MTL MACHINE TOOL

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<td>MTL.101 Machine Tool Fundamentals 1</td>
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<td>This course provides a basic introduction to machine tools with the primary emphasis on the engine lathe, drill press and hand tools common to the machinist trade. Offered: Fall</td>
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| MTL.103 Manufacturing Processes             | 2     | 2     |     |       |      |    |      |     |    |
| This course is designed to familiarize the student with the basic processes that are common to industry and the techniques used in the manufacturing of a product. Offered: Fall |       |       |     |       |      |    |      |     |    |
| Applicable toward graduation at Sandburg where program structure permits: |       |       |     |       |      |    |      |     |    |
| Degree or Certificate: AAS, AGS, and Certificates where applicable (1.2). General Education – Not Applicable |       |       |     |       |      |    |      |     |    |

| MTL.130 CNC Machining Technology            | 2     | 4     | 4   |       |      |    |      |     |    |
| This course provides an introduction to Computer Numerical Control (CNC) machining processes and the technology that supports them. Some of the processes covered are gauging, quality control, spot drilling, drilling, reaming, tapping, counter-boring, countersinking, defining and calculating speed and feed rates, screw thread identification, and drill sharpening. Students will perform these processes on manual equipment prior to observing them on CNC equipment. Occupational computer skills are also covered in this course. Offered: Spring |       |       |     |       |      |    |      |     |    |
| Prerequisites: Take MFG.125 |       |       |     |       |      |    |      |     |    |
| Applicable toward graduation at Sandburg where program structure permits: |       |       |     |       |      |    |      |     |    |
| Degree or Certificate: AAS, AGS and Certificates where applicable (1.2). General Education – Not Applicable |       |       |     |       |      |    |      |     |    |

| MTL.135 Fund. of CNC Machine Applications   | 2     | 4     | 4   |       |      |    |      |     |    |
| This course is designed to give students a familiarization with the necessary practices and techniques used to operate Computer Numerical Controlled (CNC) machines. Some of the topics covered include CNC machine introduction, safe practices and techniques used to remove burrs, basic CNC machine operator maintenance, and production support equipment use and operation. Topics such as machine homing, tooling used, an understanding of offsets, setting offsets, and the application of offsets in the CNC machine will also be covered. Actual run time in the lab will be provided for hands-on machine operation. Students will work in groups and as individuals to gain experience in machine operation during a production run, applying theories learned to the production process. Offered: Spring |       |       |     |       |      |    |      |     |    |
| Applicable toward graduation at Sandburg where program structure permits: |       |       |     |       |      |    |      |     |    |
| Degree or Certificate: AAS, AGS and Certificates where applicable (1.2). General Education – Not Applicable |       |       |     |       |      |    |      |     |    |

| MTL.150 Fund. of CNC Turning Applications   | 2     | 2     | 3   |       |      |    |      |     |    |
| This course provides an introduction to Computer Numerical Control (CNC) turning processes and their proper application. Some of the topics covered include lathe set-up and operation, lathe safety, types of lathes, lathe work-holding devices, lathe cutting tools, grinding and sharpening of lathe cutters, and a review of lathe machining speeds and feeds. In this course, you will perform O.D. and I.D. turning operations on engine lathes as well as facing, drilling, reaming, tapping, grooving, chamfering, boring, knurling, tapering, and thread cutting operations. Offered: Fall |       |       |     |       |      |    |      |     |    |
| Prerequisites: Take MTL.130 or Proficiency-based Exam |       |       |     |       |      |    |      |     |    |
| Applicable toward graduation at Sandburg where program structure permits: |       |       |     |       |      |    |      |     |    |
| Degree or Certificate: AAS, AGS, and Certificates where applicable (1.2). General Education – Not Applicable |       |       |     |       |      |    |      |     |    |

| MTL.155 Fund. of CNC Milling Applications   | 2     | 2     | 3   |       |      |    |      |     |    |
| This course provides an introduction to Computer Numerical Control (CNC) milling processes and their proper application. Some of the topics covered include machine set-up and operation, machine safety, types of milling machines, use and care of various cutting tools, and a review of milling speeds and feeds. The student will perform face and end milling operations as well as drilling, reaming, tapping, and slotting operations on manual milling machines. The proper use and care of accessories, such as edge finders, digital readouts, dial indicators, and boring heads, and an introduction to a CNC milling machine are also covered. Offered: Fall |       |       |     |       |      |    |      |     |    |
| Prerequisites: Take MTL.130 or Proficiency-based Exam |       |       |     |       |      |    |      |     |    |
| Applicable toward graduation at Sandburg where program structure permits: |       |       |     |       |      |    |      |     |    |
| Degree or Certificate: AAS, AGS, and Certificates where applicable (1.2). General Education – Not Applicable |       |       |     |       |      |    |      |     |    |
**MTL.160 CNC Lathe Set-up**  

Students will produce and troubleshoot Computer Numerical Control (CNC) lathe set-ups from job packets and machine parts to blueprint specifications. Students will learn simple G and M codes, download programs to machines, graphically verify programs, and prove out parts on 2-axis turning center utilizing various CNC controllers. Set-ups will include faceting, turning, drilling, grooving, and thread operations. Students will also learn to produce some simple tooling necessary to complete various set-ups.

Offered: As Needed

Applicable toward graduation at Sandburg where program structure permits:

Degree or Certificate: AAS, AGS, and Certificates where applicable (1.2).

**General Education – Not Applicable**

**MTL.165 CNC Mill Set-up**  

Students will produce and troubleshoot Computer Numerical Control (CNC) mill set-ups from job packets and machine parts to blueprint specifications. Students will learn simple G and M codes, download programs to machines, graphically verify programs, and prove out parts on 3-axis machining centers using various CNC controllers. Set-ups will include face, end, and profile milling and drilling, slotting, boring, and tapping operations. Students will also learn to produce some simple tooling necessary to complete various set-ups.

Offered: Fall

Prerequisites: Take MTL.155

Applicable toward graduation at Sandburg where program structure permits:

Degree or Certificate: AAS, AGS, and Certificates where Applicable (1.2).

**General Education – Not Applicable**

**MTL.200 Fundamentals of Live Tooling**  

The course provides the specific skills required to efficiently and effectively operate machines employing multi-axis part processing to maximize machine productivity. This course covers concepts of Computer Numerical Control (CNC) machining, setup and operations, tooling and work-holding systems, and basics of manual part programming for drilling, milling, and tapping, as well as boring operations by utilizing G codes. Hands-on practice is an integral part of the class.

Offered: Spring

Prerequisites: Take MTL.160 and MTL.165

Applicable toward graduation at Sandburg where program structure permits:

Degree or Certificate: AAS, AGS, and Certificates where applicable (1.2).

**General Education – Not Applicable**

**MTL.205 Live Tooling Set-Up & Orientation**  

The course provides the knowledge and skills required to translate the part drawing into a finished product. Part programs will be created with a consistent focus on identifying those specific part features that lend themselves to 4-axis structured programming, and simultaneous machining. The individual will be capable of defining the list of required processes and their optimum sequential order, create the complete CNC tool part program, install the appropriate tools correctly, establish the program zero points, and perform corresponding tool offsets and related machine safety procedures.

Offered: Spring

Prerequisites: Take MTL.160 and MTL.165

Applicable toward graduation at Sandburg where program structure permits:

Degree or Certificate: AAS, AGS, and Certificates where applicable (1.2).

**General Education – Not Applicable**

**MTL.210 CNC Lathe Process**  

This course is designed to provide the knowledge and skills required to create a Computer Numerical Control (CNC) program that will convert stock material into a finished product. The student will be capable of defining the list of required processes, their optimum sequence, create the complete CNC part program, install the appropriate tools correctly, establish the program zero point, and perform corresponding tool offsets. This course is also an advanced, hands-on study of Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) theory and applications using CAD/CAM software. Emphasis is placed on generating programs using advanced modeling techniques for the CNC lathe at an intermediate level under moderate instructor supervision. The course is structured to include classroom instructional theory and hands-on operation of a CNC turning center.

Offered: Spring

Prerequisites: Take MTL.160 and MTL.165

Applicable toward graduation at Sandburg where program structure permits:

Degree or Certificate: AAS, AGS, and Certificates where applicable (1.2).

**General Education – Not Applicable**

**MTL.215 CNC Mill Process**  

This course is designed to provide the knowledge and skills required to create a Computer Numerical Control (CNC) program that will convert stock material into a finished product on a vertical machining center. The students will be capable of defining the list of required processes, their logical / optimum sequence, create the complete CNC part program, install the appropriate tools correctly, establish the program zero point, and perform corresponding tool offsets. This course is also an advanced hands-on study of Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) theory and applications using CAD/CAM software. Emphasis is placed on generating programs using advanced modeling techniques for the CNC mill at an intermediate level under moderate instructor supervision. The course is structured to include classroom instructional theory and hands-on operation of a CNC vertical machining center.

Offered: Spring

Prerequisites: Take MTL.160 and MTL.165

Applicable toward graduation at Sandburg where program structure permits:

Degree or Certificate: AAS, AGS and Certificates where applicable (1.2).

**General Education – Not Applicable**
**MTL.295 Operator Internship I**

10 2

The objective of this course is to integrate classroom theory with industry practice. All students will receive on-the-job training with selected area industry in the public and private sectors. All internship positions will be supervised by the supervising instructor and a job site supervisor. The positions associated with this internship will be non-paying positions. 160 hours required for course completion.

Offered: Fall or Spring or Summer

Prerequisites: Take MFG.125, MFG.130, MTL.103, MTL.130, and MTL.135.

Applicable toward graduation at Sandburg where program structure permits:

Degree or Certificate: AAS, AGS and Certificates where applicable (1.2).

General Education – Not Applicable

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**MTL.296 Operator Internship II**

10 2

Students who are currently employed in the industry will perform a special project on a topic of interest to the student and his/her firm. The project will be supervised by the supervising instructor and a job site supervisor. (1.2).

General Education – Not Applicable

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**MTL.297 Programmer Internship I**

10 2

The objective of this course is to integrate classroom theory with industry practice. All students will receive on-the-job training with selected area industry in the public and private sectors. All internship positions will be supervised by the supervising instructor and a job site supervisor. The positions associated with this internship will be non-paying positions.

Offered: Fall or Spring or Summer

Prerequisites: Take MAT.101, MTL.150, MTL.155, MTL.160, MAT.102, MTL.200, MTL.205, MTL.210, and MTL.215

Applicable toward graduation at Sandburg where program structure permits:

Degree or Certificate: AAS, AGS and Certificates where applicable (1.2).

General Education – Not Applicable

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**MTL.298 Programmer Internship II**

10 2

Students who are currently employed will perform a research project on a topic of interest to the student and his/her firm. The project will be supervised by the supervising instructor and a job site supervisor.

Offered: Fall or Spring or Summer

Prerequisites: Take MAT.101, MTL.150, MTL.155, MTL.160, MTL.165, MAT.102, MTL.200, MTL.205, MTL.210, and MTL.215.

Applicable toward graduation at Sandburg where program structure permits:

Degree or Certificate: AAS, AGS and Certificates where applicable (1.2).

General Education – Not Applicable