

COMPUTER INTEGRATED MANUFACTURING

ECC prepares students for entry-level employment in jobs such as general machinist, tool and die maker, mold maker, special machine builder, maintenance machinist, computer-aided manufacturing technician, computer numerical control (CNC) operator or programmer, set-up specialist, industrial sales, and supervision.

As a result of computer integrated manufacturing course work, students learn about computer-controlled production machines which include a variety of machine tools running on CNC-programmed instructions. Students master programming skills using CNC equipment. Plus, electives in computer-aided manufacturing or traditional machine tool processes allow students to specialize or pursue concentrated study.

ECC's machine tool degree is ideal for the student interested in a career as a tool and die maker. In addition to the technical background needed for this highly skilled and well-paid trade, students take additional courses in liberal arts and sciences to broaden their academic backgrounds and prepare them for supervisory positions. Upon graduation, most students are prepared to enter the third year of a four-year tool and die apprenticeship.

Accreditation

Computer integrated manufacturing course work is approved by the U.S. Department of Labor Bureau of Apprenticeship Training for the supplemental instruction portion of local industry apprenticeship programs in tool and die maker, mold maker, and machinist including CNC programming, CNC operations/setup, and MasterCam software training.

Entrance Requirements

None

Program Requirements

Students must purchase their own safety glasses and locks and are expected to wear sturdy leather shoes to all IMT classes. Lists of recommended supplies and tools are available from ECC industrial manufacturing technology instructors.

Machine Tool Technology

- Describe and demonstrate shop safety practices
- Demonstrate proficiency with various tools and machines
- Identify and describe the purpose and function of precision measurement systems
- Identify and describe basic functions of precision measurement tools
- Describe the importance of precision in manufacturing
- Perform complex machine tool making activities commonly used in manufacturing

Industrial Manufacturing Technology

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Computer Integrated Manufacturing Option - Associate of Applied Science

Course	Title	Credit Hours
First Semester		
IMT 103	Industrial Manufacturing Tech I	3
IMT 104	Industrial Manufacturing Tech II	3
CAD 101	Introduction to Engineering Design	4
IMT 107 or MTH 107	Technical Math I or Technical Math I	4
IMT 112	Metrology-The Study of Measurement	3
Total		17
Second Semester		
CAD 120	Introduction to SolidWorks	3
IMT 110	Introduction to Cnc Programming I	4
IMT 220	Introduction to CNC Programming II	4
IST 105	Electrical Control Circuits	3
Required Liberal Education Course		3
Total		17
Third Semester		
IMT 221	Introduction to CNC Toolpath	4
IMT 222	Advanced CNC Programming I	4
CAD 121	Advanced Concepts in SolidWorks	3
IST 140	Programmable Controllers I	3
Required Communication Course		3
Total		17
Fourth Semester		
IMT 223	Advanced CNC Programming II	4
IMT 204	Industrial Manufacturing Tech V	5
Required Communications Course		3
Required Social or Behavioral Sciences Course		3
Total		15
Program Total		66

Industrial Manufacturing Technology - Associate of Applied Science

Course	Title	Credit Hours
First Semester		
IMT 103	Industrial Manufacturing Tech I	3
IMT 104	Industrial Manufacturing Tech II	3
CAD 101	Introduction to Engineering Design	4
IMT 107 or MTH 107	Technical Math I or Technical Math I	4
IMT 112	Metrology-The Study of Measurement	3
Total		17
Second Semester		
IMT 108	Industrial Manufacturing Tech III	3
IMT 110	Introduction to Cnc Programming I	4
CAD 120	Introduction to SolidWorks	3
Required Communications Course		3
Total		13
Third Semester		
IMT 220	Introduction to CNC Programming II	4
IMT 221	Introduction to CNC Toolpath	4
IMT 204	Industrial Manufacturing Tech V	5

Liberal Education Requirement	3
Total	16
Fourth Semester	
Industrial Electives	11-12
Required Social or Behavioral Sciences Course	3
Required Communications Course	3
Total	17-18
Program Total	63-64

Industrial Electives

Course	Title	Credits
IMT 222	Advanced CNC Programming I	4
IMT 223	Advanced CNC Programming II	4
IMT 212	Metallurgy-The Study of Steel	2
CAD 105	Pro/ENGINEER Basic Design Training	3
CAD 121	Advanced Concepts in SolidWorks	3
CAD 205	Geometric Dimensioning & Tolerancing	3
CAD 208	Applied Descriptive Geometry & Statics	4
IMT 234	Special Topics in Industrial Manuf.	1-3

Machine Tool Technology - Associate of Applied Science

Course	Title	Credit Hours
First Semester		
IMT 103	Industrial Manufacturing Tech I	3
IMT 104	Industrial Manufacturing Tech II	3
CAD 101	Introduction to Engineering Design	4
IMT 107 or MTH 107	Technical Math I or Technical Math I	4
IMT 112	Metrology-The Study of Measurement	3
Total		17
Second Semester		
IMT 108	Industrial Manufacturing Tech III	3
IMT 110	Introduction to Cnc Programming I	4
IMT 119	Fabrication of Machine Parts	3
Required Communication Course		3
Required Liberal Education Course		3
Total		16
Third Semester		
IMT 203	Manufacturing Process & Design Tech	3
IMT 204	Industrial Manufacturing Tech V	5
IST 121	Fluid Power Systems	3
Social or Behavioral Sciences Course		3
Total		14
Fourth Semester		
IMT 208	Basic Die Theory	4
IMT 209	Basic Mold Theory	4
IMT 214	Jig & Fixture Theory	2
WEL 101	Welding I	2.5
Required Communications Course		3
Total		15.5
Program Total		62.5

CNC Programmer-Vocational Specialist

Course	Title	Credit Hours
First Semester		
IMT 103	Industrial Manufacturing Tech I	3
IMT 104	Industrial Manufacturing Tech II	3
IMT 107 or MTH 107	Technical Math I or Technical Math I	4
CAD 101	Introduction to Engineering Design	4
Total		14
Second Semester		
IMT 110	Introduction to Cnc Programming I	4
IMT 220	Introduction to CNC Programming II	4
Total		8
Third Semester		
IMT 221	Introduction to CNC Toolpath	4
Total		4
Fourth Semester		
IMT 222	Advanced CNC Programming I	4
IMT 223	Advanced CNC Programming II	4
Total		8
Program Total		34

Computer Integrated Manufacturing - Vocational Specialist

Course	Title	Credit Hours
First Semester		
IMT 103	Industrial Manufacturing Tech I	3
IMT 104	Industrial Manufacturing Tech II	3
CAD 101	Introduction to Engineering Design	4
IMT 107	Technical Math I	4
CAD 120	Introduction to SolidWorks	3
Total		17
Second Semester		
CAD 121	Advanced Concepts in SolidWorks	3
IST 121	Fluid Power Systems	3
IST 140	Programmable Controllers I	3
IMT 110	Introduction to Cnc Programming I	4
Total		13
Third Semester		
IMT 220	Introduction to CNC Programming II	4
IMT 221	Introduction to CNC Toolpath	4
CAD 208	Applied Descriptive Geometry & Statics	4
Total		12
Program Total		42

Machine Tool Operations - Vocational Specialist

Course	Title	Credit Hours
First Semester		
IMT 103	Industrial Manufacturing Tech I	3
IMT 104	Industrial Manufacturing Tech II	3
IMT 107 or MTH 107	Technical Math I or Technical Math I	4
CAD 101	Introduction to Engineering Design	4
IMT 112	Metrology-The Study of Measurement	3
Total		17

Second Semester		
IMT 108	Industrial Manufacturing Tech III	3
IMT 110	Introduction to Cnc Programming I	4
IMT 119	Fabrication of Machine Parts	3
IMT 220	Introduction to CNC Programming II	4
IMT 212	Metallurgy-The Study of Steel	2
Total		16
Program Total		33

IMT 208	Basic Die Theory	4
Total		11
Program Total		21

All IMT courses numbered 100 and above may be applied to the major field and elective requirement for the Associate in Arts and Associate in Science degrees.

Mold Making - Basic Vocational Specialist

Course	Title	Credit Hours
First Semester		
IMT 103	Industrial Manufacturing Tech I	3
IMT 104	Industrial Manufacturing Tech II	3
CAD 101	Introduction to Engineering Design	4
IST 121	Fluid Power Systems	3
Total		13
Second Semester		
IMT 108	Industrial Manufacturing Tech III	3
IMT 212	Metallurgy-The Study of Steel	2
IMT 119	Fabrication of Machine Parts	3
IMT 107 or MTH 107	Technical Math I or Technical Math I	4
IMT 209	Basic Mold Theory	4
Total		16
Program Total		29

CNC Operator - Basic Vocational Specialist

Course	Title	Credit Hours
First Semester		
IMT 103	Industrial Manufacturing Tech I	3
IMT 104	Industrial Manufacturing Tech II	3
IMT 107 or MTH 107	Technical Math I or Technical Math I	4
Total		10
Second Semester		
CAD 101	Introduction to Engineering Design	4
IMT 110	Introduction to Cnc Programming I	4
IMT 220	Introduction to CNC Programming II	4
Total		12
Program Total		22

Tool and Die Making - Basic Vocational Specialist

Course	Title	Credit Hours
First Semester		
IMT 103	Industrial Manufacturing Tech I	3
IMT 104	Industrial Manufacturing Tech II	3
CAD 101	Introduction to Engineering Design	4
Total		10
Second Semester		
IMT 107 or MTH 107	Technical Math I or Technical Math I	4
IMT 108	Industrial Manufacturing Tech III	3

IMT 103 Industrial Manufacturing Tech I (3) 1,4

This course provides classroom and laboratory learning experiences related to fundamental machine tool technology by focusing on power saws, drill presses, basic lathes and related tooling. Course includes speed and feed calculation, part layout, basic measuring tools and related manufacturing theory. Safe work practices are strongly stressed. (1.2) Proficiency Credit Available (3 LETSIR) Pass/No Credit Available.

In-District Tuition/Fees: \$446 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: None

Semester(s) Offered: Fall and Spring

IMT 104 Industrial Manufacturing Tech II (3) 1,4

This course is a continuation of IMT 103 beginning with engine lathes and introducing horizontal mills, vertical mills, and CNC basics. Course includes related information on tooling, speeds and feeds, measuring instruments and manufacturing theory. (1.2) Proficiency Credit Available (3 LETSIR) Pass/No Credit Not Available.

In-District Tuition/Fees: \$446 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: IMT 103 or consent of instructor

Semester(s) Offered: Fall and Spring

IMT 106 Mathematics for Machinists (5) 5,0

Study of all mathematics used in the machine shop. Includes addition, subtraction, multiplication, division, fractions, decimals, percentage, area and volume, algebra, geometry, and right angle trigonometry. (1.2) Proficiency Credit Available (3 LETSIR) Pass/No Credit Not Available.

In-District Tuition/Fees: \$660 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: None

Semester(s) Offered: Varies

IMT 107 Technical Math I (4) 4,0

The course emphasizes the mathematical knowledge needed to be successful in the workplace, including number systems, geometry, algebra, and trigonometry. Students will engage in problem-solving activities using real-world career examples that help students learn not only the needed mathematical skills, but also how those skills are used in specific fields of interest Special Note: This course is offered concurrently as MTH 107. The student must decide whether to earn credits in Industrial Manufacturing Technology (IMT) or Mathematics (MTH) prior to enrolling. (1.2) Proficiency Credit Available Pass/No Credit Not Available.

In-District Tuition/Fees: \$528 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: Grade of C or better in MTH 090, consent of instructor, or satisfaction of other placement criteria.

Semester(s) Offered: Fall and Spring

IMT 108 Industrial Manufacturing Tech III (3) 1,4

A continuation of IMT 104, with emphasis on a greater degree of precision in completing a comprehensive project. Grinding operations, form grinding, O.D. and I.D. grinding are introduced, including grinding wheel specifications, technique and related manufacturing theory. (1.2) Proficiency Credit Available (3 LETSIR) Pass/No Credit Not Available.

In-District Tuition/Fees: \$446 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: IMT 107 or MTH 107 and IMT 104 and CAD 101 or consent of instructor

Semester(s) Offered: Fall and Spring

IMT 109 Industrial Manufacturing Tech IV (3) 1,4

A continuation of IMT 108 with emphasis on a greater degree of precision in completing a comprehensive project. The dividing head rotary table and EDM will be introduced, including electrode specifications, technique and related manufacturing theory. (1.2) Proficiency Credit Available (3 LETSIR) Pass/No Credit Not Available.

In-District Tuition/Fees: \$446 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: IMT 108

Semester(s) Offered: Fall and Spring

IMT 110 Introduction to Cnc Programming I (4) 2,4

A survey of the tools and theory regarding computer integrated manufacturing (CIM). CIM is the union of hardware and software, database management, and communications to automate and control production activities from planning and design to manufacturing and distribution. Introduces basic CNC lathe set up and operation. Includes safety, turning, grooving, drilling, boring, threading, and cutting tools. Programs are written, developed, simulated, run, and debugged on actual machine tools. (1.2) Proficiency Credit Available (3 LETSIR) Pass/No Credit Not Available.

In-District Tuition/Fees: \$578 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: (1) CAD 101 and IMT 104; and (2) IMT 107 or MTH 107; or (3) Consent of Instructor.

Semester(s) Offered: Fall and Spring

IMT 111 Technical Mathematics II (4) 4,0

Continuation of IMT 107, Technical Mathematics I, and an introduction to further methods used in mathematics problem-solving needed for technology. (1.2) Proficiency Credit Available Pass/No Credit Not Available.

In-District Tuition/Fees: \$528 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: Grade of C or better in IMT 107 or MTH 107 or consent of instructor

Semester(s) Offered: Varies

IMT 112 Metrology-The Study of Measurement (3) 1,3

A study and use of the various measuring tools used in the establishment of quality control for the manufacturing of parts and assemblies including basic SPC techniques. (1.2) Proficiency Credit Available (3 LETSIR) Pass/No Credit Available.

In-District Tuition/Fees: \$396 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: None

Semester(s) Offered: Fall and Spring

IMT 119 Fabrication of Machine Parts (3) 0,6

The student will apply theory learned in lecture/discussion including selection of material and proper machine procedure to complete the project with the necessary tolerances and finishes. Improvements in areas of individual machining weakness will be stressed. (1.2) Proficiency Credit Available Pass/No Credit Not Available.

In-District Tuition/Fees: \$446 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: IMT 109 or consent of instructor

Semester(s) Offered: Varies

IMT 203 Manufacturing Process & Design Tech (3) 3,0

A survey of manufacturing methods and materials employed in a variety of industrial processes. The student will understand the various methods of product fabrication and the manufacturing processes for sustainable, sound economic decision making in manufacturing and product design. Other topics include the interrelationship among materials, their selection for use in product design and processes, and conversion of these materials into finished components. (1.2) Proficiency Credit Available (3 LETSIRC) Pass/No Credit Not Available.

In-District Tuition/Fees: \$396 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: IMT 107 or MTH 107

Semester(s) Offered: Varies

IMT 204 Industrial Manufacturing Tech V (5) 0,10

The laboratory portion of IMT 203. The student will select a project from a group of assembled projects (6 parts or more) to be completed. (1.2) Proficiency Credit Not Available Pass/No Credit Not Available.

In-District Tuition/Fees: \$715 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: IMT 203 or concurrent enrollment in IMT 203 or consent of instructor

Semester(s) Offered: Varies

IMT 208 Basic Die Theory (4) 2,4

The study of the design and fabrication of stamping and forming dies used in the metal stamping industry. Included in the course will be the knowledge of metals used for specific stamping operations. The student will be required to design several progressive stamping dies throughout the course. (1.2) Proficiency Credit Available Pass/No Credit Not Available.

In-District Tuition/Fees: \$583 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: IMT 108 or consent of instructor

Semester(s) Offered: Varies

IMT 209 Basic Mold Theory (4) 2,4

The study of design and fabrication of plastic, die cast, and rubber molds for production of finished products. Included are units of instruction in the flow characteristics of thermoset thermoplastics and die cast materials and their properties. (1.2) Proficiency Credit Available Pass/No Credit Not Available.

In-District Tuition/Fees: \$583 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: IMT 108

Semester(s) Offered: Varies

IMT 212 Metallurgy-The Study of Steel (2) 2,0

Basic introduction to ferrous and nonferrous materials and alloys and their molecular activity during processing from raw material to finished product. The composition and changes of the metal are analyzed under laboratory testing to heat treatment, destructive and nondestructive testing, and various fabrication processes. (1.2) Proficiency Credit Available (3 LETSIR) Pass/No Credit Not Available.

In-District Tuition/Fees: \$274 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: None

Semester(s) Offered: Fall and Spring

IMT 214 Jig & Fixture Theory (2) 2,0

The course will cover parameters involved in controlling the design of either a jig or fixture for a specific piece part and the type of construction dictated by the number and design of that piece part. Included in the course will be the relationship of jigs and fixtures to stampings, castings, and machine parts. (1.2) Proficiency Credit Available (3 LETSIR) Pass/No Credit Not Available.

In-District Tuition/Fees: \$264 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: IMT 104

Semester(s) Offered: Varies

IMT 215 Special Projects in Indust Manuf (1-4) 0,2

(0, 2-8) This course allows an advanced student to study or complete, in depth, a related subject or project in conjunction with machine tool processing. Course is repeatable to four credits. (1.2) Proficiency Credit Available Pass/No Credit Not Available.

In-District Tuition/Fees: \$528 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: Consent of instructor

Semester(s) Offered: Varies

IMT 220 Introduction to CNC Programming II (4) 2,4

This course is an introduction to CNC programming. The use of M & G code programming to produce CNC programs for machined parts will be taught. Specific areas of programming including linear and circular interpolation, canned cycles, drilling, reaming, tapping, boring, face milling, end milling and the use of sub programs will be covered. Setup and operation of CNC milling machine controls will be covered and used to proof run programs. (1.2) Proficiency Credit Available Pass/No Credit Not Available.

In-District Tuition/Fees: \$583 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: IMT 110 or concurrent enrollment in IMT 110 or consent of instructor

Semester(s) Offered: Fall and Spring

IMT 221 Introduction to CNC Toolpath (4) 2,4

The student will bring together his/her knowledge of geometry generation using CAD and conventional CNC program generation to learn computer generated toolpathing. The student will generate geometry, initiate computer toolpaths and output executable CNC programs using CAD/MasterCam toolpathing software on personal computers. Additionally post processor generation will be discussed. (1.2) Proficiency Credit Available Pass/No Credit Not Available.

In-District Tuition/Fees: \$583 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: IMT 110 and IMT 220 or concurrent enrollment in IMT 220 or consent of instructor

Semester(s) Offered: Fall and Spring

IMT 222 Advanced CNC Programming I (4) 2,4

This course builds on the knowledge gained in the IMT 221 Introduction to CNC Toolpath course and expands the knowledge of design and production of CNC programming. Advanced programming are simulated off-line and run on multi-axis CNC machines Students apply advanced precision machining skills, complex setup, and programming advanced part geometry. Canned cycles, cutter compensation, subroutines, probing functions, and high speed machining processes will be introduced. (1.2) Proficiency Credit Available Pass/No Credit Not Available.

In-District Tuition/Fees: \$583 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: IMT 221 or consent of instructor.

Semester(s) Offered: Varies

IMT 223 Advanced CNC Programming II (4) 2,4

Advanced CNC Programming II is a continuation of the first semester Advanced CNC Programming I. Great complexity on multi-axis programming task. Students will learn advanced topics in Computer Aided Manufacturing (CAM) and advanced programming, with an intro to macro language. Instruction on capabilities of Computer Aided Design and Computer Aided Manufacturing (CAD/CAM) interface, material selection, and introduction to Computer Integrated Manufacturing (CIM) is included. Projects in CNC problem solving and troubleshooting are accomplished utilizing the CNC machine lab using CAD/CAM software on personal computers. Troubleshooting of machine problems, cycle time reduction practices, fixturing design, and perform complex setup will be introduced. (1.2) Proficiency Credit Available Pass/No Credit Not Available.

In-District Tuition/Fees: \$568 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: (1) IMT 221; and (2) IMT 222 or concurrent enrollment in IMT 222; or (3) Consent of instructor.

Semester(s) Offered: Varies

IMT 233 Injection Molding Dies (2) 2,0

The student will acquire a full understanding of the design of molds, including care of molds, setting basic types and applications, features and components and production of molds. (1.2) Proficiency Credit Available (3 LETSIR) Pass/No Credit Not Available.

In-District Tuition/Fees: \$264 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: IMT 133 and IMT 231

Semester(s) Offered: Varies

IMT 234 Special Topics in Industrial Manuf. (1-3) .5,1

Designed to satisfy specific needs or interests of students and the community. The following guidelines are to be used in selecting topics: 1) adequate and available material on specific topics; 2) comprehensive outlines for each topic; and, 3) course should be designed to increase skill and knowledge in field of industrial manufacturing. Course is repeatable to four credits. (1.2) Proficiency Credit Available (2 EIST) Pass/No Credit Not Available.

In-District Tuition/Fees: \$396 (effective 2022/23 academic year)

In-district tuition rates are subject to change based on Board approval.

Prerequisite: None

Semester(s) Offered: Varies