CNC Machine Tool Operation  
31-444-1 Technical Diploma

Program Overview
In the CNC Machine Tool Operation program, students learn the skills to set up and operate manual and computer numerically-controlled (CNC) machine tools and to measure and inspect parts for accuracy. Additionally, students learn to use computer-aided drafting (CAD) and computer-aided manufacturing (CAM) software programs to design and machine parts. Skilled machine tool operators work in tool rooms, job shops, CNC production facilities, and in modern manufacturing companies. Successful graduates have many opportunities to advance in their careers as they gain additional experience and training.

Career Pathway Options
A career pathway is a series of connected education and training strategies and support services that enable individuals to secure stackable industry relevant credentials and obtain employment within an occupational area and advance to higher levels of future education and employment in that area. The CNC Machine Tool Operation one-year technical diploma includes two embedded short-term technical diplomas as documented below:

- 30-444-2 CNC Technician
- 30-444-3 Manufacturing Production Technician

Admission Requirements
Students in this program must:

- Complete application form and submit with fee (fee waiver may apply if previously submitted)
- Complete Accuplacer entrance assessment to determine placement (waiver may apply with acceptable alternative test scores and/or postsecondary degree completion)
- Complete admissions interview with a WITC counselor (above requirements should be completed prior to interview)

Student Profile
When students enter this program, they should be able to:

- Solve math problems
- Visualize shapes and forms
- Problem solve
- Be detail oriented
- Enjoy doing mechanical work
- Lift 25 pounds
- Assume responsibility
- Follow procedures carefully
- Manage their time
- Work well with others and under supervision

Preparation for Admission
Students should strive to reach a comfort level in the following courses or skills:

- Communications
- Computer drafting
- General metals/welding
- Machine shop
- Print reading
- Algebra
- Trigonometry
- Geometry
- Keyboarding
- Physics

Program Outcomes
Employers will expect graduates of the program to be able to:

- Apply basic safety practices in the machine shop
- Interpret industrial/engineering drawings
- Apply precision measuring methods to part inspection
- Perform basic machine tool equipment set up and operation
- Perform programming, set up, and operation of CNC machine tools

Collegewide outcomes and indicators will also be addressed to develop personal awareness, career effectiveness, and professionalism. See page 5 of the college catalog for a list of collegewide outcomes and indicators.

Career Outlook
After completing this program, graduates will be ready for their career in a variety of positions such as:

- Machine Tool Operator
- Apprentice Machinist
- CNC Machinist
- Maintenance Machinist
- CNC Programmer

Curriculum

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<tr>
<th>Number</th>
<th>Course Title</th>
<th>Credits</th>
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<td>Print Reading for Machine Trades 2</td>
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<td>CAD/CAM Applications</td>
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<td>Introduction to CAD/CAM</td>
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<td>32444300</td>
<td>CNC Turning – Basic Operation and Programming</td>
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<td>32444301</td>
<td>CNC Milling – Basic Operation and Programming</td>
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<td>Machining - Fundamentals and Drilling Processes</td>
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Program Requirements 35

- Requires a prerequisite and/or corequisite that must be completed with a grade point of 2.0 or better.
- See pages 41-43 for course descriptions.
Programs and Course Descriptions

(See pages 41-43 for General Studies course descriptions)

31420322
Print Reading for Machine Trades 1 - Credits: 1
This course will cover the basic principles of print reading. The emphasis will be on object representation, geometric dimensioning and tolerances (GDT), threads, and section views. Strongly recommend a basic understanding of mathematics concepts.

31420323
Print Reading for Machine Trades 2 - Credits: 1
This advanced print reading course will cover drawing changes, auxiliary and section views, detail and assembly prints, machined features, gears, and CNC documents. PREREQUISITE: 31420322 Print Reading for Machine Trades 1.

32420320
CAD/CAM Applications - Credits: 2
Computer-Aided Design (CAD) and Computer-Assisted Manufacturing (CAM) have become standard tools used almost wherever CNC production in metalworking takes place. Students will use the CAD/CAM software to build geometry, tool and material libraries, and define cutting paths/patterns. Post-processing of these CAD/CAM files will generate CNC programs in machine-specific G-code format. PREREQUISITE: 32420361 Introduction to CAD/CAM or consent of instructor.

32420361
Introduction to CAD/CAM - Credits: 1
This course will introduce students to computer-aided drafting (CAD) and computer-aided machining (CAM). Students will use appropriate CAD software to prepare mechanical drawings. Students will be introduced to CAD/CAM equipment.

32444300
CNC Turning - Basic Operation and Programming - Credits: 2
This course includes the operation of CNC (Computer Numerical Control) lathes and turning centers including calling up programs, loading and unloading parts, part inspection, and monitoring tool wear. The use of process plans, inspection sheets and set up guides will also be covered. This course will also provide an introduction to planning and writing programs for CNC turning centers using standard G and M codes. Learners will set up work pieces in machines, enter programs, set tool offsets, enter tool compensation, and complete part projects.

32444301
CNC Milling - Basic Operation and Programming - Credits: 2
This course includes the operation of CNC (Computer Numerical Control) mills and machining centers including calling up programs, loading and unloading parts, part inspection, and monitoring tool wear. The use of process plans, inspection sheets, and set up guides will also be covered. This course will provide an introduction to planning and writing programs for CNC mills and machining centers using standard G and M codes. Learners will set up work pieces in machines, enter programs, set tool offsets, enter tool offsets, and complete part projects.

32444302
Machining - Fundamentals and Drilling Processes - Credits: 2
This course will provide the basic machining information needed by the learner in subsequent CNC Machine Tool Operation courses. It will also provide instruction and practice in the use of sawing and drilling machines and related processes.

32444303
Machining - Turning Processes - Credits: 3
This course will provide basic instruction and practice in the use of lathes and various turning machines. Students will learn about lathes, associated processes, turning tools, and related safety/maintenance issues.

32444304
Machining - Milling Processes - Credits: 3
This course will provide instruction and practice in the use of milling machines and various processes performed on them. Students will learn about mills, associated processes, milling machine tooling, and related safety/maintenance issues.

32444305
Machining - Surface Grinding Processes - Credits: 3
This course will provide instruction and practice in the use of the manual surface grinder and various surface grinding processes.

32444306
CNC Milling - Advanced Operation and Programming - Credits: 4
The advanced setup and operation of CNC (Computer Numerical Control) machining centers is covered in this course. Applications include selection of tools and workholding devices, setting tool offsets and work offsets, calling up programs, proofing programs, making edits and machine adjustments. Advanced level programming for CNC machining centers is also covered in this course. Learners will write programs at the machine and computer, enter offsets and compensation, and machine multiple parts to prove out programs.

32444307
CNC Turning - Advanced Operation and Programming - Credits: 4
The advanced setup of CNC (Computer Numerical Control) turning centers is covered in this course. Applications include selection of tools and workholding devices, setting tool offsets and work coordinate positions, calling programs, proofing programs, making edits and machine adjustments. Advanced level programming for CNC turning centers is also covered in this course. Learners will write programs at the machine and computer, enter offsets and tool compensation, and machine multiple parts to prove out programs.

Gainful employment information is available at this link: http://www.witc.edu/pgmpages/cncmachtoolop/career.htm. This information is provided as a federal requirement in an effort to help students make informed decisions related to the costs and potential employment in a chosen field.

Graduate Employment Information
(WITCS Graduate Survey Responses 2012-2013; for most recent data, go to witc.edu)

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<tr>
<th>Number of graduates</th>
<th>Number employed</th>
<th>% employed in WITC district</th>
<th>Range of yearly salary</th>
<th>Average yearly salary</th>
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<tr>
<td>10</td>
<td>8</td>
<td>88%</td>
<td>$25,374-$61,485</td>
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800.243.9482
witc.edu
2015-2016
67