

## Design Drafting Technology-Mechanical CAD Certificate

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32 Credits

This is a one-year (three quarter) program designed for both the new student entering the field of drafting and for the current employee who wishes to learn more about the knowledge and skills currently in demand by the industry. This certificate prepares students for entry-level careers in computer-aided drafting. Students will learn to create drawings and plans that show the end-product in the proper orthographic layout required by industry. The certificate is a pathway to the [Mechanical Computer-Aided Design, AAS](#) program.

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**Program Website:** Design Drafting Technology | <https://www.greenriver.edu/students/academics/degrees-programs/cad-design/>

### Program Outcomes:

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1. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.
2. Apply current ASME Y14.5, machining and AWS symbology for industry production and documentation.
3. Create accurate solid model computer files to output designs to 2-D documentation, 3-D printing, and CNC machines, using feature based solid modeling or Boolean based construction methods.

### Requirements:

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- [CAD 101 - Introduction to AutoCAD](#) Credits: 4
- [CAD 102 - AutoCAD 2](#) Credits: 5
- [CAD 103 - 3-D AutoCAD Solids](#) Credits: 4
- [CAD 105 - Introduction to Orthographic Geometry](#) Credits: 7
- [CAD 106 - Advanced Geometry and Nonorthographic Creation](#) Credits: 7
- [CAD 107 - Introduction to Feature Based Modeling](#) Credits: 5

### Notes:

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Last updated:

7/1/2023

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## Course Descriptions

[Contract All Courses](#) |

This section includes a brief description of each credit class offered on a regular basis at Green River College. Classes are arranged in alphabetical order according to the college department that offers the class.

Each listing includes a course number (prefix & code/number), course title, number of credits awarded, prerequisite, course outcomes, and academic transfer distributions are also designated where applicable. Common course numbers are identified by an “&” symbol at the end of the department abbreviation.

Course numbers 100-299 are designated for Green River College programs and courses that transfer to senior institutions (transfer is sometimes limited). The 100 series is ordinarily for first-year students and the 200 series for second-year students, but this distinction varies because of differing requirements at other colleges and universities. The 300 and 400 level series are for third- and fourth-year students. The courses 0-99 are pre-college level courses, are designed to ease your transition to college and start on a pathway to a degree.

Consult the “[Programs of Study](#)” section of this catalog and your faculty advisor for specific information about each class and about which classes will meet your requirements.

### CAD Design & Engineering Technology

#### • CAD 101 - Introduction to AutoCAD

Credits: 4

Primary instruction covers AutoCAD (current release), which is used for computer-aided drafting to create and edit drawings. Includes instruction on file management and an introduction to basic word processing and basic spreadsheet functions. Introduces competencies required for Operators to create, format and plot with current AutoCAD software.

**Enrollment Requirement:** Eligible for [ENGL 97](#) or instructor consent.

**Course Fee:** \$100.00

#### **Course Outcomes:**

Students who successfully complete this class will be able to:

1. Work productively within a group setting.
2. Create basic drawings in AutoCAD software. Create new files under an organized template.
3. Show the ability to document and produce drawings in an organized output.

#### **Program Outcomes**

1. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.

#### **College-wide Outcomes**

- **Critical Thinking** -Critical thinking finds expression in all disciplines and everyday life. It is characterized by an ability to reflect upon thinking patterns, including the role of emotions on thoughts, and to rigorously assess the quality of thought through its work products. Critical thinkers routinely evaluate thinking processes and alter them, as necessary, to facilitate an improvement in their thinking and potentially foster certain dispositions or intellectual traits over time.
- **Responsibility** - Responsibility encompasses those behaviors and dispositions necessary for students to be effective members of a community. This outcome is designed to help students recognize the value of a commitment to those responsibilities which will enable them to work successfully individually and with others.

#### • CAD 102 - AutoCAD 2

Credits: 5

AutoCAD 2 continues students exposure and understanding of higher level AutoCAD functions. This class will explore W blocks, tables, template creation, setting dimension variables (DIMVARS), adding X-refs and script files.

**Enrollment Requirement:** [CAD 101](#) with a grade of 1.0 or higher; or instructor consent.

**Course Fee:** \$100.00

#### **Course Outcomes:**

Students who successfully complete this class will be able to:

1. Create drawings with basic dimension families with parent/child relations.
2. Learn to insert and edit XREFs.
3. Create and manipulate titleblocks.
4. Create tables.
5. Control DIMVARS.

#### **Program Outcomes**

1. Identify, solve, and apply engineering principles and calculations relevant to a design project.
2. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.

#### College-wide Outcomes

- **Critical Thinking** -Critical thinking finds expression in all disciplines and everyday life. It is characterized by an ability to reflect upon thinking patterns, including the role of emotions on thoughts, and to rigorously assess the quality of thought through its work products. Critical thinkers routinely evaluate thinking processes and alter them, as necessary, to facilitate an improvement in their thinking and potentially foster certain dispositions or intellectual traits over time.
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#### • CAD 103 - 3-D AutoCAD Solids

Credits: 4

Focuses on AutoCAD 3-D solids modeling with an emphasis on User Coordinate System (UCS) control and manipulation. This class will also introduce students into using 3rd party software (Navisworks) to visually inspect files from different formats integrated into a single file.

**Enrollment Requirement:** [CAD 101](#) with a grade of 1.0 or higher; or instructor consent.

**Course Fee:** \$100.00

#### Course Outcomes:

Students who successfully complete this class will be able to:

1. Create 3-D solid models using AutoCAD's Boolean construction methods.
2. Demonstrate proper control and manipulation of AutoCAD's UCS (User Coordinate System) for construction and editing of solid models.
3. Prepare proper orthographic views of models for fabrication.
4. Create feature based control of 2D AutoCAD geometry.

#### Program Outcomes

1. Identify, solve, and apply engineering principles and calculations relevant to a design project.
2. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.

#### College-wide Outcomes

- **Critical Thinking** -Critical thinking finds expression in all disciplines and everyday life. It is characterized by an ability to reflect upon thinking patterns, including the role of emotions on thoughts, and to rigorously assess the quality of thought through its work products. Critical thinkers routinely evaluate thinking processes and alter them, as necessary, to facilitate an improvement in their thinking and potentially foster certain dispositions or intellectual traits over time.
- **Quantitative and Symbolic Reasoning** - Quantitative Reasoning encompasses abilities necessary for a student to become literate in today's technological world. Quantitative reasoning begins with basic skills and extends to problem solving.

#### • CAD 104 - Structural Design and Introduction to BIM

Credits: 10

Introduces the study of structural steel and concrete drafting. The steel portion includes engineering fundamentals, welding symbols, seated and framed connections (both welded and bolted), moment connections, detailing various steel products, and the use of standard industry practices. Concrete discusses prestressed (P/S) and post-tensioned concrete (P/C). Includes engineering fundamentals, reinforcement bar detailing, P/C and P/S concrete products, and connections for P/C and P/S concrete, detailing using standard P/C and P/S concrete building products. Will also work with Building Information Modeling (BIM) principles, skills in 3-D modeling construction of Mechanical, Electrical, and Plumbing (MEP) detailing.

**Enrollment Requirement:** [CAD 101](#) and [CAD 102](#); or instructor consent.

**Course Fee:** \$100.00

#### Course Outcomes:

Students who successfully complete this class will be able to:

1. Identify the different types of structural drawings for construction industry.
2. Draw structural steel framing plans and identify structural steel products (shapes, plate, and bar) and their application in a structure.
3. Draw pre-cast and cast-in-place concrete foundation plans, concrete beam framing plans and wall framing plans, concrete stairs plan and sections/details and elevations.
4. Draw and define the symbols used in the creation of section views and the different types of sections that are used in steel and concrete construction.
5. Construct different weld symbols used on structural drawings, based on verbal and graphic instructions.
6. Define shop drawings and fabrication details, and then draw the fabrication details for structural steel columns, beams, floor and roof framing members.

#### Program Outcomes

1. Identify, solve, and apply engineering principles and calculations relevant to a design project.
2. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.

#### College-wide Outcomes

- **Critical Thinking** -Critical thinking finds expression in all disciplines and everyday life. It is characterized by an ability to reflect upon thinking patterns, including the role of emotions on thoughts, and to rigorously assess the quality of thought through its work products. Critical thinkers routinely evaluate thinking processes and alter them, as necessary, to facilitate an improvement in their thinking and potentially foster certain dispositions or intellectual traits over time.
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#### • CAD 105 - Introduction to Orthographic Geometry

Credits: 7

Fundamental drawing course that provides students with knowledge of drafting tools and techniques. Includes drafting fundamentals, geometric construction,

orthographic projection, isometric sketching, dimensioning, and sectional views. Drawing layout will include basic print reading, General notes and basic parts lists.

**Enrollment Requirement:** Eligible for [ENGL 97](#) or instructor consent.

**Course Outcomes:**

Students who successfully complete this class will be able to:

1. Create orthographic drawings based on the "rules of orthographic projection."
2. Work productively in a group setting.
3. Use office programs within an office environment.
4. Use terminology consistently within the engineering office.

**Program Outcomes**

1. Identify, solve, and apply engineering principles and calculations relevant to a design project.
2. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.

**College-wide Outcomes**

- **Critical Thinking** -Critical thinking finds expression in all disciplines and everyday life. It is characterized by an ability to reflect upon thinking patterns, including the role of emotions on thoughts, and to rigorously assess the quality of thought through its work products. Critical thinkers routinely evaluate thinking processes and alter them, as necessary, to facilitate an improvement in their thinking and potentially foster certain dispositions or intellectual traits over time.
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• **CAD 106 - Advanced Geometry and Nonorthographic Creation**

Credits: 7

Geometrical processes are used to analyze spatial relationships by viewing the object or situation in such a way that the relationship being investigated is actual size and measurable. Students apply descriptive geometry to develop and dimensions primary and secondary auxiliary views of 3-D objects. Students use visualization techniques to develop 3-D pictorial drawings dealing with non-isometric surfaces, irregular shapes and compound angles. Covers perspective development, exploded, and cut-away views. This class will also introduce principles, techniques and applications of creating geometry across the different disciplines mechanical, Civil, and Architectural. Areas of study include a review of selecting views, sectioning and auxiliary views, drafting conventions, format selection, and comparing dimensioning conventions over different industries.

**Enrollment Requirement:** [CAD 105](#) with a grade of 1.0 or higher; or instructor consent.

**Course Outcomes:**

Students who successfully complete this class will be able to:

1. Create complex orthographic views based on the "rules of orthographic projection."
2. Complete assignments based on a checking process used within engineering offices.
3. Use systems and symbols described by different engineering industries.
4. Create complex, non-orthographical images using visualization techniques.

**Program Outcomes**

1. Identify, solve, and apply engineering principles and calculations relevant to a design project.
2. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.
3. Apply current ASME Y14.5, machining and AWS symbology for industry production and documentation.

**College-wide Outcomes**

- **Critical Thinking** -Critical thinking finds expression in all disciplines and everyday life. It is characterized by an ability to reflect upon thinking patterns, including the role of emotions on thoughts, and to rigorously assess the quality of thought through its work products. Critical thinkers routinely evaluate thinking processes and alter them, as necessary, to facilitate an improvement in their thinking and potentially foster certain dispositions or intellectual traits over time.
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- **Quantitative and Symbolic Reasoning** - Quantitative Reasoning encompasses abilities necessary for a student to become literate in today's technological world. Quantitative reasoning begins with basic skills and extends to problem solving.

• **CAD 107 - Introduction to Feature Based Modeling**

Credits: 5

Focuses on geometric modeling, display manipulation, geometric analysis, online plotting, and Additive Manufacturing (3-D Printing). Included will be basic development of wireframe modeling, surface modeling and a more extensive look into 3-D solids modeling with an emphasis on User Coordinate System (UCS) control and manipulation. The general principles of 3-D printing in all of its forms such as extrusion or sintering with added instruction on methods of obtaining printable file-types and how to orient files for printing. Focuses on creating 3-D prints from Class created or pre-defined models. This class will also introduce students into using 3rd party software (Navisworks) to visually inspect files from different formats integrated into a single file.

**Enrollment Requirement:** [CAD 106](#) with a grade of 1.0 or higher; or Instructor consent.

**Course Outcomes:**

Students who successfully complete this class will be able to:

1. Create accurate 3D objects using feature-based solid modeling (Inventor).
2. Master use of UCS manipulation in the creation of solid models.
3. Organize drawing views and descriptions of individual and complex multi-part assemblies based on industry requirements.
4. Learn to work with visualization programs to modify and create geometry with a multiplatform reader.

#### Program Outcomes

1. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.
2. Create accurate solid model computer files to output designs to 2-D documentation, 3-D printing, and CNC machines, using feature based solid modeling or Boolean based construction methods.

#### College-wide Outcomes

- **Critical Thinking** -Critical thinking finds expression in all disciplines and everyday life. It is characterized by an ability to reflect upon thinking patterns, including the role of emotions on thoughts, and to rigorously assess the quality of thought through its work products. Critical thinkers routinely evaluate thinking processes and alter them, as necessary, to facilitate an improvement in their thinking and potentially foster certain dispositions or intellectual traits over time.
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### • CAD 116 - International and Regional Building Codes

Credits: 3

Students learn general and specific requirements of building codes, as applicable to the residential and commercial carpenter, contractor, homeowner, or builder. Covers energy codes, zoning laws, and environmental protection requirements.

**Enrollment Requirement:** [CAD 101](#) or instructor consent.

**Course Fee:** \$30.00

#### Course Outcomes:

Students who successfully complete this class will be able to:

1. Divide the codes books into sections relative to the questions being raised.
2. Identify related codes contained in other sections.
3. Confirm design requirements to industry standards.
4. Define solutions to design issues based on written regulations.

#### Program Outcomes

1. Solve problems by referencing Residential and International building codes applicable to the industry.

#### College-wide Outcomes

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### • CAD 118 - Introduction to Revit

Credits: 3

Introduction to building design using basic features of the Revit Architecture software. Revit Architecture software can be applied across the whole building design and documentation process including conceptual design, detailed design, building analysis, construction documentation and visualization. This course introduces students to the design concept of Building Information Modeling (BIM) and to use Revit's parametric modeling capabilities to incorporate the industry's BIM concepts.

**Enrollment Requirement:** Eligible for [ENGL 97](#) or instructor consent.

**Course Fee:** \$55.00

#### Course Outcomes:

Students who successfully complete this class will be able to:

1. Create and edit files created in Revit parametric (intelligent geometry) modeling.
2. Develop a complete set of house architectural plans that will include floor plans, roof plans, elevations, sections, axonometrics and critical details.
3. Create rendered 3D views.
4. Publish 2D plans in both electronic and printed formats.

#### Program Outcomes

1. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.
2. Solve problems by referencing Residential and International building codes applicable to the industry.

#### College-wide Outcomes

- **Critical Thinking** -Critical thinking finds expression in all disciplines and everyday life. It is characterized by an ability to reflect upon thinking patterns, including the role of emotions on thoughts, and to rigorously assess the quality of thought through its work products. Critical thinkers routinely evaluate thinking processes and alter them, as necessary, to facilitate an improvement in their thinking and potentially foster certain dispositions or intellectual traits over time.
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## • CAD 121 - Civil 3-D Drafting and Design

Credits: 5

Introduces civil drafting symbols, terminology, and standards. Includes development of an engineering drawing from survey notes to its inclusion into a set of construction plans or an engineering report. Previously DT 125.

**Enrollment Requirement:** [CAD 101](#) or instructor consent.

**Course Fee:** \$55.00

### Course Outcomes:

Students who successfully complete this class will be able to:

1. Demonstrate basic skills required for a CAD Drafting role in civil engineering-related fields, using both Auto CAD and Autodesk's Civil 3D (C3D) program.
2. Demonstrate knowledge in identifying elements of roadway horizontal and vertical alignments.
3. Create profiles and Cross sections.
4. Complete assignments using civil terminology and practices common in the industry.

### Program Outcomes

1. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.
2. Solve problems by referencing Residential and International building codes applicable to the industry.

### College-wide Outcomes

- **Critical Thinking** -Critical thinking finds expression in all disciplines and everyday life. It is characterized by an ability to reflect upon thinking patterns, including the role of emotions on thoughts, and to rigorously assess the quality of thought through its work products. Critical thinkers routinely evaluate thinking processes and alter them, as necessary, to facilitate an improvement in their thinking and potentially foster certain dispositions or intellectual traits over time.
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## • CAD 133 - Introduction to Solidworks

Credits: 5

Introduces 3-D CAD model creation using a feature-based, parametric solid modeling design program. Course covers base, boss and cut feature creation using extruded, revolved, simple swept or simple lifted shapes; sketching techniques for capturing design intent using automatic or user-defined geometric and dimensional constraints; building assemblies from created parts; detail and assembly drawings creation and bill of material insertion. Previously D T 113.

**Enrollment Requirement:** [CAD 101](#) or instructor consent. **Recommended:** [CAD 103](#)

**Course Fee:** \$55.00

### Course Outcomes:

Students who successfully complete this class will be able to:

1. Create "feature based geometry" used in the mechanical design industry to create 3-D models that capture the designer's intent for that feature.
2. Demonstrate the use parametric dimensions and geometric controls allowing a change in the value of a feature dimension that will rebuild and reshape the model accordingly.
3. Demonstrate the use of feature relations and mathematical equations to create related dimensions to other features within an object, within a part, or within an assembly between parts.
4. Create and manipulate full associative within an entire assembly of parts.
5. Create full drawing sets defining parts, assemblies and parts lists for a defined project.

### Program Outcomes

1. Identify, solve, and apply engineering principles and calculations relevant to a design project.
2. Create accurate solid model computer files to output designs to 2-D documentation, 3-D printing, and CNC machines, using feature based solid modeling or Boolean based construction methods.

### College-wide Outcomes

- **Critical Thinking** -Critical thinking finds expression in all disciplines and everyday life. It is characterized by an ability to reflect upon thinking patterns, including the role of emotions on thoughts, and to rigorously assess the quality of thought through its work products. Critical thinkers routinely evaluate thinking processes and alter them, as necessary, to facilitate an improvement in their thinking and potentially foster certain dispositions or intellectual traits over time.
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## • CAD 137 - Geometric Dimension & Tolerancing Application

Credits: 4

Geometric Dimensioning and Tolerancing (GD&T) is an international technical language of symbols used to describe the function and relationship of a part's feature. The symbology of GD&T, as defined in the ASME Y14.5 standard, is understood and applied by all designing and manufacturing communities. Students learn to recognize, interpret and apply GD&T theories and symbols. Students study applicable mathematical formulas. Previously D T 115.

**Enrollment Requirement:** [CAD 101](#) or instructor consent.

**Course Fee:** \$40.00

**Course Outcomes:**

Students who successfully complete this class will be able to:

1. Interpret drawings per current ASME Y 14.5 Standard
2. Describe geometric tolerancing symbols and their relative controls
3. Demonstrate the ability to properly identify Datums, and correct an improper identification
4. Create a Feature Control frame (FCF) and place properly for proper identification
5. Identify maximum material and Least material conditions.
6. Describe a tolerance zone as indicated by the controlling FCF.
7. Describe applicable changes to the tolerance zone with material modifiers being applied.

**Program Outcomes**

1. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.
2. Apply current ASME Y14.5, machining and AWS symbology for industry production and documentation.

**College-wide Outcomes**

- **Critical Thinking** -Critical thinking finds expression in all disciplines and everyday life. It is characterized by an ability to reflect upon thinking patterns, including the role of emotions on thoughts, and to rigorously assess the quality of thought through its work products. Critical thinkers routinely evaluate thinking processes and alter them, as necessary, to facilitate an improvement in their thinking and potentially foster certain dispositions or intellectual traits over time.
- **Quantitative and Symbolic Reasoning** - Quantitative Reasoning encompasses abilities necessary for a student to become literate in today's technological world. Quantitative reasoning begins with basic skills and extends to problem solving.
- **Written Communication** - Written Communication encompasses all the abilities necessary for effective expression of thoughts, feelings, and ideas in written form.

• **CAD 141 - Introduction to Architectural Design**

Credits: 5

Students develop architectural drafting skills using Auto CAD and manual drafting including site planning, floor plans, wall sections, roof types, and elevations of single-story structures. Previously D T 141.

**Enrollment Requirement:** [CAD 101](#) or instructor consent.

**Course Fee:** \$55.00

**Course Outcomes:**

Students who successfully complete this class will be able to:

1. Use proper construction terminology, i.e. roof rafter and a roof truss, mud sill.
2. Develop Auto CAD Drawings for building permits and for construction.
3. Create accurate Auto CAD drawings using Model space and Layout Space relative to the industry.
4. Set Units, View Port scales, Layers, Pen Weights and Plots to Scale.
5. Create a drawing showing a parcel of land and location of a structure. Including the building department requirements for a Site Plan.

**Program Outcomes**

1. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.
2. Identify cost, effectiveness, and sustainability in design.

**College-wide Outcomes**

- **Critical Thinking** -Critical thinking finds expression in all disciplines and everyday life. It is characterized by an ability to reflect upon thinking patterns, including the role of emotions on thoughts, and to rigorously assess the quality of thought through its work products. Critical thinkers routinely evaluate thinking processes and alter them, as necessary, to facilitate an improvement in their thinking and potentially foster certain dispositions or intellectual traits over time.
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• **CAD 148 - Intermediate Revit 2**

Credits: 3

Builds on skills and concepts developed in [CAD 118](#). Revit is an Architectural 3-D design CAD software using the design concept of Building Information Modeling (BIM). Intermediate Revit class focuses on construction drawings of residential and basic commercial buildings. Includes rendering and materials. Explores a deeper application of tips and tricks to help make the student more productive and knowledgeable about the many ways Revit can solve BIM problems.

**Enrollment Requirement:** [CAD 118](#) with a grade of 1.0 or higher; or Instructor consent.

**Course Outcomes:**

Students who successfully complete this class will be able to:

1. Access online building codes and zoning information to make design decisions based on city or county ordinances relating to potential building projects.
2. Apply and edit BIM (Building Information Modeling) standards into an existing Revit model.
3. Create basic layouts for commercial buildings using applications within Revit.
4. Understand the constructability of architectural details and how to document those construction drawings in Revit.

**Program Outcomes**

1. Create accurate solid model computer files to output designs to 2-D documentation, using feature based solid modeling.

#### College-wide Outcomes

- **Quantitative and Symbolic Reasoning** - Quantitative Reasoning encompasses abilities necessary for a student to become literate in today's technological world. Quantitative reasoning begins with basic skills and extends to problem solving.

#### • CAD 221 - Advanced Civil 3-D Design

Credits: 4

Teaches advanced civil drafting techniques. Course expands Autodesk's Land Desktop Companion (LDC) civil 3-D modeling concepts started during the CAD 121 class. Includes design elements of roadway horizontal and vertical alignments, profiles, grade lines, roadway cross-sections, side slopes, road templates and earthwork volume calculations. Students use industry standards to create plan and profile drawings. Previously D T 225.

**Enrollment Requirement:** [CAD 121](#) or instructor consent.

**Course Fee:** \$40.00

#### Course Outcomes:

Students who successfully complete this class will be able to:

1. Create drawings with Auto CAD and Autodesk's Civil 3D (C3D) software.
2. Expand the 3-D models created in the first class to include design elements of roadway horizontal and vertical alignments.
3. Create Profiles, cross-sections and earthwork volume calculations.
4. Communicate with civil terminology and concepts common in the industry.

#### Program Outcomes

1. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.
2. Apply systems, symbols, and language applicable to the Civil Technology and Design Engineering industries.

#### College-wide Outcomes

- **Critical Thinking** -Critical thinking finds expression in all disciplines and everyday life. It is characterized by an ability to reflect upon thinking patterns, including the role of emotions on thoughts, and to rigorously assess the quality of thought through its work products. Critical thinkers routinely evaluate thinking processes and alter them, as necessary, to facilitate an improvement in their thinking and potentially foster certain dispositions or intellectual traits over time.
- **Quantitative and Symbolic Reasoning** - Quantitative Reasoning encompasses abilities necessary for a student to become literate in today's technological world. Quantitative reasoning begins with basic skills and extends to problem solving.

#### • CAD 228 - Intermediate Revit for Civil

Credits: 4

Builds on skills and concepts developed in [CAD 118](#). Revit is a 3-D design CAD software using the design concept of Building Information Modeling (BIM). This is an advanced Revit class focusing on site plans, landscaping, roads, topography and integrating previously-drawn buildings into the new construction site plan.

**Enrollment Requirement:** [CAD 118](#) and [CAD 121](#); or instructor consent.

**Course Fee:** \$40.00

#### Course Outcomes:

Students who successfully complete this class will be able to:

1. Access internet websites to obtain recorded public information, or survey data, on potential work sites.
2. Access internet websites to obtain recorded public information on city or county ordinances relating to potential building projects.
3. Create drawings according to industry standards, showing relevant information pertaining to potential work site (aka property lines, roads, contour lines, setbacks and landscaping).

#### Program Outcomes

1. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.
2. Apply systems, symbols, and language applicable to the Civil Technology and Design Engineering industries.

#### College-wide Outcomes

- **Critical Thinking** -Critical thinking finds expression in all disciplines and everyday life. It is characterized by an ability to reflect upon thinking patterns, including the role of emotions on thoughts, and to rigorously assess the quality of thought through its work products. Critical thinkers routinely evaluate thinking processes and alter them, as necessary, to facilitate an improvement in their thinking and potentially foster certain dispositions or intellectual traits over time.
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#### • CAD 231 - Mechanical Principles of Design

Credits: 5

Teaches advanced principles, techniques and applications of drafting technology required for the preparation of detail and assembly drawings. Based on current industry practices and standards. Areas of study include dimensioning and tolerancing geometric form and positional tolerancing, shop processes and procedures, layout drawings including developments and triangulation, piping and tubing drawings, welding and welding symbols, and forging and casting drawings. Previously D T 231.

**Enrollment Requirement:** [CAD 101](#) and [CAD 102](#); or instructor consent.



**Course Fee:** \$55.00

**Course Outcomes:**

Students who successfully complete this class will be able to:

1. Create Bill of Materials with main assemblies and simple sub assemblies and identifying the objects properly
2. Identify and properly dimension FITS based on charts controlling tolerances
3. Identify datums and Feature Control Frames (FCF) on drawings per ASME Y14.5
4. Calculate hydraulic forces and motions based on given criteria.
5. Create motion diagram and proper cam form based on that diagram.
6. Calculate and create proper basic gear forms.

**Program Outcomes**

1. Identify, solve, and apply engineering principles and calculations relevant to a design project.
2. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.
3. Apply current ASME Y14.5, machining and AWS symbology for industry production and documentation.

**College-wide Outcomes**

- **Critical Thinking** -Critical thinking finds expression in all disciplines and everyday life. It is characterized by an ability to reflect upon thinking patterns, including the role of emotions on thoughts, and to rigorously assess the quality of thought through its work products. Critical thinkers routinely evaluate thinking processes and alter them, as necessary, to facilitate an improvement in their thinking and potentially foster certain dispositions or intellectual traits over time.
- **Responsibility** - Responsibility encompasses those behaviors and dispositions necessary for students to be effective members of a community. This outcome is designed to help students recognize the value of a commitment to those responsibilities which will enable them to work successfully individually and with others.
- **Quantitative and Symbolic Reasoning** - Quantitative Reasoning encompasses abilities necessary for a student to become literate in today's technological world. Quantitative reasoning begins with basic skills and extends to problem solving.

• **CAD 233 - Intermediate Solidworks**

Credits: 4

Application of advanced engineering skills to create complex detail drawings of machined and cast metal parts from engineering sketches with emphasis on ASME standards. Includes research and use of various reference materials and vendor resources and media selection. Some time will be given to introduce students to stress analysis routines within the program.

**Enrollment Requirement:** [CAD 133](#) or instructor consent.

**Course Fee:** \$40.00

**Course Outcomes:**

Students who successfully complete this class will be able to:

1. Create new complex parts based on current model assembly.
2. Edit the value of a feature dimension to rebuild and reshape model accordingly; including global dimensions.
3. Show model in motion to view for interferences between interactive parts.
4. Create basic stress studies to review proper part design.
5. Reach out to industry created parts and integrate them into current design practices.

**Program Outcomes**

1. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.
2. Apply current ASME Y14.5, machining and AWS symbology for industry production and documentation.
3. Create accurate solid model computer files to output designs to 2-D documentation, 3-D printing, and CNC machines, using feature based solid modeling or Boolean based construction methods.

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• **CAD 235 - Introduction to Mastercam**

Credits: 4

Focuses on rapid prototyping and basic toolpaths using Mastercam software. Includes creation and editing of 2-D geometry, 3-D wire-frame modeling, 3-D solid modeling, and 3-D surface modeling. Students use programming 3-D toolpaths from 3-D wire-frame models and 3-D derived and composite surface and solid models. Covers toolpath editing including project and trim functions, as well as production of prototype model using the milling machine. Discusses the verification and editing of toolpath programs using rendered backplots. Previously D T 237.

**Enrollment Requirement:** Instructor consent.

**Course Fee:** \$50.00

**Course Outcomes:**

Students who successfully complete this class will be able to:

1. Create and edit surface and solid models in Auto CAD and Mastercam.
2. Create compiled files for the 2 different CNC cutting machines.
3. Troubleshoot files within the software to verify compliance
4. Load and "Zero" out the machine in preparation for running the program
5. Use Mastercam to create the cutting paths for described projects.

#### Program Outcomes

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2. Apply current ASME Y14.5, machining and AWS symbology for industry production and documentation.
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### • CAD 241 - Architectural Design 2

Credits: 4

Develops advanced architectural drafting skills, including multi-level floor plans, stairs and stair sections, foundation plans, floor framing and wall sections, and/or building cross sections. Students complete drafting assignments using Auto CAD and/or manual drafting. Previously DT 241.

**Enrollment Requirement:** [CAD 102](#) and [CAD 141](#); or instructor consent.

**Course Fee:** \$40.00

#### Course Outcomes:

Students who successfully complete this class will be able to:

1. Create/Design a set of Working Drawings, approximately 6-8 drawings. Model Space and Layout Space or REVIT.
2. Create Working Drawings suitable for the building industry.
3. Develop and maintain good drawing information, content in an organized format.
4. Coordinate dimensioning throughout Drawing Design Package. Dimstyle Settings
5. Design Exterior Elevations by Orthographic Projection from floor plan.
6. Calculate and display stair representation according to IRC code requirements.
7. Design-draw Foundation Plan showing floor framing, required notes and dimensioning.
8. Develop Roof-Framing Plan that reflects what is displayed in elevation views.

#### Program Outcomes

1. Identify, solve, and apply engineering principles and calculations relevant to a design project.
2. Identify cost, effectiveness, and sustainability in design.
3. Solve problems by referencing Residential and International building codes applicable to the industry.

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### • CAD 248 - Advanced Revit 3

Credits: 3

Final Revit course that builds on skills and concepts developed in [CAD 118](#) and [CAD 148](#). Advanced Revit class focusing on construction drawings of residential and basic commercial buildings. Includes refinement of rendering, materiality and construction documentation detailing in Revit. Explores a deeper understanding of modeling practices within Revit so that the student can feel confident when jumping into a new or existing project at an engineering or architecture firm and instantly start making an impact when hired.

**Enrollment Requirement:** [CAD 118](#) and [CAD 148](#) with grades of 1.0 or higher; or instructor consent.

**Course Fee:** \$40.00

#### Course Outcomes:

Students who successfully complete this class will be able to:

1. Access online building codes and zoning information to make design decisions based on city or county ordinances relating to potential building projects.
2. Apply and edit BIM (Building Information Modeling) standards into existing Revit model.
3. Create basic layouts for commercial buildings using applications within Revit.

4. Gain greater understanding of constructability of architectural details and how to then document those construction drawings in Revit.

**Program Outcomes**

1. Identify, solve, and apply engineering principles and calculations relevant to a design project.
2. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.
3. Solve problems by referencing Residential and International building codes applicable to the industry.

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**• CAD 250 - Industry Project Development**

Credits: 4

Students determine their area of focus through their own chosen course direction. Projects are proposed by students or are assigned by the instructor. Projects are selected on the basis of difficulty and completeness. Instructor endeavors to obtain a project from a local construction firm, architectural office, or manufacturing company. Design teams create complete documentation sets for the required discipline.

**Course Fee:** \$75.00

**Course Outcomes:**

Students who successfully complete this class will be able to:

1. Review and solve basic and complex Orthographic problems.
2. Solve complex industry related designs for local companies or projects created by instructor.
3. Generate related drawings and calculations required to solve related project.
4. Review industry standards and terminology related to chosen industries.
5. Read and correctly interpret drawings per industry standards.
6. Read and correctly interpret welding symbols per current AWS standard.

**Program Outcomes**

1. Identify, solve, and apply engineering principles and calculations relevant to a design project.
2. Apply computer and engineering office software for documentation, communication and approval within an engineering office environment.

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