

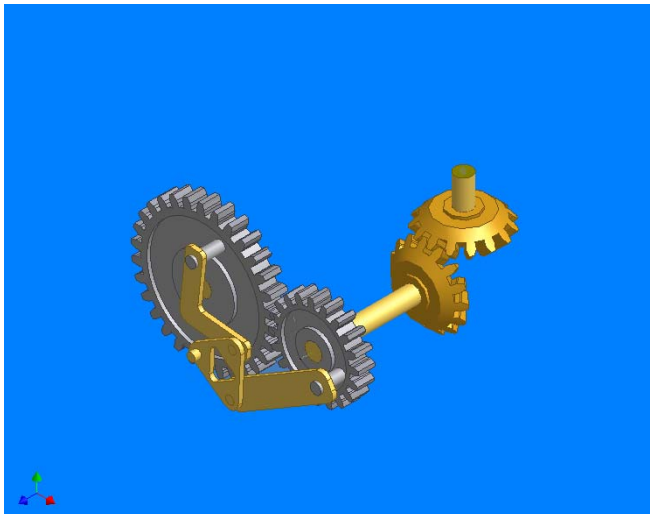
CLINTON ♦ MUSCATINE ♦ SCOTT

COMMUNITY COLLEGES

⇒ EASTERN IOWA COMMUNITY COLLEGE DISTRICT

Mechanical Design Technology

CAD/PRO-E PROGRAM DESCRIPTION



ASSOCIATE IN APPLIED SCIENCE DEGREE DIPLOMA CERTIFICATE

**John T. Blong Technology Center
8500 Hillandale Road
Davenport, Iowa 52804
563.441.4360**

⇒ EASTERN IOWA COMMUNITY COLLEGE DISTRICT

*Accounting Specialist, A
Agriculture, Art, Auto C
Collision Repair, Autom
Aviation, Banking, Biol
Business Administration,
Chemistry, Child Care,
Communications Media,
Computer Science, Cons
Culinary Arts, Criminal
Justice, Dental Assisting,
Diesel, Drama, Educatio
Electroneurodiagnostic,
Electronics, English, En
Compliance, Farm Mana
Feed and Fertilizer Mark
Heating, Ventilation and
Air Conditioning, Histor
Horticulture Science, Ind
Engineering Technology
- CAC/CNC, Industrial
Safety and Health, Interi
Design, Library Technic
Assistant, Management
Support Systems, Manufa
Microcomputer Informat
Technology, Music,
Journ Management and
Supervision.
Marketing/Sales/Retaili
Mathematics, Network
Administrator, Pharmar
Technician, Physical Ed
Recreation, Physical The
Assistant, Physics, Politic
Science, Pre-Chiropractic
Pre-Engineering, Pre-He,
Nursing, Pre-Mortuary
Science, Pre-Pharmacy,
Pre-Physical Therapy, P
Pre-Veterinary, Pre-Law,
Printing, Psychology, Ra
Sign Language Interpret
Sociology & Social Work,
Speech, Truck Driving,
Accounting Specialist, A
Agriculture, Art, Auto C
Collision Repair, Autom
Aviation, Banking, Biolo
Business Administration,
Chemistry, Child Care,
Communications Media,
Computer Science*

John T. Blong Technology Center: Registration Checklist

- Pick up or request a **Student Packet*** from the **Front Desk** at the **John T. Blong Technology Center** (phone: 563.441.4360; address: 8500 Hillandale Rd., Davenport, Iowa 52806).

*The Student Packet contains an Application, Student Financial Aid form and the Program Brochure.

- Fill out an **Application** and **Student Financial Aid form**.
- Arrange to be **Compass** tested.
- Attend **Student Orientation**. Check with the Manufacturing Technology Center (see information above) to sign up for a scheduled session or arrange an individual session.
- Obtain a **computer login** from the IT Department at the Manufacturing Technology Center

- Contact Information:**

John T. Blong Technology Center
8500 Hillandale Road
Davenport, Iowa 52806
563.441.4360

Instructors:

Bruce Bainbridge, 563.441.4370, bbainbridge@eicc.edu
Brad McConnell, 563.441.4369, bemccconnell@eicc.edu

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PROGRAM DESCRIPTION

Changes are occurring right now in manufacturing that make it necessary for potential employees to have higher skill levels than ever before. Critical thinking, math and science, electronics and computer skills are at the top of the list.

An Associate in Applied Science degree in Mechanical Design Technology allows you to get those skills and specialize in Computer Aided Design (CAD)/Pro-E.

The Mechanical Design Technology program includes proficiencies required by industry, delivered in a practical, hands-on method that applies directly to the world of work.

Pro-Engineer (Pro-E) is a standard in industry, that's why we incorporated it into our curriculum several years ago. In addition we offer training in SolidWorks and AutoCAD. Over 500 hours of lab time prepare you well for employment. Our graduates' extensive CAD training gives them the edge in today's job market.

A two-year degree is the new criteria for the manufacturing employee. An Associate in Applied Science degree in CAD/Pro-E from Eastern Iowa Community College is an excellent foundation for success. To speak with an advisor see the contact information on page two.

ESTIMATED PROGRAM COSTS

Approximate costs for the entire program are:

Fall - Semester 1:

Books \$700 - \$800

Tuition @ \$112.00 a credit hour (13 hours) = \$1,456.00

Supplies \$200.00-\$300.00

Spring - Semester 2:

Books \$300 - \$400

Tuition @ \$112.00 a credit hour (17 hours) = \$1,904.00

Summer Session:

Books \$100 - \$200

Tuition @ \$112.00 a credit hour (9 hours) = \$1,008.00

Fall - Semester 3:

Books \$200 - \$300

Tuition @ \$112.00 a credit hour (14 hours) = \$1,568.00

Spring - Semester 4:

Books \$300 - \$400

Tuition @ \$112.00 a credit hours (14 hours) = \$1,568.00

Based on In-State tuition fees

Revised 7/23/09

FINANCIAL AID

There are several scholarships specific to this degree program. See the Financial Aid office for more information.

HOW TO ENROLL

A candidate for admission must:

- Submit the Scott Community College admission application in person or by mail.
- Send all high school, college or GED scores to: Student Services, Scott Community College, 500 Belmont Road, Bettendorf, IA 52722
- Complete the college assessment by making an appointment with the Testing Center, 441-4088.

PROGRAM FACULTY

Bruce Bainbridge – BS, University of Wisconsin-Stout

Brad McConnell – AAS, Morrison Institute of Technology

SUPPLIES

The following is a list of recommended equipment that will be needed to complete the CAD/Drafting program.

Scientific Calculator (TI30Xa)

1Gb (or larger) Flash Drive (Recommended)

CADD SKILL STANDARDS

Each course has been developed around a set of CADD Skill Standards, National Occupational Skill Standards. These standards were prepared by the National Coalition of Advanced Manufacturing located at 2000 L. St., NW, Washington, DC 20036. The phone number is 202.429.2220. The web site is www.nacfam.org. For a copy of the standards, please see the Front Desk at the Manufacturing Technology Center.

In each course, rather than list all of the standards, numbers will be used to reflect which standards are being used. If a student wishes to look up the standards, just go to the web site above or look at the hard copy at the front desk. An example of how this information will be shown in each module is as follows: **I, A, 1(a)***.

*Fundamental Drafting Skills / A. Drafting Skills / 1(a) would be shown as **I, A, 1(a)**. It would stand for the **Skill** "Use drawing media and related drafting materials." Its **Objectives** would be to "Identify the characteristics and types of vellum, mylar, plotting pens, plotting pencils, ink and toner cartridges." The Standard would be "Select drawing media from among the following choices . . ."

The following Table of Contents is taken from the CADD Skill Standards located at www.nacfam.org. It will help you understand the organization of the standards shown in each module.

Table of Contents (CADD Skill Standards, National Occupational Skill Standards)

- I. Fundamental Drafting Skills
 - A. Drafting Skills
 - B. Orthographic Projections
 - C. Pictorial Drawings
 - D. Dimensioning
- II. Fundamental Computer Skills
 - A. Hardware
 - B. Physical and Safety Needs
 - C. Operating Systems
- III. Basic CADD Skills
 - A. Create
 - B. Edit
 - C. Manipulate
 - D. Analyze
 - E. Dimensioning
- IV. Advanced CADD Skills
 - A. Create
 - B. Edit
 - C. Manipulate
 - D. Analyze
 - E. Productivity and Work Habits

JOHN T. BLONG TECHNOLOGY CENTER **MECHANICAL DESIGN TECHNOLOGY** **CAD/PRO-E PROGRAM ORIENTATION**

Introduction

The CAD/Pro Engineer program is comprised of three separate degree paths—Certificate, Diploma, and Associate in Applied Science Degree. All three of these paths consist of courses that will be available through the Eastern Iowa community College MEDIA SITE system and be offered at the Blong Technology Center as well as the Clinton and Muscatine campuses.

What is “MEDIA SITE”?

Beginning with Fall 2009, the Mechanical Design Technology program will be offered district-wide through the Eastern Iowa Community college’s MEDIA SITE system. This technology allows students access to lectures over the Internet at the Blong Technology Center, Clinton Community College, Muscatine Community College or a site of the student’s choosing as long as there is Internet access available. Instructors will be available on each campus on a set schedule. Lab/classroom space is also available on each campus. It is the responsibility of the student to allow adequate time to complete assigned work for each course they are enrolled in. A MANDATORY orientation for the program detailing the use of MEDIA SITE will be held at each campus at the beginning of each semester. (Students needing to schedule specific orientation time will be accommodated.)

Job Classification

Mechanical Design Technicians assist engineers in design and development work by preparing detailed drawings showing exact dimensions and specifications. Most drawings are prepared on the computer (CAD system) utilizing advanced knowledge and skills of drafting, design, mechanical operations, geometric dimensioning and tolerances, strength of materials, and solid modeling. In some instances mechanical design technicians will work with solid modeling software such as Pro-Engineer (basic modeling, basic detailing, assemblies, and sheet metal) for comprehensive design and processing of different mechanical/geometrical sub-assemblies, and/or systems.

Program/Course Descriptions

Mechanical Design Technology

Eastern Iowa Community College (Certificate, Diploma, AAS)

Certificate, Diploma, and Associate in Applied Science Degree are available

Pro Engineer/SolidWorks Certificate	20 Credits
Certificate CAD\Pro Engineer	30 Credits
Diploma CAD\Pro Engineer	39 Credits
Associate in Applied Science Degree CAD\Pro Engineer	67 Credits

Each session is 8 weeks in length.

Pro Engineer/SolidWorks Solid Modeling Certificate

Core Courses		
	Course Name	Cr. Hours
CAD:231	Pro Engineer – Basic Modeling or	4
CAD:261	SolidWorks – Basic Modeling	
CAD:241	Pro Engineer – Advanced Modeling or	4
CAD:262	SolidWorks – Advanced Modeling	
CAD:251	Pro Engineer – Assembly Modeling or	4
CAD:263	SolidWorks – Assembly Modeling	
CAD:233	Pro Engineer – Basic Detailing or	4
CAD:264	SolidWorks – Basic Detailing	
CAD:256	Pro Engineer – Sheet Metal or	4
CAD:265	SolidWorks – Sheet Metal	—
Pro Engineer/SolidWorks Certificate Total		20

CAD/PRO ENGINEER CERTIFICATE

Session 1

DRF:114	Basic Drafting 1/A	2.5
MAT:142	Technical Mathematics 1	1.5
CAD:211	Fundamentals of AutoCAD	<u>3.0</u>
	Session Total	7.0

Session 2

DRF:115	Basic Drafting 1B	2.5
MAT:143	Technical Mathematics 2	1.5
CSC:112	Computer Fundamentals for Technicians 1/A	2.0
XXX:XXX	Humanities/Social Science Elective	<u>3.0</u>
	Session Total	9.0

Session 3

DRF:130	Industrial Drafting Applications 1A	3.5
MAT:144	Technical Mathematics 3	1.5
PHY:130	Applied Physics 1	<u>2.0</u>
	Session Total	7.0

Session 4

DRF:135	Industrial Drafting Applications 1B	3.5
MAT:145	Technical Mathematics 4	1.5
PHY:135	Applied Physics 2	<u>2.0</u>
	Session Total	7.0

CAD/ProEngineer Certificate Total 30

CAD/PRO ENGINEER DIPLOMA

Session 1

DRF:114	Basic Drafting 1/A	2.5
MAT:142	Technical Mathematics 1	1.5
CAD:211	Fundamentals of AutoCAD	<u>3.0</u>
	Session Total	7.0

Session 2

DRF:115	Basic Drafting 1B	2.5
MAT:143	Technical Mathematics 2	1.5
CSC:112	Computer Fundamentals for Technicians 1/A	2.0
XXX:XXX	Humanities/Social Science Elective	<u>3.0</u>
	Session Total	9.0

Session 3

DRF:130	Industrial Drafting Applications 1A	3.5
MAT:144	Technical Mathematics 3	1.5
PHY:130	Applied Physics 1	<u>2.0</u>
	Session Total	7.0

Session 4

DRF:135	Industrial Drafting Applications 1B	3.5
MAT:145	Technical Mathematics 4	1.5
PHY:135	Applied Physics 2	<u>2.0</u>
	Session Total	7.0

Session 5

ENG:111	Technical Writing	3.0
CAD:225	Descriptive Geometry	2.0
CAD:231	Pro Engineer – Basic Modeling or	4.0
CAD:261	SolidWorks – Basic Modeling	<u> </u>
	Session Total	9.0

CAD/ProEngineer Diploma Total 39

CAD\PRO ENGINEER ASSOCIATE IN APPLIED SCIENCE DEGREE

Session 1

DRF:114	Basic Drafting 1/A	2.5
MAT:142	Technical Mathematics 1	1.5
CAD:211	Fundamentals of AutoCAD	<u>3.0</u>
	Session Total	7.0

Session 2

DRF:115	Basic Drafting 1B	2.5
MAT:143	Technical Mathematics 2	1.5
CSC:112	Computer Fundamentals for Technicians 1/A	<u>2.0</u>
	Session Total	6.0

Session 3

DRF:130	Industrial Drafting Applications 1A	3.5
MAT:144	Technical Mathematics 3	1.5
PHY:130	Applied Physics 1	<u>2.0</u>
	Session Total	7.0

Session 4

DRF:135	Industrial Drafting Applications 1B	3.5
MAT:145	Technical Mathematics 4	1.5
PHY:135	Applied Physics 2	<u>2.0</u>
	Session Total	7.0

Session 5

ENG:111	Technical Writing	3.0
CAD:225	Descriptive Geometry	2.0
CAD:231	Pro Engineer – Basic Modeling or	4.0
CAD:261	SolidWorks – Basic Modeling	<u>9.0</u>
	Session Total	9.0

Session 6

EGT:161	Strength of Materials 1/A	1.5
IND:222	Geometric Dimensioning & Tolerancing	3.0
CAD:241	Pro Engineer – Advanced Modeling or	4.0
CAD:262	SolidWorks – Advanced Modeling	<u>8.5</u>
	Session Total	8.5

Session 7

EGT:162	Strength of Materials 1/B	1.5
XXX:XXX	Humanities/Social Science Elective	3.0
CAD:251	Pro Engineer – Assembly Modeling or	4.0
CAD:263	SolidWorks – Assembly Modeling	<u>8.5</u>
	Session Total	8.5

Session 8

EGT:163	Strength of Materials 2/A	1.5
DRF:148	Project Design 1	1.5
CAD:233	Pro Engineer – Basic Detailing or	4.0
CAD:264	SolidWorks – Basic Detailing	<u>7.0</u>
	Session Total	7.0

Session 9

EGT:164	Strength of Materials 2/B	1.5
DRF:149	Project Design 2	1.5
CAD:256	Pro Engineer – Sheet Metal or	4.0
CAD:265	SolidWorks – Sheet Metal	<u>7.0</u>
	Session Total	7.0

CAD/ProEngineer AAS Degree Total	67
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COURSE DESCRIPTIONS:

MAT-142 & MAT-143 Technical Mathematics 1 & 2 (1.5 Credits each)

Designed to give the student a basic knowledge of applied mathematics and the understanding of how they relate to the manufacturing industry. Also will prepare the student for further study in mathematics. Topics include basic math operations, English and metric linear measurement units and instruments, algebraic operations, plane geometry, trigonometry, compound angles and numerical control.

Prerequisite(s): **MAT-142→None**
 MAT-143→MAT-142

MAT-144 & MAT-145 Technical Mathematics 3 & 4 (1.5 Credits each)

This course is designed to follow Technical Mathematics 1 & 2 as it covers more advanced areas of application mathematics using trigonometry, algebra, and geometry. Specific areas of emphasis are basic linear equations, graphing, exponents and scientific notation, roots and radicals, quadratic equations, logarithms, and advanced trigonometry. Use of a scientific calculator will be emphasized as well as industry related application problems.

Prerequisite(s): **MAT-144→MAT-143**
 MAT-145→MAT-144

DRF-114 & DRF-115 Basic Drafting 1/A & 1/B (2.5 Credits each)

An introductory course covering the fundamentals and foundations of Drafting / Mechanical drawing. This course will develop student skills in the areas of lettering and sketching techniques as well as the use of drafting instruments. Major units of instruction will include applied geometry and construction, the drawing and dimensioning of orthographics, pictorial representations, sections, and auxiliary views. The student will progress from single view drawings to multi-view detail / working drawings. Labs will closely parallel lecture material.

Prerequisite(s): **DRF-114 →None**
 DRF-115→DRF-114

DRF-130 & DRF-135 Industrial Drafting Applications 1/A & 1/B (3.5 Credits each)

Advanced drafting course progression from skills developed in DRF:114 & DRF:115. Major areas of concentration will include: Tolerancing, Geometric Tolerancing, Manufacturing Processes, Fasteners, Gearing and Cams, Welding Representations, Piping Drawing, Electronic Diagrams and Detail Working Drawings. Lab and Lecture hours will be meshed to aid in student understanding.

Prerequisite(s): **DRF-130→DRF-115**
 DRF-135→DRF-130

CSC-112 Computer Fundamentals for Technicians 1A (2 Credits)

This course will cover microcomputer operating systems, hardware, and application software. Spreadsheets, word processing, graphs, and operating Windows environment, and Internet searches. Lab exercises will follow lecture and class discussion.

Prerequisite(s): **None**

PHY-130 & PHY-135 Applied Physics 1/A & 1/B (2.0 Credits each)

An intensive applied math and physics experience. The content covered will be reinforced with a highly "hands-on" approach, applying concepts across the four primary energy systems, while strengthening each participant's math skills. Topics covered will include force, work, rate, resistance, and power/ force transformers.

Prerequisite(s): **PHY-130→MAT-143**
 PHY-135→PHY-130

CAD-211**Fundamentals of AutoCAD (3.0 Credits)**

This is a tutorial-based course covering the fundamentals of AutoCad. Students begin with basic shapes and work thru multi-view drawings in a series of extensive hands on tutorial lessons. The AutoCad Heads-up Design Interface is also covered allowing students to concentrate on design intent rather than the keyboard. Other areas of coverage include the (What You See Is What You Get) plotting feature as well as Named Plot Style, and Layout Plotting. During the course students will cover object properties and organization thru Layers, orthographic views, dimensioning and notes, auxiliary views and GRIPS, section views, blocks, and assembly drawings.

Prerequisite(s): None

CAD-225**Descriptive Geometry (2.0 Credits)**

This course will introduce students to the basic principles of Descriptive Geometry. These principles are valuable for determining true shapes of lines, angles between two lines, two planes, or a line and a plane, and for locating the intersection between two planes, a cone and a plane, or two cylinders. Problems are solved graphically by projecting points onto selected adjacent projection planes in an imaginary projection system. Major areas of concentration will be orthographic projection, primary auxiliary views, lines, planes, successive auxiliary views, piercing points, intersection of planes, angle between planes, parallelism, perpendicularity, angle between line and oblique plane, and plane tangencies.

Prerequisite(s): DRF-115

EGT-161 & EGT-162**Strength of Materials 1/A & 1/B (1.5 Credits each)**

This course is designed to deliver instruction and study in the area of static force systems, centers of gravity, friction, moments of inertia, shear and moment diagrams. Analysis of stress/strain that occurs within machine and structural elements is also covered. Other topics such as results of tensile, compressive, torsional and flexural loading are also included.

Prerequisite(s): EGT-161→MAT-145
EGT-162→EGT-161

EGT-163 & EGT-164**Strength of Materials II/A & II/B (1.5 Credits each)**

This is a course covering the branch of mechanics that develops relationships between external forces acting on a body and the intensity of internal forces acting within the body. Computations of deformation and comparison of stability under external forces will be covered.

Prerequisite(s): EGT-163→EGT-162
EGT-164→EGT-163

DRF-148**Project Design I (1.5 Credits)**

This course will provide students an introduction to the design process. Students are introduced to some of the design tools used by engineering teams and will cover such topics as "Whole systems thinking," "Teams as a tool in the engineering design process," "Creativity and innovation in design," "Problem solving processes for design," and "Communicating a design." Students will work in teams of two to three and will be required to complete a project during the course of the class. Students will be given a choice of projects to choose from.

Pre-requisites: EGT-162

DRF-149**Project Design 2 (1.5 Credits)**

This class will build on the skills and techniques learned in Project Design I. Students will work in teams of two to three and will cover topics to include "From concept to delivery: Managing the project," "Quality through the design review process," and "Delivering the product." Each team will be required to complete an assigned project during the course of the class.

Pre-requisites: DRF-148

CAD-231**Pro E - Basic Modeling (4 Credits)**

This is a basic course teaching the fundamental operation of Pro Engineer thru the use of Computer Based Training Software. Students will learn the menu structure and command functionality to model basic parts using Pro Engineer. Students will gain an understanding of Parametric Modeling and the feature based design process. Use of the Intent Manager will be emphasized for creation of sketched features. Students will understand the need for and application of datums during the modeling creation. A large part of the course will be devoted to editing and modifying existing models. Students will develop an understanding of and control references during the modeling process. Students will also demonstrate a clear understanding of the resolve mode during modeling.

Prerequisite(s): DRF-115 or Instructor's Approval

CAD-233**Pro E - Basic Detailing (4 Credits)**

This is a course designed for technicians and designers who must use Pro Engineers Drawing functionality. Students will learn how to create orthographic views of part models to be used in detail drawings. Students will completely dimension drawings using title block formats; design tolerancing and GD&T. Students will also create assembly drawings and bill of materials using the table command. Multiple sheet drawings and multi model drawings will also be created.

Prerequisite(s): CAD-251 or Instructor's Approval

CAD-251**Pro E - Assembly Modeling (4 Credits)**

This course is for the designers who will create assemblies from existing parts. The constraint functionality of Pro Engineer will be used to create multiple part assemblies as well as sub-assemblies. Students will learn the differences between Top Down and Bottom Up assemblies. Students will use the start part and start assembly tools in assembly creation. Troubleshooting and redefining assembly constraints will also be emphasized. Students will also learn to modify the assembly explode states for assembly drawing creation.

Prerequisite(s): CAD-241 or Instructor's Approval

CAD-241**Pro E - Advanced Modeling (4 Credits)**

This is a continuation of IE231 – Basic Modeling. Students will gain more experience in part modeling using more advanced sketching and modeling tools. More advanced use of datums, layers, relations and sweeps will be utilized. Students will also create family tables of similar parts and use Pro Program to automate part design and creation. Development of mapkeys and customization of the Pro Engineer interface will also be addressed.

Prerequisite(s): CAD-231 or Instructor's Approval

CAD-256**Pro E - Sheet metal (4 Credits)**

This course is designed for the user who creates and manipulates large or multiple sheet drawings. Students will use Pro Engineers layer control, and feature show capabilities to create advanced detail drawings. Exploded assemblies and tabulated drawings will be covered, as will simplified reps, the use of symbols, ordinate dimensions, and created and shown dimensions.

Prerequisite(s): CAD-233 or Instructor's Approval

CAD-261**SolidWorks - Basic Modeling (4 Credits)**

This course will introduce students to the basic parametric modeling concepts using SolidWorks. Coverage will also include customizing the SolidWorks environment, parametric equations, and design tables. Students will follow tutorials in each chapter and will use the skills learned in the tutorials to complete assigned projects at the end of each chapter.

Prerequisite(s): DRF-115 or Instructor's Approval

CAD-262**SolidWorks - Advanced Modeling (4 Credits)**

This course will introduce students to the advanced parametric modeling concepts using SolidWorks. Coverage will include lofts, sweeps, and shelled parts. Coverage will also include 2-D layouts, vector mechanics, mechanism design, and analysis & mold design.

Prerequisite(s): CAD-261 or Instructor's Approval

CAD-263**SolidWorks - Assembly Modeling (4 Credits)**

This course will introduce students to the assembly modeling functionality of SolidWorks. Coverage will include basic assembly functionality, sub-assemblies, creating features at the assembly level, and exploded assemblies.

Prerequisite(s): CAD-262 or Instructor's Approval

CAD-264**SolidWorks - Basic Detailing (4 Credits)**

This course will introduce students to the detailing (drawing) functionality of SolidWorks. Students will create basic part drawings from existing part geometry, drawing sheet formats, eDrawings, assembly drawings, and exploded assembly drawings.

Prerequisite(s): CAD-263 or Instructor's Approval

CAD-265**SolidWorks - Sheet metal (4 Credits)**

This course will introduce students to the sheetmetal modeling functionality of SolidWorks. Students will create sheetmetal parts in both flat and bent states. Areas of coverage will include bends, flattened states, tabs, and reliefs.

Prerequisite(s): CAD-264 or Instructor's Approval

IND-222**Geometric Dimensioning & Tolerancing (3 Credits)**

This is a basic introductory course covering the fundamental use of Geometric Dimensioning and Tolerancing. Area of coverage include Engineering Drawings, GD&T fundamentals, Form control, Datums, Orientation, Tolerance of Position, Concentricity, Symmetry, Runout and Profile. Lectures will be viewed via eCompanion and the Media Site system.

Prerequisite(s): DRF-115