# DRAFTING AND 3D TECHNOLOGIES

## ASSOCIATE OF APPLIED SCIENCE (AAS) – 66 CREDITS

## About this program

The Drafting and 3D Technologies program prepares students for employment in a wide variety of engineering-related disciplines. Students are trained across multiple two- and three-dimensional software platforms to generate drawings of parts, assemblies and layouts, as well as other manufacturing and construction-related documentation specifically required by employers. The curriculum incorporates 3D printing, 3D scanning and rapid prototyping as tools for taking student designs from computer models to three-dimensional solids. Graduates of the program enter the workforce as mechanical drafters, designers and engineering technicians. This degree also allows students to continue their education in a baccalaureate program at participating four-year institutions.

## Program outcomes

1. Produce and interpret engineering drawings and models using multiple software packages and various design methodologies, including two-dimensional layouts, three-dimensional layouts and designs, and three-dimensional printed solid models.
2. Demonstrate a knowledge of manufacturing processes and materials utilized in modern manufacturing.
3. Effectively communicate graphically, orally and with written communication skills in a professional manner.
4. Function effectively as part of a design team to complete projects while following and maintaining industry standards.
5. Demonstrate knowledge of computer numerical control concepts related to industrial machining, 3D printing and CAD/CAM operations.
6. Perform the math required to communicate and document design concepts.
7. Apply critical thinking concepts to identify and solve design concerns for industry-specific projects.

## Curriculum overview

| Crds | Requirement type |
|---|---|
| 63 | Required courses |
| 3 | Restricted electives in courses |
| 66 | **Total** |

**Developmental courses note:** A student may be required to enroll in developmental courses in reading, writing and math. A student's scores on the Accuplacer assessment will determine enrollment in developmental courses. The purpose of developmental courses is to prepare students for the demands of a college-level curriculum. *Credits may vary.*

**Accreditation:** Minnesota State Community and Technical College is accredited by the Higher Learning Commission, a regional accreditation agency recognized by the U.S. Department of Education. The Higher Learning Commission 230 South LaSalle Street, Suite 7-500 Chicago, IL 60604-1411 http://www.ncahigherlearningcommission.org Phone: 312.263.0456 / 800.621.7440

# Curriculum requirement details

## Required courses

| Course | Crds |
|---|---|
| CADD1000 - AutoCAD Basics | 3 |
| CADD1400 - Introduction to SolidWorks | 3 |
| CADD1410 - Introduction to Autodesk Inventor | 3 |
| COMM1120 - Introduction to Public Speaking | 3 |
| ENGL1101 - College Writing | 3 |
| ENGL1215 - Professional and Technical Writing | 3 |
| ENGT1118 - Construction and Manufacturing Math | 3 |
| MCDD1104 - Mechanical Engineering Drawing I | 4 |
| MCDD1106 - Mechanical Engineering Drawing II | 4 |
| MCDD1114 - Manufacturing Processes | 2 |
| MCDD1124 - Mechanical Drafting Applications I | 3 |
| MCDD2112 - Geometric Dimensioning and Tolerancing | 2 |
| MCDD2200 - Advanced Modeling with SolidWorks | 3 |
| MCDD2204 - Mechanical Engineering Drawing III | 4 |
| MCDD2210 - Advanced Modeling with Inventor | 3 |
| MCDD2220 - Mechanical Engineering Drawing IV | 3 |
| MCDD2230 - 3D Printing and Prototyping | 2 |
| MCDD2246 - Tool Design | 3 |
| MCDD2252 - Mechanical Drafting Applications II | 4 |
| MCDD2254 - Computer Numerical Control | 2 |
| SOC1111 - Introduction to Sociology | 3 |

## Other requirements or restricted electives

**3 credits from one or more of these Courses:**

| Course title | Credits |
|---|---|
| ECON2210 - Macroeconomics | 3 |
| ECON2222 - Microeconomics | 3 |

# Course summaries

**CADD1000 - AutoCAD Basics** ..... ***(3 credits)***
This course provides the fundamentals of computer-aided drafting (CAD) using the latest version of the AutoCAD drafting software. The course develops the CAD skills necessary to design and print complex two-dimensional drawings and sheet sets.

**CADD1400 - Introduction to SolidWorks** ..... ***(3 credits)***
This course will introduce students to the part modeling and drawing layout tools in Dassault's SolidWorks design software. Students will learn the concepts of parametric sketching and modeling, sketched feature creation and editing, placed feature creation and editing, and model-derived drawing layouts.
***Prerequisites:***

**CADD1410 - Introduction to Autodesk Inventor** ..... ***(3 credits)***
This course will introduce students to the part modeling and drawing layout tools in Autodesk's Inventor software. Students will learn the concepts of parametric sketching and modeling, sketched feature creation and editing, placed feature creation and editing, and model-derived drawing layouts.
***Prerequisites:***

**COMM1120 - Introduction to Public Speaking** ..... ***(3 credits)***
Meets MnTC Goal Area 1. This course clarifies the process of oral communication, clarifies the basic principles of public speaking and allows the student to increase the application of these principles while both speaking and listening.
***Prerequisites:***

**ENGL1101 - College Writing** ..... ***(3 credits)***
Meets MnTC Goal Area 1. This is an introductory writing course designed to prepare students for later college and career writing. The course focuses on developing fluency through a process approach, with particular emphasis on revision. Students will consider purpose and audience, read and discuss writing and further develop their own writing processes through successive revisions to produce polished drafts. Course work will include an introduction to argumentative writing, writing from academic sources and a short research project.
***Prerequisites:***

**ENGL1215 - Professional and Technical Writing** ..... ***(3 credits)***
Meets MnTC Goal Area 1. This course provides instruction in writing and designing professional and technical documents, including print and non-print correspondence, descriptions, instructions, reports and proposals, along with promotional material. Analysis, critical thinking and synthesis of sources will be covered, along with the development of presentation skills. Coursework also includes a formally documented, multi-source professional project.
***Prerequisites:***

**ENGT1118 - Construction and Manufacturing Math** ..... ***(3 credits)***
This course covers the application of common geometric and trigonometric calculations related to the construction and manufacturing industries.
***Prerequisites:***

**MCDD1104 - Mechanical Engineering Drawing I** ..... ***(4 credits)***
The objective of this course is to develop the student's knowledge and use of machine drafting, lettering, line identity and application, orthographic projection, dimensioning practices, and section and auxiliary drawings.

**MCDD1106 - Mechanical Engineering Drawing II** ..... ***(4 credits)***
The objective of this course is to develop the student's use and knowledge of pictorial drawings, sheet metal, pattern layout and welding drawing. Mechanical fasteners will be identified.
***Prerequisites:***

**MCDD1114 - Manufacturing Processes** ..... ***(2 credits)***
The objective of this course is to develop the student's understanding of processes for casting, molding, forming, separating and assembling a variety of manufacturing-related materials.

**MCDD1124 - Mechanical Drafting Applications I** ..... ***(3 credits)***
The objective of this course is for students to develop a set of working drawings of an existing machine project. A genealogy chart, final and sub-assembly drawings, detail drawings, parts lists and part numbering system will be completed.
***Prerequisites:***

**MCDD2112 - Geometric Dimensioning and Tolerancing** ..... ***(2 credits)***
The objective of this course is to develop the student's understanding and application of a self-defined set of symbols, rules, definitions and conventions used to describe the size, form, orientation and location of part features.
***Prerequisites:***
***Corequisites:***

**MCDD2200 - Advanced Modeling with SolidWorks** ..... ***(3 credits)***
This course covers advanced part modeling, assembly modeling, sheet metal, weldments and presentation files in the latest version of the SolidWorks drawing software package.
***Prerequisites:***

**MCDD2204 - Mechanical Engineering Drawing III** ..... ***(4 credits)***
The objective of this course is to explore advanced applications of various industry drawing methods. Students will be introduced to and will construct drawings related to multiple drafting and engineering disciplines.
***Prerequisites:***

**MCDD2210 - Advanced Modeling with Inventor** ..... ***(3 credits)***
This course covers advanced part modeling, assembly modeling, sheet metal, frame generator and presentation files in the latest version of the Inventor drawing software package.
***Prerequisites:***

**MCDD2220 - Mechanical Engineering Drawing IV** ..... ***(3 credits)***
This course introduces the student to multiple specialized computer programs to create working drawings for manufacturing and construction.
***Prerequisites:***

**MCDD2230 - 3D Printing and Prototyping** ..... ***(2 credits)***
This course covers the basic concepts of rapid prototyping for manufacturing utilizing three-dimensional printers and scanning equipment.
***Prerequisites:***

**MCDD2246 - Tool Design** ..... ***(3 credits)***
The objective of this course is to develop an understand of jigs, fixtures, dies and their function in mass production, from the basic levels of component pieces through design and implementation.
***Prerequisites:***
***Corequisites:***

**MCDD2252 - Mechanical Drafting Applications II** ..... ***(4 credits)***
The objective of this course is to develop the student's knowledge of the processes involved in design development and scheduling. Gearing, shafts, chains, and belts and bearings, along with part, sub-assembly and assembly representations are applied to the student's capstone project.
***Prerequisites:***

**MCDD2254 - Computer Numerical Control** ..... ***(2 credits)***
This course develops the student's knowledge of computer numerical control components, machines, and basic programming codes and functions.
***Prerequisites:***

**SOC1111 - Introduction to Sociology** ..... ***(3 credits)***
Meets MnTC Goal Areas 2, 5 and 7. This course is an introduction to the study of societies and the social factors that influence individual and group behavior. The course incorporates sociological and other critical thinking models for the investigation of various components of social life: culture, socialization, social organization, social stratification, social institutions, populations dynamics and social change.

**ECON2210 - Macroeconomics** ..... ***(3 credits)***
This course provides the student with a means to study economic principles as they relate to determinants of national income, national income accounting, business cycles, unemployment, inflation and aggregate expenditures. The course also examines macroeconomic policy and provides information to gain further understanding in the areas of fiscal policy, financial markets, money and banking, monetary policy, international policy and the varying viewpoints that have evolved throughout history, including the Keynesian and Monetarist schools of thought.

**ECON2222 - Microeconomics** ..... ***(3 credits)***
Microeconomics stresses the concepts of scarcity, production possibilities, supply and demand curves, elastic and inelastic goods and services, competition, monopolies, oligopolies, poverty and income distribution in the United States. In general, microeconomics examines the functioning of individual industries and the behavior of the individual.

# DRAFTING AND 3D TECHNOLOGIES

## ASSOCIATE OF APPLIED SCIENCE (AAS) – 66 CREDITS

## Program Plan — "Moorhead AAS"

Locations: Moorhead

### 1st Fall Term (15 credits)

**Courses**

| Course | Crds |
|---|---|
| CADD1000 - AutoCAD Basics | 3 |
| COMM1120 - Introduction to Public Speaking | 3 |
| MCDD1104 - Mechanical Engineering Drawing I | 4 |
| MCDD1114 - Manufacturing Processes | 2 |
| SOC1111 - Introduction to Sociology | 3 |

### 1st Spring Term (18 credits)

**Courses**

| Course | Crds |
|---|---|
| CADD1400 - Introduction to SolidWorks | 3 |
| CADD1410 - Introduction to Autodesk Inventor | 3 |
| ENGL1101 - College Writing | 3 |
| ENGT1118 - Construction and Manufacturing Math | 3 |
| MCDD1106 - Mechanical Engineering Drawing II | 4 |
| MCDD2112 - Geometric Dimensioning and Tolerancing | 2 |

### 2nd Fall Term (18 credits)

**Courses**

| Course | Crds |
|---|---|
| MCDD1124 - Mechanical Drafting Applications I | 3 |
| MCDD2200 - Advanced Modeling with SolidWorks | 3 |
| MCDD2204 - Mechanical Engineering Drawing III | 4 |
| MCDD2210 - Advanced Modeling with Inventor | 3 |
| MCDD2230 - 3D Printing and Prototyping | 2 |
| MCDD2246 - Tool Design | 3 |

### 2nd Spring Term (15 credits)

**Courses**

| Course | Crds |
|---|---|
| ENGL1215 - Professional and Technical Writing | 3 |
| MCDD2220 - Mechanical Engineering Drawing IV | 3 |
| MCDD2252 - Mechanical Drafting Applications II | 4 |
| MCDD2254 - Computer Numerical Control | 2 |

**3 credits in one or more of the following:**

ECON2210 - Macroeconomics 3

ECON2222 - Microeconomics 3