

## Required Courses

### Required Discipline Courses (49 credits)

CMAE 1528	Career Success Skills .....	1 cr
MATH 1500	Applied Mathematics .....	3 cr
MTTS 1110	Principles of Machine Operations I .....	2 cr
MTTS 1111*	Principles of Machine Operations II .....	2 cr
MTTS 1120	Machine Operations I .....	3 cr
MTTS 1121	Machine Operations II .....	3 cr
MTTS 1122*	Machine Operations III .....	3 cr
MTTS 1124	Introduction to Engineering Graphics .....	2 cr
MTTS 1130	Print Reading .....	2 cr
MTTS 1131*	Print Applications .....	2 cr
MTTS 1134*	CNC Operations .....	3 cr
MTTS 1135	CNC Programming and Process Planning ...	2 cr
MTTS 1140	CAD/CAM I .....	2 cr
MTTS 2110	Geometric Dimensioning and Tolerancing .....	1 cr
MTTS 2112	Metallurgy .....	1 cr
MTTS 2116*	Introduction to EDM .....	2 cr
MTTS 2118*	Jigs and Fixtures .....	1 cr
MTTS 2130*	CNC Milling and Turning .....	4 cr
MTTS 2134*	CNC Operations Theory .....	2 cr
MTTS 2140*	CAD/CAM II .....	2 cr
MTTS 2155	Capstone Project <b>OR</b> .....	1-6 cr
MTTS 2190	Internship .....	4-6 cr
RAST 1109	Computers in Industry .....	2 cr

### Required MnTC Courses

\*\*\*An A.A.S. degree requires a minimum of 15 credits selected from at least three of the ten goal areas of the Minnesota Transfer Curriculum (MnTC).

ENGL 1422	Practical Writing (Goal 1) .....	3 cr
Minnesota Transfer Curriculum Courses .....		12 cr

\*Denotes Prerequisites

## GRADUATION REQUIREMENT - 64 CREDITS

## Description

In the Machine Tool Technology program students learn how to use hand tools, laths and mills, computer-aided-drafting and design software, power machinery, and computerized equipment. The Associate of Applied Science (A.A.S.) Degree curriculum includes geometric tolerancing, advanced CAD/CAM, and advanced CNC milling and turning operations. Instruction takes place in a well-equipped shop for a hands-on, practical experience.

## Outcomes

By completing this program, students will achieve the following learning outcomes:

- Read and interpret a mechanical working drawing;
- Perform precision measurement, layout, drilling, sawing, turning, milling, and precision grinding safely;
- Perform shop calculations;
- Program, setup, and operate a computer numerical control (CNC) turning center and machining center;
- Anticipate, choose, and troubleshoot the proper tooling based on manufacturing requirements;
- Manufacture assemblies to specification; and
- Apply effective communication and interpersonal skills in the machining industry.

## Pre-Program Requirements

Some courses may require students to meet College Placement Levels in reading, writing, and/or math. See an advisor for more information.

For insurance purposes, internships may require that students be 18 years old.

## Graduation Requirements

In addition to the program requirements, students must meet the following conditions in order to graduate:

- College Cumulative GPA Requirement: cumulative grade point average (GPA) of credits attempted and completed at CLC must be at least 2.0;
- College Technical Core GPA Requirement: cumulative GPA of credits attempted and completed towards the technical core of the diploma or degree must be at least 2.0;
- Residency Requirement: students must complete 25% of their credits at Central Lakes College.

## Career & Transfer

Computer numerically controlled (CNC) machine tool programmers and operators develop and operate programs to control the machining or processing of metal or plastic parts by automatic machine tools, equipment, or systems. Most jobs are in manufacturing settings in a variety of industries including machine shops, aerospace, medical, automotive, and metalworking machining. Math, computer, and engineering skills are important in this field, but machinists also use a creative side to solve problems and make new designs. Examples of career titles in this field include numerical control machine operator, CNC programmer, robotic machine operator, numerical control drill press operator, lathe operator, automated cutting machine operator, machinist tool and die, precision instrument maker, and tool maker.

## Academic Plan

### Semester One (16 credits)

CMAE 1528	Career Success Skills.....	1 cr
<b>OR Substitute with</b>		
RAST 1110	Intro to Manufacturing.....	2 cr
MATH 1500	Applied Mathematics .....	3 cr
MTTS 1110	Principles of Machine Operations I.....	2 cr
MTTS 1120	Machine Operations I.....	3 cr
MTTS 1121	Machine Operations II.....	3 cr
MTTS 1130	Print Reading.....	2 cr
RAST 1109	Computers in Industry.....	2 cr

### Semester Two (16 credits)

MTTS 1111*	Principles of Machine Operations II .....	2 cr
MTTS 1122*	Machine Operations III.....	3 cr
MTTS 1124	Introduction to Engineering Graphics .....	2 cr
MTTS 1131*	Print Applications .....	2 cr
MTTS 1134*	CNC Operations.....	3 cr
MTTS 1135	CNC Programming and Process Planning....	2 cr
MTTS 1140	CAD/CAM I .....	2 cr

### Semester Three (16 credits)

ENGL 1422	Practical Writing (Goal 1) .....	3 cr
MTTS 2110	Geometric Dimensioning and Tolerancing.....	1 cr
MTTS 2118*	Jigs and Fixtures .....	1 cr
MTTS 2130*	CNC Milling and Turning.....	4 cr
MTTS 2134*	CNC Operations Theory.....	2 cr
MTTS 2140*	CAD/CAM II .....	2 cr
Minnesota Transfer Curriculum Courses .....		3 cr

### Semester Four (16 credits)

MTTS 2112	Metallurgy .....	1 cr
MTTS 2116*	Introduction to EDM .....	2 cr
MTTS 2155	Capstone Project <b>OR</b> .....	1-6 cr
MTTS 2190	Internship.....	4-6 cr
Minnesota Transfer Curriculum Courses .....		9 cr