.12.C.3				What is the appropriate attire for a machinist?	Appropriate fire extinguisher selection
9.2.12.C.1					
9.2.12.C.2					
9.2.12.C.3					
9.2.12.C.4					
9.2.12.C.6					
9.2.12.C.7					
9.2.12.C.9					
9.3.MN.1					
9.3.MN.2					
9.3.MN.3					
9.3.MN.4					
9.3.MN.5					
9.3.MN.6					

Course: Introduction to Manufacturing & Safety

Length: 3 Weeks

Unit: Understanding Drawings

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 RST.9-10.2 RST.9-10.3 RST.9-10.4 8.2.12.C.2 8.2.12.C.3 8.2.12.C.5 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.2 9.3.MN.4 9.3.MN.5 9.3.MN.6	What are the purpose of prints/drawings? What is the information found on a print/drawing? How do you read a drawing?	Reading and interpretation of mechanical drawings	Reading metric and imperial drawings Application of information found on a typical drawing Understanding of the basics of geometric dimensioning and tolerancing	Test Summarization of drawing terms Identification of types of lines on a drawing Completion of questions found in Machining Fundamentals 9th Edition workbook Completion of review questions. Demonstration of skills within the laboratory

Course: Introduction to Manufacturing & Safety

Length: 3 weeks

Unit: Layout Work

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12	What is the purpose of layout?	Layout Tools	Use of Layout Tools	Test
RST.9-10.3 RST.9-10.4	What is layout work?	Basic Layout technique	Making basic layouts	Summarization of terms
8.2.12.C.3	How does layout work help a machinist?	Basic Horizontal Band Saw techniques	Understanding of the safety rules for layout work	Completion of questions found in Machining
9.2.12.C.1		Basic File Technique	Basic Horizontal Band Saw Use	Fundamentals 9th Edition workbook
9.2.12.C.2				
9.2.12.C.3				
9.2.12.C.4			Basic File use	Completion of review questions.
9.2.12.C.6				
9.2.12.C.7				
9.2.12.C.9				
9.3.MN.1				Demonstration of skills within the laboratory on Drift
9.3.MN.2				Key Layout
9.3.MN.3				
9.3.MN.4				
9.3.MN.5				
9.3.MN.6				

Course: Quality Control & Machine Tool Mathematics

Length: 3 weeks

Unit: Metrology

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 RST.9-10.3 RST.9-10.4 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	Why is metrology so important? What is the difference between precision and accuracy? Why are they equally important?	Measuring tools including: Rules, Micrometers, Vernier tools, Gages, and Indicators	Safe application of measuring tools Use of various measuring tools Correct tool selection for a situation	Test and Quiz Self assessment Peer assessment Demonstration of safe work habits. Demonstration of tool use in lab

Course: Quality Control & Machine Tool Mathematics

Length: 3 weeks

Unit: Machine Tool Math

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 RST.9-10.3 RST.9-10.4. RST.9-10.5 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	Why is proper hand tool selection important? How do speeds and feeds affect the use of machine tools? How are mathematics used in Advanced Manufacturing?	Hand Tools Sawing and Cut off Machines Offhand Grinding	Safe use of hand tools Safe use of Sawing & Cutoff Machines Safe use of offhand grinders Use of basic tool geometry for drills	Test and Quiz Self assessment Peer assessment Workbook and textbook questions Demonstration of safe work habits. Application of hand tools in the machining of the drift key. Application of offhand grinding by sharpening a twist drill.

Course: Manufacturing Processes

Length: 3 weeks

Unit: Drills & Drilling Machines

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 RST.9-10.3 RST.9-10.4. RST.9-10.5 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	How do drills operate? What are the safety rules that pertain to drilling operations?	Drill Press set-ups Sharpening a twist drill Drills and various drilling machines	Safe use of drills and drilling machines Proper selection of the correct drills and drilling machine for a given job Making safe setups on a drill press Identification and description of common drills and drill-holding devices.	Test and Quiz Self assessment Peer assessment Workbook and textbook questions Demonstration of safe work habits. Application of drills and the drill press in the machining of the drift key. Application of offhand grinding by sharpening a twist drill.

Course: Manufacturing Processes

Length: 2 weeks

Unit: Fasteners and Cutting Fluids

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 RST.9-10.3 RST.9-10.4. RST.9-10.5 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	How do fasteners work? Are fasteners universally interchangeable? Why are cutting fluids necessary? How are cutting fluids applied?	Inch and Metric based fasteners. Adhesives Types of cutting fluids	Application of Fasteners Application of adhesives Safe use of adhesives and solvents Application of cutting fluids Safe use of cutting fluids	Test and Quiz Self assessment Peer assessment Workbook and textbook questions Demonstration of safe work habits. Application of drills and the drill press in the machining of the drift key. Application of cutting fluids on twist drill, and drift key.

Course: Machining Processes I with Lab

Length: 4.5 weeks

Unit: The Lathe

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 RST.9-10.3 RST.9-10.4. RST.9-10.5 RST.11-12.3 RST.11-12.4 RST.11-12.7 RST.11-12.9 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	How do Lathes Operate? Of what purpose is the lathe?	Lathe operation	Setting up and operating a lathe safely using various work-holding devices Calculation of correct cutting speeds and feeds Basic machining operations on the lathe Sharpening lathe cutting tools	Test and Quiz Self assessment Peer assessment Workbook and textbook questions Demonstration of safe work habits. Application of drills and the drill press in the machining of the drift key. Fabrication of the lathe center

Course: Machining Processes I with Lab

Length: 4.5 weeks

Unit: Adv Lathe Operations

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
<p>CRP1-12</p> <p>RST.9-10.3 RST.9-10.4. RST.9-10.5</p> <p>RST.11-12.3 RST.11-12.4 RST.11-12.7 RST.11-12.9</p> <p>8.2.12.B.4 8.2.12.C.2 8.2.12.C.3</p> <p>9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7</p> <p>9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6</p>	<p>How do Lathe tools affect the machining process?</p> <p>How are lathe tools changed in order to meet the needs of a part?</p>	<p>Lathe operation</p>	<p>Setting up and operating a lathe safely using various work-holding devices</p> <p>Calculation of correct cutting speeds and feeds</p> <p>Basic machining operations on the lathe</p> <p>Sharpening lathe cutting tools</p>	<p>Test and Quiz</p> <p>Self assessment</p> <p>Peer assessment</p> <p>Workbook and textbook questions</p> <p>Demonstration of safe work habits.</p> <p>Application of drills and the drill press in the machining of the drift key.</p> <p>machining of the fly cutter shank</p>

Course: Machining Processes II with Lab

Length 4.5 weeks

Unit: Mill

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 RST.9-10.3 RST.9-10.4. RST.9-10.5 RST.11-12.3 RST.11-12.4 RST.11-12.9 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	How do various mills operate? Of what purpose is the milling machine?	Mill Operation	Setting up and operating a lathe safely using various work-holding devices Calculation of correct cutting speeds and feeds Basic machining operations on the Mill Machining of a fly cutter	Test and Quiz Self assessment Peer assessment Workbook and textbook questions Demonstration of safe work habits. Application of drills and the drill press in the machining of the drift key. Machining of the Fly Cutter Body

Course: Machining Processes II with Lab

Length: 4.5 weeks

Unit: Adv Mill Operations

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 RST.9-10.3 RST.9-10.4. RST.9-10.5 RST.11-12.3 RST.11-12.4 RST.11-12.9 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	How do various mills operate? Of what purpose is the milling machine?	Mill Operation	Setting up and operating a lathe safely using various work-holding devices Calculation of correct cutting speeds and feeds Basic machining operations on the Mill Machining of a fly cutter	Test and Quiz Self assessment Peer assessment Workbook and textbook questions Demonstration of safe work habits. Application of drills and the drill press in the machining of the drift key. Machining of the Fly Cutter Body

Course: Introduction to CAD/CAM

Length: 4.5 weeks

Unit: CAD/CAM

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 RST.9-10.3 RST.9-10.4. RST.9-10.5 RST.11-12.3 RST.11-12.4 RST.11-12.9 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 8.2.12.D.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	How does CAD/CAM software affect the efficiency of a machine shop? Of what purpose does CAD/CAM software have in the shop?	CNC Conversational programming through MasterCAM Editing programs, handling and transferring data Performing set-up and fixturing of parts and machines.	Graphic system manipulation Development of tool path part geometry in a the graphic system Production of coded machine tool language from graphic system.	Test and Quiz Self assessment Peer assessment Workbook and textbook questions Demonstration of safe work habits. Application of MasterCAM software Fabrication of instructor approved CNC projects

Course: Introduction to CAD/CAM

Length: 4.5 weeks

Unit: CAM Processes

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
<p>CRP1-12</p> <p>RST.9-10.3 RST.9-10.4. RST.9-10.5</p> <p>RST.11-12.3 RST.11-12.4 RST.11-12.9</p> <p>8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 8.2.12.D.3</p> <p>9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7</p> <p>9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6</p>	<p>How does CAD/CAM software affect the efficiency of a machine shop?</p> <p>Of what purpose does CAD/CAM software have in the shop?</p>	<p>Basic MasterCAM functions including HEM</p> <p>Editing programs, handling and transferring data</p> <p>Performing set-up and fixturing of parts and machines.</p>	<p>Development of job plans from prints.</p> <p>Graphic system manipulation</p> <p>Development of tool path part geometry in a the graphic system</p> <p>Production of coded machine tool language from graphic system.</p>	<p>Test and Quiz</p> <p>Self assessment</p> <p>Peer assessment</p> <p>Workbook and textbook questions</p> <p>Demonstration of safe work habits.</p> <p>Application of MasterCAM software</p> <p>Fabrication of instructor approved CNC projects</p>

Course: Introduction to Manufacturing Maintenance

Length: 4.5 weeks

Unit: Electrical Maintenance

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 RST.9-10.3 RST.9-10.4. RST.9-10.5 RST.11-12.3 RST.11-12.4 RST.11-12.9 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	What is the purpose of Lockout-Tagout? How and why do electrical shocks happen?	Principles of motor control and controllers Principles of Industrial wiring Thorough electrical machine maintenance procedure.	Proper use of a multi-meter Proper lockout-tagout procedure Understanding of related National Electrical Code standards	Test and Quiz Self assessment Peer assessment Workbook and textbook questions Demonstration of safe work habits. Application of maintenance techniques on lab tools and machines

Course: Introduction to Manufacturing Maintenance

Length: 4.5 weeks

Unit: Preventative Maintenance

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 RST.9-10.3 RST.9-10.4. RST.9-10.5 RST.11-12.3 RST.11-12.4 RST.11-12.9 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	What is the purpose of Lockout-Tagout? Why must equipment be maintained so diligently?	Principles of basic machine maintenance Thorough physical machine maintenance procedure.	Proper use of grease guns Proper lockout-tagout procedure Understanding of preventative maintenance plans	Test and Quiz Self assessment Peer assessment Workbook and textbook questions Demonstration of safe work habits. Application of maintenance techniques on lab tools and machines

Course: CNC Lathe Operation & Programming

Length: 9 weeks

Unit:CNCTC

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 8.2.12.D.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	What jobs require the use of a CNC turning center?	Safe set-up and operation of CNC machines Practical training in entering programs, setting tool lengths, and proving and modifying programs Transferring data and use of CAM software	Transfer of code from PC to machine tools Transfer of code from machine tools to PC Use of CAM programming in an introductory fashion Write manual CNC programs Solving complex cutter path geometry	Test and Quiz Self assessment Peer assessment Workbook and textbook questions Demonstration of safe work habits. Application of MasterCAM software Fabrication of instructor approved CNC projects

Course: CNC Mill Operation & Programming

Length: 9 weeks

Unit:CNCMC

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 8.2.12.D.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	What jobs require the use of a CNC machining center?	Safe set-up and operation of CNC machines Practical training in entering programs, setting tool lengths, and proving and modifying programs Transferring data and use of CAM software	Transfer of code from PC to machine tools Transfer of code from machine tools to PC Use of CAM programming in an introductory fashion Write manual CNC programs Solving complex cutter path geometry	Test and Quiz Self assessment Peer assessment Workbook and textbook questions Demonstration of safe work habits. Application of MasterCAM software Fabrication of instructor approved CNC projects

Course: Advanced CNC Machine Processes

Length: 9 weeks

Unit:ADVCNC

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 8.2.12.D.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	What is the best way to program a multi-step operation.	Safe set-up and operation of CNC machines Practical training in entering programs, setting tool lengths, and proving and modifying programs Transferring data and use of CAM software	Transfer of code from PC to machine tools Transfer of code from machine tools to PC Use of CAM programming to create machined parts that require multiple steps	Test and Quiz Self assessment Peer assessment Workbook and textbook questions Demonstration of safe work habits. Application of MasterCAM software Fabrication of instructor approved CNC projects

Course: Blueprint Reading & Solid Modeling

Length: 4.5 weeks

Unit: GD&T

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 8.2.12.D.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	How does Geometric Dimensioning and Tolerancing affect the manufacturing of a part? What is Geometric Dimensioning and Tolerancing?	Basic GD&T Symbols GD&T Feature Control Frames	Calculations of tolerance modifiers Understanding of GD&T Terminology and symbols	Test and Quiz Self assessment Peer assessment Workbook and textbook questions Demonstration of safe work habits. Application of knowledge in order to machine projects

Course: Blueprint Reading & Solid Modeling

Length: 4.5 weeks

Unit: Solid Modeling

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 8.2.12.D.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	How do solid models benefit machinists?	Applications of CAD Wireframe drawings Solid model drawings Surface Drawings	Identification and description of Wire Frames, Solid Models, and Surface Drawings. Understanding of GD&T Terminology and symbols	Test and Quiz Self assessment Peer assessment Workbook and textbook questions Demonstration of safe work habits. Application of knowledge in order to machine projects

Course: Properties of Materials

Length 4.5 Weeks

Unit:Industrial Materials

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	How do materials affect the development of the manufacturing process?	Introduction to the utilization of various materials in manufacturing such as: metals, fiberglass, ceramics, adhesives, concrete, plastics, and composites.	Knowledge of the machining requirements of various materials. Development of skills in the processes of heat treating and tempering specific metals.	Test and Quiz Self assessment Peer assessment Workbook and textbook questions Demonstration of safe work habits. Application of research in various industrial materials.

Course: Properties of Materials

Length: 4.5 Weeks

Unit: Industrial Materials

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12 8.2.12.B.4 8.2.12.C.2 8.2.12.C.3 9.2.12.C.1 9.2.12.C.2 9.2.12.C.3 9.2.12.C.4 9.2.12.C.7 9.3.MN.1 9.3.MN.2 9.3.MN.3 9.3.MN.4 9.3.MN.5 9.3.MN.6	How do materials affect the development of the manufacturing process? What are the characteristics of metals?	Introduction to the utilization of various metals in manufacturing. Ferrous and Non Ferrous metals Alloys Low-, Medium-, and high-carbon steels	AISI/SAE steel classification understanding Understanding of UNS classification of carbon steels Understanding of AA/IADS classification of aluminum alloys	Test and Quiz Self assessment Peer assessment Workbook and textbook questions Demonstration of safe work habits. Application of research in the machining of various materials.

Course: Welding

Length: 9 Weeks

Unit: Welding

CTE Proficiencies	Essential Questions	Content	Skills	Assessments
CRP1-12	What is Gas metal arc welding?	Understanding what Gas metal arc welding is.	Electrode selection with Gas metal arc welding.	Written/Oral Tests and Quizzes
8.2.12.B.4	How does Gas metal arc welding work?	Safety and Hazards associated with Gas metal arc welding	Safe and proper use of Gas metal arc welding equipment	Setup and operation of Gas metal arc welding equipment
8.2.12.C.2	What is safety and hazards with Gas metal arc welding?	Setup and proper use of Gas metal arc welding	Create a proper Gas metal arc welding Weld	Completion of a basic MIG welding project.
8.2.12.C.3				
8.2.12.D.3				
9.2.12.C.1				
9.2.12.C.2				
9.2.12.C.3				
9.2.12.C.4				
9.2.12.C.7				
9.3.MN.1				
9.3.MN.2				
9.3.MN.3				
9.3.MN.4				
9.3.MN.5				
9.3.MN.6				