

# Machining Technology Programs

These programs offer training in using computer-controllers on CNC machine tools, manual machining tools, and computers as tools in machine tool control inspection (CMM), manufacturing engineering, and mechanical design.

The Basic Manufacturing Technician program serves as a pathway to higher level manufacturing-related training in a wide range of certificate and degree programs, and also prepares students for entry-level employment in a variety of manufacturing-related settings.

The first year of study emphasizes basic machining skills as they relate to computer-numerical control (CNC), as well as manual machining, basic measuring and inspection, and print reading. Students completing the first year may find employment as entry-level machine tool operators.

Second-year classes build on previously-learned knowledge and skills and concentrate on further enhancement of CNC and manual skills in programming and machine tool set-ups. Students use extended time in machining labs to solve increasingly complex “real world” programming and fixturing issues. After successful completion, graduates may find employment in the fields of machining/programming and engineering technology.

If you are interested in manufacturing, machining, manual operations, or CNC, contact [appliedtech@chemeketa.edu](mailto:appliedtech@chemeketa.edu).

## Program outcomes

**Students completing the Basic Manufacturing Technician certificate should be able to:**

- Analyze and discuss current manufacturing processes.
- Interpret and evaluate blueprints and specifications to determine accuracy
- Apply workplace rules and safety and environmental standards used in the workplace
- Identify and use measurement instruments to produce a product
- Construct a product using industry acceptable manufacturing principles

**Students completing the CAM Fundamentals certificate should be able to:**

- Use effective communication skills as a team member
- Apply basic and precision industry standard measurement practices
- Set up and operate Computer Numerical Controlled (CNC) machine tools to produce accurately sized parts
- Apply cutting speeds and feeds to materials used in machining and manufacturing

**Students completing the CNC Operator certificate should be able to:**

- Use effective communication skills as a team member
- Apply basic and precision industry standard measurement practices
- Set up and operate Computer Numerical Controlled (CNC) machine tools and program CNC machine tools at the machine control level to produce accurately sized parts
- Apply cutting speeds and feeds to materials used in machining and manufacturing

**Students completing the Manual Machine Operator certificate should be able to:**

- Use effective communication skills as a team member
- Apply basic and precision industry standard measurement practices
- Set up and operate manual machine tools to produce accurately sized parts
- Apply cutting speeds and feeds to materials used in machining and manufacturing

**Students completing Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) degree should be able to:**

- Produce accurate 2D and 3D drawings using CAD software
- Use effective communication skills as a team member
- Program CNC machine tools at the machine control level
- Perform advanced set-ups and operations using manual and/or Computer Numerical Controlled (CNC) equipment to produce accurately sized parts
- Create parametric solid models and generate CNC code through CAM software to manufacture parts on CNC machine tools
- Design and build fixtures and tooling for manufacture production purposes to meet customer specifications
- Determine optimal production process planning to meet customer requirements
- Select and optimize available machines and equipment to meet product process requirements
- Calculate power requirements, select drive and system components, and design criteria for mechanical systems

## Getting started

The first step to entering these programs is to take part in an assessment process, which includes taking the college’s free placement test and meeting with Advising and Counseling Services staff. You may need to complete program entry requirements. Then your program advisor will help you



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develop an individualized program of study, which may include one or more of the following:

CIS101	Introduction to Microcomputer Applications.....	3
MTH020	Basic Mathematics.....	4
SSP051	Studying for College.....	3
	or	
RD090	College Textbook Reading.....	3
WR080	Basic Writing.....	4

If you have questions about the program requirements, please contact program chair Sheldon Schnider at 503.589.7875 (sheldon.schnider@chemeketa.edu) or the office of the Dean of Applied Technologies, 503.399.5210.

### Basic Manufacturing Technician Certificate of Completion

The Basic Manufacturing Technician certificate program covers the basics of machine tool fundamentals, measurement, and basic blueprint reading. Specialty areas for electives include welding, manual machining, and CNC mill operations. As a statewide cooperative effort this program is also offered by other community colleges, including Clackamas, Linn-Benton, Lane, and Portland.

*In addition to tuition, estimated costs for students who complete the certificate listed below are books, \$500; class fees, \$54; universal fee, \$224; equipment and supplies, \$125. Contact the Financial Aid Office at 503.399.5018 to find out if you qualify for help with these costs.*

You may earn a certificate of completion by successfully completing the Basic Manufacturing Technician required core of 9 credit hours, plus the additional credits in one area of specialization listed below.

#### Basic Manufacturing Technician core requirements (9 credit hours):

Course	Title	Credit Hours
CAM050	Orientation to Manufacturing Processes.....	2
CAM100	Blueprint Reading and Sketching.....	2
CAM105	Precision Measurement.....	2
MTH052	Introduction to Algebra and Geometry.....	3

Plus: Choose one area of specialization

#### Welding Specialization

WLD151	Basic Arc Welding.....	5
WLD156	Blueprint Reading and Sketching.....	4

#### Mill Specialization

CAM110	Benchwork and Manual Fundamentals.....	4
CAM120	Manual Milling Processes.....	4

#### Lathe Specialization

CAM110	Benchwork and Manual Fundamentals.....	4
CAM121	Manual Lathe Processes.....	2

## Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) AAS

### Computer-Aided Manufacturing (CAM) Fundamentals Certificate of Completion

The CAM Fundamentals certificate offers training in the knowledge and skills used by employees in manufacturing and related occupations. The certificate includes courses in manufacturing materials, interpretation of engineering drawings, measuring practices, bench and layout work, and basic set-up and operation of computer controlled mills and lathes. This certificate may qualify graduates for an entry position in a variety of manufacturing-related jobs.

*In addition to tuition, estimated costs for students who complete the entire program listed below are books, \$569; class fees, \$162; universal fee, \$364; precision tools and supplies, \$1,000. Contact the Financial Aid Office at 503.399.5018 to find out if you qualify for help with these costs.*

You may earn a certificate of completion by successfully completing the required 25 credits with a grade of "C" or better in all courses.

Course	Title	Credit Hours
<b>Term 1</b>		
CAM100	Blueprint Reading and Sketching.....	2
CAM105	Precision Measurement.....	2
CAM110	Benchwork and Manual Fundamentals.....	4
CAM130	CNC Machine Setup Operation.....	4
MTH052	Introduction to Algebra and Geometry.....	3
	or	
MTH081	Technical Mathematics 1.....	4
	or	
MTH111	College Algebra (or higher).....	5
<b>Term 2</b>		
CAM115	Geometric Dimensioning/Tolerancing.....	2
CAM140	Metallurgy for Manufacturing.....	2
MTH053	Introduction to Trigonometry and Geometry.....	3
WR088	Introduction to Technical Writing 1.....	3

## Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) AAS

### Computer Numerically Controlled (CNC) Operator Certificate of Completion

This CNC Operator certificate builds on the training provided in the CAM Fundamentals certificate with an emphasis on the setup and operation of computer-controlled machines. The certificate includes courses in manual programming ("G code") for both mills and lathes. Graduates of this certificate program may qualify to work as a CNC machine tool operator or in a variety of manufacturing-related jobs.

*In addition to tuition, estimated costs for students who complete the entire program listed below are books, \$719; class fees, \$234; universal fee, \$574; precision tools and supplies, \$1,000. Contact the Financial Aid Office at 503.399.5018 to find out if you qualify for help with these costs.*

You may earn a certificate of completion by successfully completing the required 40 credits with a grade of "C" or better in all courses.

Course	Title	Credit Hours
<b>Term 1</b>		
CAM100	Blueprint Reading and Sketching.....	2
CAM105	Precision Measurement.....	2
CAM110	Benchwork and Manual Fundamentals.....	4
CAM130	CNC Machine Setup/Operation.....	4
MTH052	Introduction to Algebra and Geometry.....	3
	or	
MTH081	Technical Mathematics 1.....	4
	or	
MTH111	College Algebra (or higher).....	5
<b>Term 2</b>		
CAM115	Geometric Dimensioning/Tolerancing.....	2
CAM140	Metallurgy for Manufacturing.....	2
CAM160	Intermediate CNC Mill Operation and Programming.....	4
MTH053	Introduction to Trigonometry and Geometry.....	3
<b>Term 3</b>		
CAM150	Cutting Tools and Materials.....	3
CAM190	Intermediate CNC Lathe Operation and Programming.....	4
CAM280D	Cooperative Work Experience.....	4
WR088	Introduction to Technical Writing 1.....	3

### Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) AAS

#### Manual Machine Operator Certificate of Completion

The Manual Machine Operator certificate builds on the training provided in the CAM Fundamentals certificate with an emphasis on machining skills related to the set-up and operation of manual machine tools such as drills, mills, lathes, saws, and grinders. Graduates may qualify to work as a machine tool operator, entry-level machinist, or in a variety of manufacturing-related jobs.

*In addition to tuition, estimated costs for students who complete the entire program listed below are books, \$654; class fees, \$234; universal fee, \$574; precision tools and supplies, \$1,000. Contact the Financial Aid Office at 503.399.5018 to find out if you qualify for help with these costs.*

You may earn a certificate of completion by successfully completing the required 40 credits with a grade of "C" or better in all courses.

Course	Title	Credit Hours
<b>Term 1</b>		
CAM100	Blueprint Reading and Sketching.....	2
CAM105	Precision Measurement.....	2
CAM110	Benchwork and Manual Fundamentals.....	4
CAM130	CNC Machine Setup Operation.....	4
MTH052	Introduction to Algebra and Geometry.....	3
	or	
MTH081	Technical Mathematics 1.....	4
	or	
MTH111	College Algebra (or higher).....	5

<b>Term 2</b>		
CAM115	Geometric Dimensioning/Tolerancing.....	2
CAM120	Manual Milling Processes.....	4
CAM140	Metallurgy for Manufacturing.....	2
MTH053	Introduction to Trigonometry and Geometry.....	3

<b>Term 3</b>		
CAM121	Manual Lathe Processes.....	4
CAM150	Cutting Tools and Materials.....	3
CAM280D	Cooperative Work Experience.....	4
WR088	Introduction to Technical Writing 1.....	3

### Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) Associate of Applied Science Degree

The Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) program offers training in using computers as tools in engineering, drafting, machine tool control inspection (the CMM), and industrial mechanical design.

The first year of study emphasizes machining skills as they relate to Computer Numerical Control machining. Students completing the first year may find employment as entry-level machine tool operators and CNC programmers.

Second-year classes concentrate on integrating mechanical design and computer-aided manufacturing programming and advanced manual machining skills. Students apply knowledge and skills to solve increasingly complex fixturing and machining problems. After successful completion, graduates may find employment in the fields of machining/manufacturing and engineering technologies. Graduates use computers on the job for drafting, design and programming, and operating CNC machine tools.

*In addition to tuition, estimated costs for students who complete the entire program listed below are books, \$1,388; class fees, \$321; universal fee, \$1,302; precision tools and supplies, \$4,000. Contact the Financial Aid Office at 503.399.5018 to find out if you qualify for help with these costs.*

You may earn an associate of applied science degree by successfully completing the required 97 credit hours with a grade of "C" or better in all courses.

Course	Title	Credit Hours
<b>Term 1</b>		
CAM100	Blueprint Reading and Sketching.....	2
CAM105	Precision Measurement.....	2
CAM110	Benchwork and Manual Fundamentals.....	4
CAM130	CNC Machine Setup/Operation.....	4
DRF130	CAD 1.....	3
MTH052	Introduction to Algebra and Geometry+.....	3
	or	
MTH081	Technical Mathematics 1+.....	4
	or	
MTH111	College Algebra+ (or higher).....	5

**Term 2**

CAM115	Geometric Dimensioning/Tolerancing .....	2
CAM120	Manual Milling Processes .....	4
CAM140	Metallurgy for Manufacturing.....	2
CAM160	Intermediate CNC Mill Operation and Programming.....	4
MTH053	Introduction to Trigonometry with Geometry .....	3
	or	
MTH082	Technical Mathematics 2 .....	4
	or	
MTH112	Trigonometry (or higher) .....	5

**Term 3**

CAM062	Practical Applications 2 .....	2
	or	
CAM280B	Cooperative Work Experience .....	2
CAM121	Manual Lathe Processes .....	4
CAM150	Cutting Tools and Materials .....	3
CAM190	Intermediate CNC Lathe Operation and Programming.....	4
WR088	Introduction to Technical Writing 1+ .....	3
	or	
WR121	The College Essay+ (or higher) .....	4

**Term 4**

CAM210	Advanced Mill Processes.....	4
CAM230	CAM Programming Mills .....	2
CAM235	Advanced CNC Mill Operation and Programming	3
DRF210	Parametric Design with SolidWorks .....	3
PH121	Applied Physics .....	4
	or	
PH201	General Physics (or higher).....	5
	or	
GS104	General Science: Physics.....	4

**Term 5**

CAM220	Advanced Lathe Processes.....	4
CAM260	CAM Programming Lathes .....	2
CAM265	Advanced CNC Lathe Operation and Programming.....	3
DRF262	Machine Design .....	3
FE205B	Resumes and Job Search Correspondence .....	1
PSY104	Workplace Psychology+ .....	4

**Term 6**

CAM225	Advanced Manual Integrations .....	4
CAM275	Tool Design .....	3
CAM290	Advanced CAD/CAM Integrations.....	4
CAM295	Introduction to Lean Manufacturing.....	1
WR089	Introduction to Technical Writing 2 .....	3
	or	
WR227	Technical Writing .....	4

+Meets related instruction requirement, see page 50. For subject areas, see page 56.