

# Computer-Integrated Machining Technology

## Computer-Integrated Machining Technology Certificates (C50210)

- Computer-Integrated Machining Technology Certificate with a Specialization in CNC Programming and Operations (C50210-C1) (p. 1)
- Computer-Integrated Machining Technology Certificate Specialization in Basic Machining Skills (C50210-C3) (p. 1)
- Computer-Integrated Machining Technology Certificate with a Specialization in Computer-Integrated Machining Pathway (C50210-C6) (p. 1)
- Computer-Integrated Machining Technology Certificate with a Specialization in Advanced CNC Technology (C50210-C7) (p. 1)

### 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 encouraged 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       |
| <b>Total Credits</b> |   | <b>16</b> |

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

#### Major Requirements

|                      |                               |           |
|----------------------|-------------------------------|-----------|
| MAC 141              | Machining Applications I      | 4.0       |
| MAC 131              | Blueprint Reading-Machining I | 2.0       |
| MAC 114              | Introduction to Metrology     | 2.0       |
| MAC 121              | Introduction to CNC           | 2.0       |
| MEC 180              | Engineering Materials         | 3.0       |
| <b>Total Credits</b> |                               | <b>13</b> |

### 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 141              | Machining Applications I      | 4.0       |
| MAC 131              | Blueprint Reading-Machining I | 2.0       |
| MAC 121              | Introduction to CNC           | 2.0       |
| MAC 122              | CNC Turning                   | 2.0       |
| MAC 124              | CNC Milling                   | 2.0       |
| <b>Total Credits</b> |                               | <b>12</b> |

### 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 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       |
| <b>Total Credits</b> |                               | <b>14</b> |

**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 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 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.  
Corequisites: Take MAC 111AB

**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 118. Machine Shop Basic. 2.0 Credits.** Class-1.0. Clinical-0.0. Lab-3.0. Work-0.0

This course will introduce the fundamentals of measuring tools, tolerances and the basic set-up and operations of drill presses, lathes, and milling machines. Emphasis is placed on manufacturing standards and procedures used in welding, automotive, and engineering environments. Upon completion, students should be able to use measuring tools, perform basic machine operations, and apply manufacturing standards.

**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, minimum grade of C

**MAC 141. Machining Applications I. 4.0 Credits.** Class-2.0. Clinical-0.0. Lab-6.0. Work-0.0

This course provides an introduction to a variety of material-working processes that are common to the machining industry. Topics include safety, process-specific machining equipment, measurement devices, set-up and layout instruments, and common shop practices. Upon completion, students should be able to safely demonstrate basic machining operations, accurately measure components, and effectively use layout instruments.

**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: TAKE MAC 141; MINIMUM GRADE 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 of 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.

**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.

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 229. CNC Programming. 2.0 Credits.** Class-2.0. Clinical-0.0. Lab-0.0. Work-0.0

This course provides concentrated study in advanced programming techniques for working with modern CNC machine tools. Topics include custom macros and subroutines, canned cycles, and automatic machining cycles currently employed by the machine tool industry. Upon completion, students should be able to program advanced CNC functions while conserving machine memory.

**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. 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 of C