"Employment in professional, scientific and technical services will grow 28% by 2016."

Occupational Outlook Handbook 2008-09

Iowa Western Community College | *Design Technology Program*

The Design Technology program prepares students to assist engineers in the design of products or the solution to problems utilizing computerized drawings for all types of machines and manufacturing industries. Coursework emphasizes Product Lifecycle Management (PLM) model of industrial product management. Students will learn various CAD techniques as well as understanding various materials used in manufacturing. Students will earn an Associate of Applied Science degree.

** Students must complete the curriculum described below:*

RECOMMENDED COURSE SEQUENCE

First Semester			***Cr.***
CSC	110	Introduction to Computers	3
MAT	129	Precalculus*	5
EGT		Introduction to PLM	3
CAD		CAD 1	3
CAD		Design Statics	3
			17

Second Semester			***Cr.***
SPC	122	Interpersonal Communication	3
MGT	195	Workplace Empowerment	3
EGT		Geometric Dimensioning & Tolerancing	3
CAD		CAD 3D - NX	4
EGT		Manufacturing Processes	3
			16

Summer Semester			***Cr.***
EGT		Design Technology Internship	6
			6

Third Semester			***Cr.***
ENG	105	Composition I	3
EGT		Electric Power and Electronics	4
CAD		Principles of Design	3
CAD		Component Design	4
EGT		Strength of Materials	3
			17

Fourth Semester			***Cr.***
PHI	105	Introduction to Ethics	3
CAD		Advanced CAD 3D - NX	3
CAD		Design Problems	4
CAD		Design Communication	3
			13

69 semester hours required

*Students may substitute both MAT 121 College Algebra and MAT 130 Trigonometry for MAT 129 Precalculus program degree requirement.

Courses

Introduction to PLM — 3 Crs

Introduction to PLM will provide an overview of the current thinking on the principles, strategies, practices, and applications of Product Lifecycle Management followed by an in-depth look at specific areas of PLM that are the focus of today's innovative organizations. This course will present both the conceptual underpinnings of PLM, along with the newest industry views on PLM applications. There will be a particular emphasis on initiating PLM projects at the beginning of the lifecycle in engineering and manufacturing and its impact on the rest of the organization. The course will also present frameworks to provide economic justifications for PLM projects and explain the pitfalls of a piecemeal approach to PLM. (3/0)

1. Understand the guiding principles of engineering and managing projects

2. Understand the significance of integrating project and product lifecycle models (PPLM).

3. Gain experience in conceptual modeling of a product and the project that delivers it.

4. Analyze strategic, tactical, and operational perspectives of project management.

5. Demonstrate the ability to balance the needs of cost expectations, quality requirements and project schedule.

CAD 1 — 3 Crs

CAD I provides instruction in entry-level CAD (computer-aided design) skills. Students learn 2D and 3D representation of objects, and national and international standards for documentation. Students will use Siemen's software and teamwork to create drawings. Parametric solid modeling will be introduced. (2/2)
Corequisite: Introduction to PLM

1. Students will develop the ability to think and visualize objects in a three-dimensional world.

2. Students will develop and communicate the design concepts using traditional graphics and computer models.

3. Students will learn computer applications for solving problems.

Design Statics — 3 Crs

Design Statics presents an elementary, analytical and practical approach to the principles and physical concepts of the study of forces and their effects on machines. The course uses problem solving related to fundamental industrial technology systems. Students will learn basic laws of energy, force, and mass applied to technology systems including: mechanical power transmission; equipment calibration; heating, ventilation and air conditioning. (3/0)
Corequisite: Introduction to PLM

1. Demonstrate the concept of a resultant force for systems of forces and proficiency in performing calculations,

2. Explain the concept and calculations of components of a force,

3. Calculate the reaction forces at the supports of a rigid body at rest,

Geometric Dimensioning & Tolerancing — 3 Crs

Geometric Dimensioning and Tolerancing provides fundamentals of geometric dimensioning and tolerancing (GD&T) per the ASME Y14.5M—2009 standard. The development of the technical knowledge and skills required for application and interpretation of GD&T is the focus of the course. Design requirements for functional gages and other methods used to verify GD&T specifications are also presented (3/0)
Prerequisite: Design Statics

1. Explain the elements of the feature control frame

2. Demonstrate the application of datum features

3. Calculate tolerances for objects

4. Describe part inspection process.

CAD 3D - NX — 4 Crs

CAD 3D-NX introduces basic (Unigraphics Solutions) NX® parametric based solid modeling techniques. Exercises include creating and editing solid models using primitive features, form features and sketches. Introduces master modeling technique of drawing creation and editing; file management in a team environment is emphasized. (3/2)
Prerequisite: CAD 1

1. Describe what constitutes a CAD/CAM system, and what elements and factors that are important in the creation of CAD/CAM software;

2. Describe the various standards pertaining to computer graphics and CAD/CAM software;

3. Explain the mathematical formulations, characteristics, and properties of popular parametric geometric curves and surfaces.

4. Explain and demonstrate the basic use and operation of Siemen's® PLM software system in a team design and development environment; and carry out all phases of the design of a mechanical.

Manufacturing Processes — 3 Crs

Manufacturing Processes is a study of selected materials and related processes used in manufacturing. Emphasis will be on material and process selection for optimum design based on quality, strength, and economic evaluations. Laboratory experiments, demonstrations, and field trips will be used. (1/4)
Prerequisite: Design Statics

1. Explain the breadth and depth of the field of manufacturing

2. Describe the strong interrelationships between material properties and manufacturing processes

3. Demonstrate some of the basic metal cutting, forming, welding, casting, and polymer processes

4. Demonstrate and apply the basic terminology associated with these fields

Design Technology Internship **6 Crs**

Design Technology internship provides work experience related to the student's Design training. This course allows the student to integrate theory with practice in the student's area of specialization. Work experience hours are arranged. (0/12)
Prerequisite: Permission from the program chair and successful completion of first year design technology courses.

1. Demonstrate interpersonal skills.

2. Demonstrate knowledge of appropriate strategies for securing and changing jobs.

3. Model appropriate skills which enhance and promote on–the-job success.

4. Demonstrate knowledge of basic concepts of entrepreneurship.

5. Demonstrate leadership skills, and knowledge and skills in all aspects of an industry

Electric Power and Electronics **4 Crs**

Electric Power and Electronics provides students with basic electrical fundamentals including; electrical safety, wiring, 3-phase service, controls, and motors for industrial applications. Planning building electrical systems will also be introduced including electronics to sense, monitor, and control mechanical processes. Students will learn fundamentals of semiconductors, digital logic circuits and reading of electrical diagrams. (3/2)
Prerequisite: Design Statics

1. Demonstrate the safe handling of electricity

2. Describe the function of a digital circuit diagram

3. Explain controls used to monitor mechanical processes.

Principles of Design **3 Crs**

Principles of Design emphasizes further development of geometric dimensioning and tolerancing techniques and applying tolerances for functionality and manufacturability. Students use Solid Edge® to create solid models and produce parts, detail and assemblies drawings suitable for manufacturing production. (2/2)
Prerequisites: CAD 1 and Geometric Dimensioning & Tolerancing

1. Demonstrate the ability to create parts, assemblies and drawings

2. Explain 3-D modeling concepts

3. Demonstrate proper dimensioning and tolerancing

4. Create drawings for parts and assemblies

5. Explain the sustainability of design

Component Design **4 Crs**

Students study the selection, analysis, fatigue and synthesis of machine components. Students explore strength and fatigue considerations for shaft design, threaded fasteners, lubrication and bearings, springs, and fundamentals of gear analysis, including forces, stresses and terminology (3/2)
Prerequisite: CAD 3D - NX

1. Ability to design a component to meet desired needs within realistic constraints.

2. Explain failure points for connectors and fasteners.

3. Demonstrate the ability to create the proper design of assemblies

Strength of Materials **3 Crs**

This course introduces the analysis and design of basic structural members (bar, beams, shafts, connectors, and columns) under various loads to determine stress, strain, load limits, required size and deflection. The course covers selection of appropriate materials for a particular design. Students use standard analytic and computer based techniques of solving problems related to force and moments. (2/2)
Prerequisites: Geometric Dimensioning & Tolerancing

1. Analyze the stresses and the corresponding deformations in various structural members, considering axial loading, torsion, and pure bending.

2. Determine the normal stresses in a beam and the design of beams based on the allowable normal stress in the material used

3. Determine shearing stresses in beams and thin-walled members under transverse loadings.

4. Determine a column's ability to support a given load

Advanced CAD 3D - NX **3 Crs**

Advanced CAD NX® explores areas of three-dimensional constructions and related features of the Unigraphics CAD system. Participants will construct 3-D models and perform model editing, use a 3-D coordinate system, create and apply surface techniques, and create 2-D drawings based on 3-D models. Students will also learn to transition data to others within the manufacturing process. (3/0)
Prerequisites: CAD 3D -NX

1. Apply basic model process to 3-d drawing

2. Demonstrate and capture design changes in a PLM Teamcenter® environment

3. Create a rendered 3-D model

4. Demonstrate the use of neutral file formats and translators

Design Problems **4 Crs**

Design Problems offers student the opportunity to use their creativity in designing a specific product from scratch. The process will start with a basic concept as a solution to a problem and progresses through an analytical state involving calculations and layout drawings. The project will include final assembly and detail drawing, and a bill of materials. (1/4)
Prerequisites: Component Design

1. Demonstrate the use of design problem solving, creative thinking, project planning and teamwork through a challenging design and build project

2. Communicate fundamental engineering reporting and communication by using project plans, design reviews, and project reports

3. Demonstrate effective teamwork skills

Design Communication **3 Crs**

Design Communication teaches techniques to communicate the design ideas to stake holders. It covers reporting to the client via different graphic methods and perspectives. Students generate presentations, animations and assembly demonstrations. Students prepare data for production. (2/2)
Prerequisites: Component Design and Principles of Design

1. Create production animations

2. Use 3-d model to create optimum cutter paths

3. Demonstrate the ability to use different file formats

4. Demonstrate effective teamwork skills