## Computer Aided Design and Engineering (CAD)

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<tr>
<th>Course Code</th>
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<th>Credit Hours</th>
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<tbody>
<tr>
<td>CAD 1050</td>
<td>Geometric Dimensioning and Tolerancing (GD&amp;T)</td>
<td>4</td>
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**English/ESL Placement:** Placement into ENG 1060 or higher (or placement into ESL 2510 or higher for students taking the ESL sequence of courses).

This course is designed to cover the fundamentals as well as more advanced applications of geometric tolerancing. The student will learn the principles of Geometric Dimensioning and Tolerancing (GD&T) as applied to engineering design, manufacturing and quality control.

The course includes geometric concepts and standards used to communicate engineering design intent and to provide a basis for design and productions. The course also includes national and international geometric standards of symbols and terms, datum feature modifiers, types of tolerances, datum reference frames, material boundary modifiers and other related topics. Also included are concepts of basic part print reading as it relates to GD&T.

**BILLABLE CONTACT HOURS:** 3

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<tr>
<td>CAD 1101</td>
<td>Introduction to CAD</td>
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**English/ESL Placement:** Placement into ENG 1055 or higher (or placement into ESL 1011 or higher for students taking the ESL sequence of courses.)

This course is an introduction to computer aided design. Students will apply computer aided design techniques and principles to create drawings related to various architectural, mechanical, interior layout, landscape, and other applications. Students will be exposed to the basic concepts of three-dimensional modeling, design modification, basic computing, and become familiar with the system hardware and software related to CAD and rapid prototyping. In addition to formal classroom lecture and demonstrations, students will utilize CAD equipment in an interactive lecture environment. Refer to the specific section using OCC's online system for software version(s).

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<td>CAD 1105</td>
<td>Animation Design</td>
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**English/ESL Placement:** Placement into ENG 1055 or higher (or placement into ESL 1011 or higher for students taking the ESL sequence of courses.)

**Prerequisite:** CAD 1101 or consent of instructor.

This course utilizes 3D Studio Max to train students interested in design animation, scene reconstruction, architectural fly-through, machine simulation, and developing animated technical training materials. Students will create rendered models, drawings and presentations that come to life and communicate creative ideas, take industrial models and sell the concept before production, show a virtual model of a building walk through and around it, and create characters that talk and move. Refer to the specific section using OCC's online system for software version(s).

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<td>CAD 1151</td>
<td>CAD Architecture / Civil Engineering</td>
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**English/ESL Placement:** Placement into ENG 1060 or higher (or placement into ESL 2510 or higher for students taking the ESL sequence of courses).

**Prerequisite:** CAD 1101 or consent of instructor.

This intermediate course emphasizes the use of CAD systems for architectural, civil engineering, and landscape design presentations. Topics include methods of creating site plans, floor plans, elevations, sections, photo-realistic renderings, dimensioning and related topics utilizing various Autodesk application software packages, including three-dimensional parametric modeling specific to architecture. Refer to the specific section using OCC's online system for software version(s).

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<td>CAD 1160</td>
<td>Revit - Advanced Architectural Applications</td>
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**English/ESL Placement:** Placement into ENG 1060 or higher (or placement into ESL 2510 or higher for students taking the ESL sequence of courses).

**Prerequisite:** CAD 1151 or consent of instructor.

This course expands on the use of CAD software for the application of building information modeling (BIM) for architecture. Students will learn CAD techniques for advanced wall creation and manipulation, details, wall sections, multiple floor systems and stair development. The course also covers walkthrough techniques and the management of design revisions within CAD database. In addition to classroom lecture and demonstrations, students will utilize CAD equipment in an interactive lecture environment. Refer to the specific section using OCC's online system for software version(s).

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<td>Introduction to Engineering Graphics</td>
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**English/ESL Placement:** Placement into ENG 1055 or higher (or placement into ESL 1011 or higher for students taking the ESL sequence of courses.)

**Prerequisite:** CAD 1101 or consent of instructor.

**Pre- or Corequisite:** DDT 1000 (Recommended)

This course presents the techniques and principles for creating orthographic and auxiliary views on a CAD system. Students will create working detail drawings by adding the necessary sections, dimensions, tolerances, notes and specifications to multi-views. Given a work description or isometric view of a simple object, the student will be able to completely describe its shape in orthographic multi-view projection. This course develops skills in the use and selection of standard parts from the CAD database and creation of assembly drawings. Area of study will also include ANSI and ISO standards for dimensioning, geometric tolerance fundamentals, fasteners and symbols. Refer to the specific section using OCC’s online system for software version(s).

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<td>CAD 1450</td>
<td>Drafting and Design Co-op Internship</td>
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**English/ESL Placement:** Placement into ENG 1060 or higher (or placement into ESL 2510 or higher for students taking the ESL sequence of courses).

**Prerequisite:** CAD 2102 and consent of instructor.

This course provides the student with practical training in the field of drafting/design and Computer Aided Engineering (CAE) applications. The student will be employed in a supervised situation under the guidance of a qualified coordinator. During the co-op internship period, the student will identify and describe, through reports, technical problems encountered on the job. **BILLABLE CONTACT HOURS:** 3
CAD 1501  Special Topics in CAD: Fusion 360  Design ....................................................... 2 Credit Hours
English/ESL Placement: Placement into ENG 1060 or higher (or placement into ESL 2510 or higher for students taking the ESL sequence of courses).
Prerequisite: CAD 1101 or MTT 1100
Fusion 360. BILLABLE CONTACT HOURS: 2

CAD 2000  Animation Design II  .............................. 3 Credit Hours
English/ESL Placement: Placement into ENG 1060 or higher (or placement into ESL 2510 or higher for students taking the ESL sequence of courses).
Prerequisite: CAD 1105 or consent of instructor.
This course is designed to build upon the foundation skills learned in Animation Design. Students will develop additional skills to create computer animations and models. Emphasis will be on character modeling, rigging and animation. Students will create animations for various applications for architectural, engineering, gaming, scientific and legal industries; crime scene reconstruction; and machine simulation. Refer to the specific section using OCC's online system for software version(s). BILLABLE CONTACT HOURS: 3

CAD 2102  Fundamentals of Part Design and Its Applications .................................................. 4 Credit Hours
English/ESL Placement: Placement into ENG 1055 or higher (or placement into ESL 1011 or higher for students taking the ESL sequence of courses).
Pre- or Corequisite: CAD 1201 (Recommended) or consent of instructor.
This course will cover the principles and techniques of creating parts in three dimensions and the basics of generative surface design. Emphasis is also placed on generation of views, text, dimensions and assembly techniques. Some of the topics include: sketcher, part design, drafting, complex and multiple sketch parts, assembly design and generative surface design. The student will use computer hardware and software to solve engineering-related problems using Computer Aided Engineering techniques (CAE). Refer to the specific section using OCC's online system for software version(s). BILLABLE CONTACT HOURS: 4

CAD 2110  Unigraphics I ............................................. 3 Credit Hours
English/ESL Placement: Placement into ENG 1055 or higher (or placement into ESL 1011 or higher for students taking the ESL sequence of courses.)
Pre- or Corequisite: CAD 1201 (Recommended) or consent of instructor.
The student will be introduced to Unigraphics software. Some of the topics include 2-D and 3-D part creation, image manipulation, layer control, curve creation, menu structure, 3-D solid models, feature operations, form features, model manipulation, data organization and others. The student will use a CAD/CAE system to complete design projects. Refer to the specific section using OCC's online system for software version(s). BILLABLE CONTACT HOURS: 3

CAD 2131  Product Design  ........................................ 4 Credit Hours
English/ESL Placement: Placement into ENG 1060 or higher (or placement into ESL 2510 or higher for students taking the ESL sequence of courses).
Prerequisite: CAD 2102 or consent of instructor.
Using a computer aided design and engineering (CAD/CAE) software package, students will be presented with the principles and techniques of advanced part design for product development. Practical applications of parametric modeling are incorporated into this product oriented class. Students will use a CAD/CAE system to complete projects dealing with metals, plastics and composites. The course also includes knowledge, use of reference elements, assembly, relational formulas, reverse engineering and rapid prototyping. Refer to the specific section using OCC's online system for software version(s). BILLABLE CONTACT HOURS: 4

CAD 2141  Kinematics .................................................. 3 Credit Hours
English/ESL Placement: Placement into ENG 1060 or higher (or placement into ESL 2510 or higher for students taking the ESL sequence of courses).
Prerequisite: CAD 2102 or consent of instructor.
The students will learn the techniques and concepts of two-dimensional and three-dimensional kinematics. The course involves geometric modeling, kinematic modeling and simulation of kinematic mechanisms, generation of traces and numerical outputs. The course also includes the study of multitude of joints and their limitations, analysis, modification and management of kinematic mechanisms. Refer to the specific section using OCC's online system for software version(s). BILLABLE CONTACT HOURS: 3

CAD 2151  Introduction to Generative Surface Design .... 4 Credit Hours
English/ESL Placement: Placement into ENG 1060 or higher (or placement into ESL 2510 or higher for students taking the ESL sequence of courses).
Prerequisite: CAD 2102 or consent of instructor.
Using a three-dimensional Computer Aided Design and Engineering System, students will be introduced to the concepts and techniques of creating curves and surfaces for product design and manufacturing. Topics included in the course are: simple and complex surfaces, wire frame features, swept and blend surfaces, surface fillets, analysis and repair, laws, and surface-solid integration. Students will solve three-dimensional engineering design and surfaceing problems dealing with metals, plastics and composites. Refer to the specific section using OCC's online system for software version(s). BILLABLE CONTACT HOURS: 4

CAD 2161  Finite Element Modeling and Analysis .... 3 Credit Hours
English/ESL Placement: Placement into ENG 1060 or higher (or placement into ESL 2510 or higher for students taking the ESL sequence of courses).
Prerequisite: CAD 2102 and PHY 1610 (or higher) or APP 2170 or consent of instructor.
The student will learn the techniques and concepts of finite element modeling. The focus of the course is the preprocessing stage of preparing geometric models for analysis. The student will design geometry of parts, define mesh, properties, loads, restraints and constraints. An overview of finite element solver and post processor to visualize the model will be presented. The student will use CAD/CAE hardware and software to prepare finite element models. Refer to the specific section using OCC's online system for software version(s). BILLABLE CONTACT HOURS: 3
CAD 2190  Unigraphics II ........................................... 3 Credit Hours
Equivalent: CAD 1350
English/ESL Placement: Placement into ENG 1060 or higher (or placement into ESL 2510 or higher for students taking the ESL sequence of courses).
Prerequisite: CAD 2110 or consent of instructor.
Pre- or Corequisite: DDT 1150 (Recommended)
This course introduces students to a wide range of intermediate and advanced modeling techniques. Topics include construction of parametric models utilizing the Sketcher module, working with reference features, using expressions, proper organization of the part files, creation of complex solids, learning to use best modeling practices for design, and utilizing the drafting module to create views, cut sections, and dimension parts. All design concepts are applicable to tool/machine, product, and body design industries. Refer to the specific section using OCC's online system for software version(s). BILLABLE CONTACT HOURS: 4

CAD 2201  Unigraphics Product Design and Assembly Layout ........................................... 3 Credit Hours
Equivalent: CAD 2200
English/ESL Placement: Placement into ENG 1060 or higher (or placement into ESL 2510 or higher for students taking the ESL sequence of courses).
Prerequisite: CAD 2190 or consent of instructor.
This course provides students with opportunities for utilizing design concepts learned previously to create master assemblies, layouts and drawings related to body dies, fixtures and product designs. Students will use Sketcher, assemblies and components, basic geometric dimensioning and tolerancing (GD&T) concepts, and drafting processes to work through design changes, create mating parts within specifications, and learn to use the master model concept. Refer to the specific section using OCC's online system for software version(s). BILLABLE CONTACT HOURS: 3

CAD 2340  Tool and Die Design ........................................... 4 Credit Hours
Equivalent: Placement into ENG 1060 or higher (or placement into ESL 2510 or higher for students taking the ESL sequence of courses).
Prerequisite: CAD 2110 or consent of instructor.
Pre- or Corequisite: CAD 2190 or consent of instructor. (Recommended)
This course is designed to acquaint the student with the procedures involved in developing Tool and Die designs. The course covers jigs, fixtures, other tooling devices and includes the preparations of all necessary drawings and supporting documents. The course will also cover the various types of dies and standard die components and will learn basic techniques to design blanking, piercing, compound blanking, and progressive dies. Design considerations of parts to be stamped and reactions of stock material will be studied along with strip layout, shearing action and stripper construction. Refer to the specific section using OCC's online system for software version(s). BILLABLE CONTACT HOURS: 4

CAD 2450  Advanced Drafting and Design Co-op Internship ........................................... 3 Credit Hours
English/ESL Placement: Placement into ENG 1060 or higher (or placement into ESL 2510 or higher for students taking the ESL sequence of courses).
Pre- or Corequisite: CAD 1450 and consent of instructor.
The Advanced Drafting and Design Co-op Internship students will continue practical training in the field of Drafting/Design and CAE (Computer Aided Engineering Applications). Students will be employed in a supervised situation under the guidance of a qualified coordinator. During the Advanced Co-op Internship period students will be involved in design activity relating to their specialty area, such as, but not limited to, body design, tool and fixture design, plastics design, etc. BILLABLE CONTACT HOURS: 3

CAD 2602  Vehicle Underbody Design and Assembly ...... 4 Credit Hours
Equivalent: Placement into ENG 1060 or higher (or placement into ESL 2510 or higher for students taking the ESL sequence of courses).
Prerequisite: CAD 2151 or consent of instructor.
This course covers an automotive-based approach to developing a typical vehicle underbody. Including the creation of individual component parts, assemblies will be designed, positioned, and analyzed, using both student-created components and supplied parts to understand the interaction of multiple components within the full underbody assembly. Component development utilizing CATIA software will incorporate automotive practices and methods. Refer to the specific section using OCC's online system for software version(s). BILLABLE CONTACT HOURS: 4

CAD 2702  Vehicle Upper Body Surface Design and Assembly ........................................... 4 Credit Hours
Equivalent: Placement into ENG 1060 or higher (or placement into ESL 2510 or higher for students taking the ESL sequence of courses).
Prerequisite: CAD 2151 or consent of instructor.
This course presents surfacing scenarios related to different design situations encountered. Students will create new parts from information such as: sections and reference surfaces; scan data; and modification of existing surfaces. Course also teaches the methodology of adding such features as flanges, stiffeners and holes. There will be extensive use of Freestyle and Generative Shape Design workbench programs. Assemblies will be created, positioned and analyzed, using both student-created components and supplied parts. Surface development utilizing CATIA software will incorporate automotive practices and methods. Refer to the specific section using OCC's online system for software version(s). BILLABLE CONTACT HOURS: 4