DESIGN AND ENGINEERING TECHNOLOGY

ASSOCIATE OF APPLIED SCIENCE (AAS) – 60 CREDITS

About this program

The Design and Engineering Technology 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 processes and materials utilized in modern manufacturing, tool design, product design and rapid prototyping.
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 accurately calculate scales, parameters, and necessary formulas for communicating and documenting design concepts.
7. Apply critical thinking concepts to identify and solve design concerns for industry-specific projects.

Curriculum overview

Crds	Requirement type
45	Required courses
3	Restricted electives in courses
12	Restricted electives in course types
60	**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
COMM1120 - Introduction to Public Speaking	3
DET1104 - Mechanical Drawing I	4
DET1105 - Mechanical Drawing II	4
DET1204 - Mechanical Drawing III	4
DET1210 - Introduction to Parametric Modeling	4
DET1230 - Introduction to 3D Printing and Scanning	2
DET2110 - Advanced Parametric Modeling	4
DET2130 - Advanced 3D Printing and Scanning	2
DET2140 - Design for Manufacturing	4
DET2240 - Computer Aided Machining and Programming	4
DET2250 - Reverse Engineering Applications	4
ENGL1101 - College Writing	3
ENGT1134 - Office Systems and Equipment	3

Other requirements or restricted electives

3 credits from one or more of these Courses:

Course title	Credits
ARCH2248 - CADD Alternatives	3
DET2120 - Structural Design and Detailing	3

12 credits from these Course Types:

- General Education w/MnTC Goals

Course summaries

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:

- Assessment into ENGL 1101

DET1104 - Mechanical Drawing I ..... ***(4 credits)***
The objective of this course is to develop students' knowledge and use of machine and mechanical drafting, lettering practices, line identity and application, orthographic projection, dimensioning practices, and detail, section and auxiliary drawings.

DET1105 - Mechanical Drawing II ..... ***(4 credits)***
In this course, students utilize design software and descriptive geometry to create, modify, detail and print orthographic, section, detail and auxiliary views. Industry standards will be incorporated into the design process, focusing on accurate view representation, dimensioning and annotation practices.

Prerequisites:

- DET1104

DET1204 - Mechanical Drawing III ..... ***(4 credits)***
The objective of this course is to develop students' use and knowledge of mechanical fasteners and welding symbols, their proper application on weldment drawings, and documentation of assemblies and sub-assemblies. Students also develop an understanding of tolerancing types and rules, including fundamental knowledge of geometric dimensioning and tolerancing symbols, datums and material conditions.

Prerequisites:

- DET1104
- DET1106

DET1210 - Introduction to Parametric Modeling ..... ***(4 credits)***
This course introduces students to part modeling and drawing layout tools in various parametric design software. Students learn concepts of parametric sketching and modeling, sketched feature creation and editing, placed feature creation and editing, and model-derived drawing layouts.

Prerequisites:

- DET1106

DET1230 - Introduction to 3D Printing and Scanning ..... ***(2 credits)***
This course covers basic concepts of 3D printing and rapid prototyping, utilizing various three-dimensional printers, scanners and slicing software.

DET2110 - Advanced Parametric Modeling ..... ***(4 credits)***
This course covers advanced part modeling, assembly modeling, sheet metal model and pattern creation, and generation of presentation and exploded assembly files in the latest versions of various parametric modeling software.

Prerequisites:

- DET1106
- DET1210

Corequisites:

- DET2140

DET2130 - Advanced 3D Printing and Scanning ..... ***(2 credits)***
In this course, students explore and apply advanced concepts in three-dimensional printing and scanning using multiple design platforms, 3D printers, hand-held and table scanners, and multiple-scan model creation.

Prerequisites:

- DET1210
- DET1230

Corequisites:

- DET2110
- DET2140

DET2140 - Design for Manufacturing ..... ***(4 credits)***
This course prepares students to work in manufacturing-related industries as jig, fixture and tool designers. The course expands students' knowledge of modern manufacturing practices and machine processes while learning concepts behind designing quality control, prototyping and production run tooling.

Prerequisites:

- DET1210
- DET1230

Corequisites:

- DET2110

DET2240 - Computer Aided Machining and Programming ..... ***(4 credits)***
The objective of this course is to develop students' knowledge of computer numerical control system components, programming codes for linear and circular interpolation, and Computer Aided Design/Computer Aided Machining (CAD/CAM) integration.

Prerequisites:

- DET2110

DET2250 - Reverse Engineering Applications ..... ***(4 credits)***
The objective of this course is for students to develop a set of production drawings of an existing product. Students will be required to reverse engineer the product and create all necessary views, layouts, annotations and instructions required for the product to be manufactured and assembled, while collaborating with a work group similar to those found in industry.

Prerequisites:

- CADD2200
- CADD2210
- DET1106
- DET2246

ENGL1101 - College Writing ..... ***(3 credits)***
Meets MnTC Goal Area 1. This is an introductory course designed to prepare students for later college and career writing through a process approach with particular emphasis on revision. Students consider purpose and audience as they read, discuss and refine their work to develop confidence in their writing and communication skills.

Prerequisites:

- ELL1085
- ENGL0097
- or placement in College Level English.

ENGT1134 - Office Systems and Equipment ..... ***(3 credits)***
This course covers the application of Windows software systems in coordination with AutoCAD software as well as general office equipment set-up and use.

ARCH2248 - CADD Alternatives ..... ***(3 credits)***
This course will familiarize the student with computer drafting and modeling software for the graphic design of residential construction.

DET2120 - Structural Design and Detailing ..... ***(3 credits)***
This course provides a comprehensive introduction to structural drafting and design, utilizing industry-standard tools to develop fundamental knowledge of structural engineering principles. Students learn to create detailed structural models, drawings and documentation. Key topics include the modeling of structural components, creation of professional construction documentation, and the coordination of structural designs within multidisciplinary projects.

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Program Plan — "Wadena AAS"

Locations: Wadena

1st Fall Term (14 credits)

Courses

Course	Crds
DET1104 - Mechanical Drawing I	4
DET1105 - Mechanical Drawing II	4
ENGT1134 - Office Systems and Equipment	3

3 credits in one or more of the following:

General Education w/MnTC Goals

1st Spring Term (16 credits)

Courses

Course	Crds
COMM1120 - Introduction to Public Speaking	3
DET1204 - Mechanical Drawing III	4
DET1210 - Introduction to Parametric Modeling	4
DET1230 - Introduction to 3D Printing and Scanning	2

3 credits in one or more of the following:

General Education w/MnTC Goals

2nd Fall Term (16 credits)

Courses

Course	Crds
DET2110 - Advanced Parametric Modeling	4
DET2130 - Advanced 3D Printing and Scanning	2
DET2140 - Design for Manufacturing	4
ENGL1101 - College Writing	3

3 credits in one or more of the following:

General Education w/MnTC Goals

2nd Spring Term (14 credits)

Courses

Course	Crds
DET2240 - Computer Aided Machining and Programming	4
DET2250 - Reverse Engineering Applications	4

3 credits in one or more of the following:

ARCH2248 - CADD Alternatives 3
DET2120 - Structural Design and Detailing 3

3 credits in one or more of the following:

General Education w/MnTC Goals