

Computer-Integrated Machining Technology

Computer-Integrated Machining Technology curriculum is designed to develop skills in the theory and safe use of hand tools, power machinery, computerized machining equipment and sophisticated precision measurement instruments. Students learn to interpret blueprints, set up manual and CNC machines, perform basic and advanced machining operations and make decisions to insure that work quality is maintained. Employment opportunities for machining technicians exist in manufacturing industries, public institutions, government agencies and in a wide range of specialty machining shops.

The Computer-Integrated Machining Technology Program at Central Piedmont provides students with the opportunity to expand their knowledge and skills in CNC programming and a broader knowledge in CNC Graphics Programming. All projects are performed on full-scale industrial equipment used in local industry.

For specific information about potential positions and wages in Computer-Integrated Machining employment, visit the Central Piedmont Career Coach (<https://cpcc.emsicc.com/programs/computer-integrated-machining-academic-program-for-credit/198260?radius=®ion=50%20Mile%20Radius>) website.

Computer-Integrated Machining Technology (A50210)

Degree Awarded

The Associate in Applied Science degree - Computer- Integrated Machining Technology is awarded by the college upon completion of the program.

Admissions

- High school diploma or equivalent is required.
- CPCC placement tests are required in English and mathematics. Developmental mathematics and English courses are available for students to build skills and knowledge.
- Consult with an advisement counselor regarding course placement and attend an orientation session after placement testing.
- Many courses have prerequisites or co-requisites; check the Courses section for details.

Note: Students who do not take program-related courses for two consecutive semesters must reenter the program under the Catalog in effect at the time of reentry.

Contact Information

The Computer-Integrated Machining Technology program is in the Engineering Technologies Division. For more information, call the Program Chair at 704.330.3206.

General Education Requirements

ENG 111	Writing and Inquiry	3.0
ENG 114	Professional Research & Reporting	3.0
Select 1 of the following:		3.0
COM 110	Introduction to Communication	

or COM 231 Public Speaking

Select 1 of the following: 3.0

MAT 110 Mathematical Measurement and Literacy
or MAT 121 Algebra/Trigonometry I

Select 1 of the following: 3.0

ART 111 Art Appreciation
or ART 114 Art History Survey I
or ART 115 Art History Survey II
or HUM 120 Cultural Studies
or HUM 130 Myth in Human Culture
or MUS 110 Music Appreciation
or MUS 112 Introduction to Jazz
or PHI 215 Philosophical Issues
or PHI 240 Introduction to Ethics
or REL 110 World Religions

Select 1 of the following: 3.0

ECO 251 Principles of Microeconomics
or ECO 252 Principles of Macroeconomics
or HIS 111 World Civilizations I
or HIS 112 World Civilizations II
or HIS 131 American History I
or HIS 132 American History II
or POL 120 American Government
or PSY 150 General Psychology
or SOC 210 Introduction to Sociology

Major Requirements

MAC 111	Machining Technology I	6.0
MAC 142	Machining Applications II	4.0
MAC 121	Introduction to CNC	2.0
MAC 122	CNC Turning	2.0
MAC 131	Blueprint Reading-Machining I	2.0
MAC 143	Machining Applications III	4.0
MAC 114	Introduction to Metrology	2.0
or ISC 212	Metrology	
MAC 152	Advanced Machining Calculations	2.0
MAC 124	CNC Milling	2.0
MAC 222	Advanced CNC Turning	2.0
MAC 224	Advanced CNC Milling	2.0
MAC 234	Advanced Multi-Axis Machining	3.0
MAC 231	Cam: Computer Numerical Control Turning	3.0
MAC 232	CAM: Computer Numerical Control Milling	3.0
MAC 228	Advanced CNC Processes	3.0
EGR 125	Appl Software for Tech	2.0
DFT 154	Intro to Solid Modeling	3.0

Technical Electives

Select 2 credits from the following: 2.0

ISC 112 Industrial Safety
MEC 180 Engineering Materials
WLD 112 Basic Welding Processes
WBL 112 Work-Based Learning I

WBL 122	Work-Based Learning II
Total Credits	67

Computer-Integrated Machining Technology Diploma (D50210)

Computer-Integrated Machining Technology Diploma gives individuals the opportunity to gain entry-level employment in the metal working industries. A basic knowledge of conventional machine tools, CNC programming and CNC operations is provided by hands-on activities on equipment commonly used in industry. Coursework will apply toward a Computer-Integrated Machining Technology A.A.S. Degree program.

Degree Awarded

A Diploma in Computer-Integrated Machining Technology is awarded by the college upon completion of this program.

Admissions

Completion of a high school diploma or the equivalent is encouraged as a foundation of a career in this area. Many courses have prerequisites or co-requisites; check the Course Descriptions section for details.

Note: Students who do not enroll in program-related courses for two consecutive semesters must reenter the program under Catalog program requirements in effect at the time of reentry.

Contact Information

Computer-Integrated Machining Technology program is in the Engineering Technologies Division. For more information, call the Program Chair at 704.330.6608.

General Education Requirements

ENG 111	Writing and Inquiry	3.0
SOC 210	Introduction to Sociology	3.0

Major Requirements

MAC 111	Machining Technology I	6.0
MAC 131	Blueprint Reading-Machining I	2.0
MAC 142	Machining Applications II	4.0
MAC 114	Introduction to Metrology	2.0
MAC 121	Introduction to CNC	2.0
MAC 124	CNC Milling	2.0
MAC 122	CNC Turning	2.0
MAC 143	Machining Applications III	4.0
MAC 152	Advanced Machining Calculations	2.0
MAC 222	Advanced CNC Turning	2.0
MAC 224	Advanced CNC Milling	2.0

Total Credits 36

Computer-Integrated Machining Technology Certificates (C50210)

- Computer-Integrated Machining Technology Certificate with a Specialization in CNC Programming and Operations (C50210-C1) (p. 2)
- Computer-Integrated Machining Technology Certificate Specialization in Basic Machining Skills (C50210-C3) (p. 2)

- Computer-Integrated Machining Technology Certificate with a Specialization in Motorsports Machining Certificate I (C50210-C4) (p. 2)
- Computer-Integrated Machining Technology Certificate with a Specialization in Computer-Integrated Machining Pathway (C50210-C6) (p. 3)
- Computer-Integrated Machining Technology Certificate with a Specialization in Advanced CNC Technology (C50210-C7) (p. 3)

Computer-Integrated Machining Technology Certificate with a Specialization in CNC Programming and Operations (C50210-C1)

This certificate provides study in CNC programming and machining operations. Coursework includes manual programming, set-up and operation and provides in-depth study in both 2-D and 3-D Graphics programming. Coursework will apply toward a Computer-Integrated Machining Technology A.A.S. degree program.

Certificate Awarded

A certificate is awarded in CNC Programming and Operations upon completion of this program.

Admissions

- Completion of a high school diploma or equivalent is required as a foundation of a career in this area.
- Individuals entering this certificate program should have a basic knowledge of manual machining and/or minimum experience with CNC machine tools.
- Many courses have prerequisites or co-requisites; check the Courses section for details.

Contact Information

Computer-Integrated Machining Technology Program is in the Engineering Technologies Division. For more information, call the Program Chair at 704.330.6608.

Major Requirements

MAC 121	Introduction to CNC	2.0
MAC 122	CNC Turning	2.0
MAC 124	CNC Milling	2.0
MAC 222	Advanced CNC Turning	2.0
MAC 224	Advanced CNC Milling	2.0
MAC 231	Cam: Computer Numerical Control Turning	3.0
MAC 232	CAM: Computer Numerical Control Milling	3.0

Total Credits 16

Computer-Integrated Machining Technology Certificate Specialization in Basic Machining Skills (C50210-C3)

Major Requirements

MAC 111	Machining Technology I	6.0
MAC 131	Blueprint Reading-Machining I	2.0
MAC 114	Introduction to Metrology	2.0
MAC 121	Introduction to CNC	2.0

Total Credits 12

Computer-Integrated Machining Technology Certificate with a Specialization in Motorsports Machining Certificate I (C50210-C4)

This certificate provides the graduate with basic skills in the set-up and operation of conventional and computer numerical control machine tools used in the Motorsports machining labs.

Certificate Awarded

A certificate is awarded in Motorsports Machining by the college upon completion of the program.

Admissions

Completion of a high school diploma or equivalent is encouraged as a foundation of a career in this area.

Contact Information

Computer-Integrated Machining Technology Program is in the Engineering Technologies Division. For more information, call the Program Chair at 704.330.6608.

Major Requirements

MAC 111	Machining Technology I	6.0
MAC 121	Introduction to CNC	2.0
MAC 122	CNC Turning	2.0
MAC 114	Introduction to Metrology	2.0
MAC 124	CNC Milling	2.0
MAC 131	Blueprint Reading-Machining I	2.0
Total Credits		16

Computer-Integrated Machining Technology Certificate with a Specialization in Computer-Integrated Machining Pathway (C50210-C6)

This certificate also is available to students enrolled in Career and College Promise.

Major Requirements

MAC 111	Machining Technology I	6.0
MAC 131	Blueprint Reading-Machining I	2.0
MAC 121	Introduction to CNC	2.0
MAC 124	CNC Milling	2.0
Total Credits		12

Computer-Integrated Machining Technology Certificate with a Specialization in Advanced CNC Technology (C50210-C7)

This certificate provides the graduate with enhanced skills in the operation and set up of multi-axis CNC machining centers. This certificate provides additional studies in multi-axis CNC machine tool operation.

Certificate Awarded

A certificate is awarded in Advanced CNC Technology by the college upon completion of this program.

Admissions

- Completion of a high school diploma or equivalent is encouraged as a foundation of a career in this area.
- Some courses have pre-requisites; check the Courses section for details.
- This certificate requires the completion of the Computer-Integrated Machining Technology Certificate Specialization in CNC Programming and Operations (C50210-C1) for admission.

Contact information

Computer Integrated Machining Technology Program is in the Engineering Technologies Division. For more information, call the Program Chair at 704.330.6608.

Major Requirements

DFT 151	CAD I	3.0
DFT 154	Intro to Solid Modeling	3.0
MAC 114	Introduction to Metrology	2.0
MAC 228	Advanced CNC Processes	3.0
MAC 232	CAM: Computer Numerical Control Milling	3.0
MAC 234	Advanced Multi-Axis Machining	3.0
Total Credits		17

MAC 111AB. Machining Technology I. 3.0 Credits. Class-1.0.

Clinical-0.0. Lab-6.0. Work-0.0

This course introduces machining operations as they relate to the metalworking industry. Topics include machine shop safety, measuring tools, lathes, drilling machines, saws, milling machines, bench grinders, and layout instruments. Upon completion, students should be able to safely perform the basic operations of measuring, layout, drilling, sawing, turning, and milling. This course emphasizes engine lathe setup and operation.

MAC 111BB. Machining Technology I. 3.0 Credits. Class-1.0.

Clinical-0.0. Lab-6.0. Work-0.0

This course introduces machining operations as they relate to the metalworking industry. Topics include machine shop safety, measuring tools, lathes, drilling machines, saws, milling machines, bench grinders, and layout instruments. Upon completion, students should be able to safely perform the basic operations of measuring, layout, drilling, sawing, turning, and milling. This is the second part of a course sequence and emphasizes milling machine setup and operation.

MAC 111. Machining Technology I. 6.0 Credits. Class-2.0. Clinical-0.0.

Lab-12.0. Work-0.0

This course introduces machining operations as they relate to the metalworking industry. Topics include machine shop safety, measuring tools, lathes, drilling machines, saws, milling machines, bench grinders, and layout instruments. Upon completion, students should be able to safely perform the basic operations of measuring, layout, drilling, sawing, turning, and milling. This course emphasizes milling machine setup and operation.

MAC 114. Introduction to Metrology. 2.0 Credits. Class-2.0.

Clinical-0.0. Lab-0.0. Work-0.0

This course introduces the care and use of precision measuring instruments. Emphasis is placed on the inspection of machine parts and use of a wide variety of measuring instruments. Upon completion, students should be able to demonstrate the correct use of measuring instruments.

MAC 121. Introduction to CNC. 2.0 Credits. Class-2.0. Clinical-0.0. Lab-0.0. Work-0.0

This course introduces the concepts and capabilities of computer numerical control machine tools. Topics include setup, operation, and basic applications. Upon completion, students should be able to explain operator safety, machine protection, data input, program preparation, and program storage.

MAC 122. CNC Turning. 2.0 Credits. Class-1.0. Clinical-0.0. Lab-3.0. Work-0.0

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.

Prerequisites: Take MAC 121

MAC 124. CNC Milling. 2.0 Credits. Class-1.0. Clinical-0.0. Lab-3.0. Work-0.0

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.

Prerequisites: Take MAC 121

MAC 131. Blueprint Reading-Machining I. 2.0 Credits. Class-1.0. Clinical-0.0. Lab-2.0. Work-0.0

This course covers the basic principles of blueprint reading and sketching. Topics include multi-view drawings; interpretation of conventional lines; and dimensions, notes, and thread notations. Upon completion, students should be able to interpret basic drawings, visualize parts, and make pictorial sketches.

MAC 132. Blueprint Reading-Machining II. 2.0 Credits. Class-1.0. Clinical-0.0. Lab-2.0. Work-0.0

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.

Prerequisites: Take MAC 131 with a minimum grade of C

MAC 142. Machining Applications II. 4.0 Credits. Class-2.0. Clinical-0.0. Lab-6.0. Work-0.0

This course provides instruction in the wide variety of processes associated with machining. Topics include safety, equipment set-up, holding fixtures, tooling, cutting speeds and depths, metal properties, and proper finishes. Upon completion, students should be able to safely demonstrate advanced machining operations, accurately measure components, and produce accurate components with a proper finish.

Prerequisites: Complete one of the following options: Take MAC 111AB, MAC 111BB, and MAC 114 with a minimum grade of C
Take MAC 111AB, MAC 111BB, and ISC 212 with a minimum grade of C

MAC 143. Machining Applications III. 4.0 Credits. Class-2.0. Clinical-0.0. Lab-6.0. Work-0.0

This course provides instruction in the field of advanced machining. Emphasis is placed on creating complex components, close-tolerance machining, precise measurement, and proper equipment usage. Upon completion, students should be able to demonstrate the ability to produce an accurately machined component with a quality finish using the proper machining process.

Prerequisites: Take MAC 122, MAC 124, and MAC 142 Minimum grade C

MAC 151. Machining Calculations. 2.0 Credits. Class-1.0. Clinical-0.0. Lab-2.0. Work-0.0

This course introduces basic calculations as they relate to machining occupations. Emphasis is placed on basic calculations and their applications in the machine shop. Upon completion, students should be able to perform basic shop calculations.

MAC 152. Advanced Machining Calculations. 2.0 Credits. Class-1.0. Clinical-0.0. Lab-2.0. Work-0.0

This course combines mathematical functions with practical machine shop applications and problems. Emphasis is placed on gear ratios, lead screws, indexing problems, and their applications in the machine shop. Upon completion, students should be able to calculate solutions to machining problems.

Prerequisites: Take MAT 110 or MAT 121

MAC 192. Selected Topics in Machining. 2.0 Credits. Class-2.0. Clinical-0.0. Lab-6.0. Work-0.0

This course provides an opportunity to explore areas of current interest in the specific program or discipline areas. Emphasis is placed on subject matter appropriate to the program or discipline. Upon completion, students should be able to demonstrate an understanding of the specific area of study.

MAC 222. Advanced CNC Turning. 2.0 Credits. Class-1.0. Clinical-0.0. Lab-3.0. Work-0.0

This course covers advanced methods in setup and operation of CNC turning centers. Emphasis is placed on programming and production of complex parts. Upon completion, students should be able to demonstrate skills in programming, operations, and setup of CNC turning centers. This course covers advanced methods in setup and operation of CNC turning centers. Emphasis is placed on programming and production of complex parts. Upon completion, students should be able to demonstrate skills in programming, operations, and setup of CNC turning centers.

Prerequisites: Take MAC 122

MAC 224. Advanced CNC Milling. 2.0 Credits. Class-1.0. Clinical-0.0. Lab-3.0. Work-0.0

This course covers advanced methods in setup and operation of CNC machining centers. Emphasis is placed on programming and production of complex parts. Upon completion, students should be able to demonstrate skills in programming, operations, and setup of CNC machining centers.

Prerequisites: Take MAC 124

MAC 228. Advanced CNC Processes. 3.0 Credits. Class-2.0. Clinical-0.0. Lab-3.0. Work-0.0

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

Prerequisites: Take MAC 232

MAC 231. Cam: Computer Numerical Control Turning. 3.0 Credits. Class-1.0. Clinical-0.0. Lab-4.0. Work-0.0

This course introduces Computer Numerical Control graphics programming and concepts for turning center applications. Emphasis is placed on the interaction of menus to develop a shape file in a graphics CAM system and to develop tool path geometry and part geometry.

Upon completion, students should be able to develop a job plan using CAM software, including machine selection, tool selection, operational sequence, speed, feed, and cutting depth. Students will write transfer machine code from CAM graphics to the CNC turning center.

Prerequisites: Take MAC 122

MAC 232. CAM: Computer Numerical Control Milling. 3.0 Credits.

Class-1.0. Clinical-0.0. Lab-4.0. Work-0.0

This course introduces Computer Numerical Control graphics programming and concepts for machining center applications. Emphasis is placed on developing a shape file in a graphics CAM system and transferring coded information from CAM graphics to the CNC milling center. Upon completion, students should be able to develop a complete job plan using CAM software to create a multi-axis CNC program.

Prerequisites: Take MAC 124

MAC 234. Advanced Multi-Axis Machining. 3.0 Credits. Class-2.0.

Clinical-0.0. Lab-3.0. Work-0.0

This course includes multi-axis machining using machining centers with multi-axis capabilities. Emphasis is placed on generation of machining center input with a CAM system and setup of pallet changer and rotary system for multi-axis machining fixtures. Upon completion, students should be able to convert CAD to output for multi-axis machining centers, including tooling, setup, and debugging processes.

Prerequisites: Take MAC 232 Minimum grade C

MAC 292. Selected Topics in Machining. 2.0 Credits. Class-2.0.

Clinical-0.0. Lab-6.0. Work-0.0

This course provides an opportunity to explore areas of current interest in specific program or discipline areas. Emphasis is placed on subject matter appropriate to the program or discipline. Upon completion, students should be able to demonstrate an understanding of the specific area of study.