

# Mechanical Design Technology

Program Code 106061

## Associate Degree - Two Years

Offered at the Green Bay campus. For information: (920) 498-5444.

Toll-free: (800) 422-NWTC, ext. 5444. Visit the Mechanical Design Technology website at: [www.nwtc.edu/programs/MechanicalDesign](http://www.nwtc.edu/programs/MechanicalDesign)

### Program Description

Mechanical Design Technology prepares learners for employment as machine designers.

Mechanical Design Technicians assist Product Engineers by detailing sections of the design. Detailing includes selecting standard parts such as bearings, couplings, and fasteners; sizing machine members; and preparing necessary documentation for detail and assembly drawings. Most of the work is done on a computer.

### Program Outcomes

- Draw principal, auxiliary, and sectional views.
- Use mechanical, architectural, metric, and civil scales to plot scalable prints of drawings.
- Research information on the Internet.
- Maintain files on a personal computer.
- Operate word processing and spreadsheet programs.
- Analyze displacement, velocity, and acceleration of machine members.
- Analyze stresses caused by forces acting on bodies at rest.
- Analyze forces acting on bodies at rest.
- Sketch orthographic and isometric views.
- Use catalogs or Internet sites to select standard components in machine design.
- Dimension mechanical drawings according to conventional ANSI Y14 standards and GDT standards.
- Draw weldments and sheetmetal layouts.
- Draw cam layouts.
- Calculate gear train ratios.
- Create basic models using a parametric modeler.
- Design simple mechanical devices.
- Draw detail and assembly drawings.
- Prepare electrical/electronic documentation for machine control.
- Construct ladder diagrams for motor controls documentation.
- Display attitudes consistent with the profession.
- Work in an organized manner, documenting work performed.
- Use Machinery's Handbook as a reference source.
- Apply various manufacturing methods and techniques as they relate to mechanical design.
- Identify the characteristics of metal, polymeric, ceramics and composites.
- Evaluate material options for machine components.
- Select materials for machine components.

### Employment Potential

A graduate of this program will have the potential for employment in the following areas:

**Detailer:** produces detailed drawings of parts of machines from supplied information on CAD, and make drawing changes to comply with Engineering Change Notices (ECN's)/ Engineering Change Requests (ECR's).

**Mechanical Design Technician:** applies knowledge of mechanical engineering technology to design, develop, and test new or revised machinery; assists in component selection and sizing of machine members; has duties split between design and drafting and may specialize in a specific type of machine or product. Most work is performed on a computer.

**Mechanical Drafter:** has the principal duty of preparing working drawings of machinery and mechanical devices using CAD systems to draft detail and assembly drawings indicating dimensions and tolerances, materials, surface finishes, joining requirements, and other engineering data.

**With additional education and/or work experience, graduates may find other opportunities for employment.**

- Mechanical Designer (Product Designer)
- Lead Designer
- Project Engineer
- Technical Sales/Service Representative

### Requirements for Program Entry

- Completed application.
- High school transcript or equivalent (such as an HSED or GED® Transcript).
- NWTC Academic Skills Assessment or equivalent (See Academic Skills Assessment section for details and equivalents).
- Beginning with applications submitted for Fall 2008, students will be required to take the Accuplacer College Level Math assessment instead of the Algebra assessment. The benchmark grade for Mechanical Design Technology on the College Math assessment is 50.
- A high school background in mathematics, science and industrial education.
- High school algebra or equivalent.
- The student will either provide proof of having completed course work in Windows, Word, and Excel or pass a proficiency test.

### Curriculum

The Mechanical Design Technology Associate Degree is a two-year program. Upon graduation, a student will have completed 68 credits.

#### First Semester

Catalog No.	Description	Credits
10-606-111	Mechanical Design-Exploring	1
10-606-113	CAD	2
10-606-157	Solidworks Fund and Drawings	2
10-614-113	2D Essentials	2
10-801-196	Oral/Interpersonal Comm	3
10-804-118	Interm Algebra w Apps	4
10-809-199	Psychology Of Human Relations	3
<b>Semester Total</b>		<b>17</b>

#### Second Semester

10-442-153	Prototype Metal Fabrication	2
10-606-103	2D CAD - Advanced	3
10-606-122	CAD-Fabrication & Assembly	2
10-606-126	Geometric Dimension/Toleran	2
10-804-196	Trigonometry w Apps	3
10-806-154	General Physics 1	4
<b>Semester Total</b>		<b>16</b>

#### Third Semester

10-420-115	CNC-Mechanical Design	3
10-606-135	Machine Members-Strength	5
10-606-139	CAD-Electrical Control	3
10-606-158	Solidworks Advanced	3
10-606-159	Materials Science	3
<b>Semester Total</b>		<b>17</b>

#### Fourth Semester

10-606-141	Design Problems	3
10-606-143	Mechanisms	3
10-620-100	Fluids 1: Basic Pneumatics	1
10-620-101	Fluids 2: Basic Hydraulics	1
10-620-165	Fluids 3: Inter Hydraulics	1
10-801-195	Written Communication	3
10-809-172	Race Ethnic & Diversity	3
	Elective	3
<b>Semester Total</b>		<b>18</b>
<b>Total Credits</b>		<b>68</b>

#### Suggested Electives:

- 10-660-104, DC 1: Introduction
- 10-660-105, DC 2: Circuits
- 10-660-107, AC 1: Properties

This program is fully eligible for financial aid.

## Please Note

- Some courses have prerequisites (listed at the end of each course description, if applicable) that need to be taken prior to enrolling in those courses.
- Many courses are offered via our Flexible Learning Options (online, accelerated, ITV, video, weekend, and self-paced) and may be taken in any order as long as prerequisites are met. To find out which program courses are offered through Flexible Learning Options, go to [www.nwtc.edu](http://www.nwtc.edu) or consult a counselor, (920) 498-5444.
- Descriptions of courses not found on this page can be found in the back of this catalog.

## Course Descriptions

*These courses provide an opportunity for students to develop the knowledge, skills, and understanding required for employment in this field.*

**10-420-115 CNC-Mechanical Design** ...2 axis CNC; 3 axis CNC; importing files; mold making. (Prerequisites: 10-606-113, CAD; 10-606-157, Solidworks)

**10-442-153 PROTOTYPE METAL FABRICATION** ...ferrous and non-ferrous metals, oxyacetylene gas, tungsten arc, gas metal arc, and metal fabrication. (Corequisite: 10-606-122, CAD Fab & Assembly; OR 10-614-122, Prototype Design)

**10-606-103 2D CAD-ADVANCED** ...primary and successive auxiliary views; intersections and developments; intersections of planes and dihedral angles; piercing points; angles between lines and planes; revolutions; vectors. (Prerequisite: 10-606-113, CAD)

**10-606-111 MECHANICAL DESIGN EXPLORING** ...philosophy/organization/procedure of the Mechanical Design Technology Program, brief overview of the engineering profession by involvement in a design project to illustrate basic concepts/methods of machine design. (Prerequisite: Accepted into the Mechanical Design Technology program)

**10-606-113 CAD (COMPUTER AIDED DRAFTING)** ...computer aided drafting using AutoCAD software focusing on template settings; creating and manipulating layers; basic drawing, editing, and inquiry commands; blocks and attributes; and plotting. (Corequisites: 10-607-119, Civil Drafting Technology; OR 10-606-119, Technical Sketching OR 10-614-113, 2D Essentials)

**10-606-122 CAD-FABRICATION & ASSEMBLY** ...sheet metal drawings as applied to brackets, enclosures & guarding; welding drawings; threads & fasteners; stock components; working drawing documentation. (Prerequisite: 10-606-113, Computer Aided Drafting)

**10-606-126 GEOMETRIC DIMENSIONING/TOLERANCING** ...basic review, geometric dimensioning, datums, material condition symbols, tolerances of form and profile, tolerances of orientation and run out, location tolerances and virtual condition. (Prerequisite: 10-606-113, CAD; OR 10-606-157, Solidworks Fund and Drawings OR 10-606-162, Solidworks Fundamentals)

**10-606-135 MACHINE MEMBERS-STRENGTH** ...force analysis, moments, truss and frame analysis, simple stress, properties of materials, joint design, centroids and moments of inertia, beam design, shafting design, combined stresses, columns. (Prerequisites: 10-806-154, General Physics 1; 10-804-196, Trigonometry w Apps)

**10-606-139 CAD-ELECTRICAL CONTROL** ...draw and wire circuits, draw and develop simple PLC logic and schematics, draw and utilize components in control circuits, develop and draw control logic from written specification. (Prerequisite: 10-606-113 CAD)

**10-606-141 DESIGN PROBLEMS** ...data gathering, mathematics, document standard practices, project management and teamwork. (Prerequisites: 10-606-126, Geometric Dimensioning/Tol; 10-606-135, Machine Members-Strength; 10-606-103, 2D CAD Adv, 10-606-158, Solidworks Adv)

**10-606-143 MECHANISMS** ...study of motion, vector equations and sense notation, basic motion concepts, kinematic drawing and displacement, velocities in mechanisms, accelerations in mechanisms, CAM motions, and gear trains. (Prerequisites: 10-806-154, General Physics 1; 10-606-113 CAD; 10-804-196, Trigonometry w Apps)

**10-606-157 SOLIDWORKS FUNDAMENTALS AND DRAWINGS** ...terminology, software operation and interface basics, creating basic models, creating casting and forging models, revolved features, Solidworks drawing environment and full dimensioned orthographic drawings. (Corequisite: 10-606-119, Sketching-Technical, OR 10-614-113, 2D Essentials Sketching-Technical Prerequisite: Familiarity with Windows file management)

**10-606-158 SOLIDWORKS ADVANCED** ...sweeps, equations, configurations, draft, base and derived parts, assemblies, assembly drawings, auxiliary, section and special views, sheet metal, lofting, surfacing, and core and cavity. (Prerequisite: 10-606-157, Solidworks Fund and Drawings OR 10-606-163, Solidworks-Intermediate)

**10-606-159 MATERIALS SCIENCE** ...engineering materials, material selection, the relationship between material structure and properties, and failure analysis for design improvement. Materials covered include; metallic, polymeric, electric, ceramic, and composite/exotic.

**10-614-113 2D ESSENTIALS** ...an introduction to technical communication, annotation, geometric construction, model, orthographic and pictorial, section and auxiliary views and dimensioning. Knowledge integral to Model Building.

**10-620-100 FLUIDS 1: BASIC PNEUMATICS** ...what fluid power is, differentiate between hydraulics and pneumatics, implement basic pneumatic circuits, utilize schematics, apply Pascal's law, define properties of fluids, implement airflow control and hydraulics cylinder circuits.

**10-620-101 FLUIDS 2: BASIC HYDRAULICS** ...hydraulic pumps, basic hydraulics actuator circuits, hydraulic schematics, apply Pascal's Law, summarize the effects of fluids friction, define properties of hydraulic energy, design hydraulic circuits with directional control valves. (Prerequisite: 10-620-100, Fluids 1: Basic Pneumatics)

**10-620-165 FLUIDS 3: INTERMEDIATE HYDRAULICS** ...design of cylinder actuating circuits with pressure-compensated flow control valves, how to control pressure, pilot-operated check valve applications, accumulator operation and application, hydraulic motor types and applications. (Prerequisite: 10-620-101, Fluids 2: Basic Hydraulics)