

# INTRODUCTION TO COMPUTER AIDED DESIGN 10

## Description

Explore Design in Architecture, Animation, and Engineering. No experience necessary. Students will learn the CAD fundamentals needed to design houses, create computer-animated videos, and engineer simple mechanisms (such as catapults), and product design utilizing professional software. Activities will include: hand sketching, creating floor plans, multi-view drawings, 3D modeling, animation, rendering still images and video, using a 3D printer to create actual parts made of plastic, and hands-on model construction. (*Software: Inventor, Revit, 3ds Max, Maya*)

## Course Overview

### Course Objectives

Students should be able to:

- communicate design ideas through hand drawn sketches.
- modify file templates to meet project requirements.
- manipulate 2D&3D models using a variety of input devices.
- demonstrate a basic knowledge of the standard drafting conventions for both mechanical and architectural drawings.
- effectively communicate design ideas through dimensioned plans.
- demonstrate proficiency in basic 3D modeling techniques.
- use basic mathematics to ensure CAD models meet the numerical parameters of the project.
- effectively communicate design ideas through rendered images and animation techniques.
- explain the career pathways for architects, engineers, and computer animators.
- demonstrate the ability to organize files into efficient folder systems on a variety of storage devices.
- merge multiple files into one CAD model.
- create and apply a variety of materials to models
- appropriately scale drawings to print plans to an output device for multiple ANSI sheet sizes.

### Essential Questions

- How is computer technology used to create designs and to effectively communicate ideas?
- What CAD related career opportunities are out there?
- What tools are commonly used to create designs, computer models, and prototypes?
- How are Architecture, Design, Engineering, and Animation different?
- What are effective steps in creating a design?
- What are common design considerations one needs to evaluate in order to satisfy clients?
- How can I communicate my design ideas clearly and efficiently?
- What pathways are available to me if I want a career in computer aided design?

### Assessments

#### *Formative Performance Assessment*

- One point perspective drawing
- Two point perspective drawing
- Alphabet of Lines Quiz
- Dimensioned Orthographic Drawing of a basic 3D object
- storyboard
- basic 2D floor plan
- 3D house model with materials
- rendered video walk through
- Simple House design and plan views
- Basic CAD prototype model
- Turntable assembly animation
- Engineering drawing conventions
- Personal Electronic Device Design
- Parametric mechanism model
- Simple machine simulation
- 3D Primitive modeling
- Material Shaders
- Key Frame Animation
- Solar System with Lens Glare Effect
- Low Polygon Character Modeling

#### *Summative Performance Assessment*

- Power transmission mechanism model
- Simple House design and dimensioned plan views
- Self-chosen Low Polygon Character Model

<p><b>Content Outline</b></p> <p>I. <a href="#">Unit 1</a> – Communication Skills for Design  II. <a href="#">Unit 2</a> – Intro to Architectural Design  III. <a href="#">Unit 3</a> – Intro to Engineering Design  IV. <a href="#">Unit 4</a> – Intro to 3-D Modeling &amp; Animation</p>	<p><b>Standards</b></p> <p>Connecticut Technology Education Standards have been met in the following areas:</p> <ul style="list-style-type: none"> <li>• <i>Essential Skills and Knowledge</i></li> <li>• <i>Computer Aided Drafting and Design (CADD)</i></li> <li>• <i>Pre-Engineering Technology</i></li> </ul>	
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Pacing Guide									
1st Marking Period		2nd Marking Period			3rd Marking Period			4th Marking Period	
September	October	November	December	January	February	March	April	May	June
Unit 1	Unit 2			Unit 3			Unit 4		
<a href="#">Communication Skills for Design</a>	<a href="#">Intro to Architectural Design</a>			<a href="#">Intro to Engineering Design</a>			<a href="#">Intro to 3-D Modeling &amp; Animation</a>		
6 weeks	10 weeks			10 weeks			10 weeks		

**Unit 1 - Communication Skills for Design, 6 weeks [top](#)**

**Standards**

***Essential Skills and Knowledge***

**EKS.03 Demonstrate mathematics knowledge and skills required to pursue the full range of post-secondary education and career opportunities.**

EKS.03.01, EKS.03.02, EKS.03.04

**EKS.08 Identify and demonstrate positive work behaviors and personal qualities needed to be employable.**

EKS.08.01, EKS.08.02, EKS.08.03, EKS.08.08

***Computer Aided Drafting and Design (CADD)***

**CADD.02 Analyze the use of current CADD design technology.**

CADD.02.02, CADD.02.03, CADD.02.04, CADD.02.09, CADD.02.11

**CADD.05 Utilize Proper projection techniques to develop orthographic and pictorial drawings.**

CADD.05.01, CADD.05.02, CADD.05.03, CADD.05.04, CADD.05.06, CADD.05.07, CADD.05.08, CADD.05.09, CADD.05.10, CADD.05.11, CADD.05.12, CADD.05.13, CADD.05.14, CADD.05.15, CADD.05.16, CADD.05.17

**CADD.08 Explain and Utilize the concepts of sketching and the sketching process used in preliminary design and development.**

CADD.08.01, CADD.08.02, CADD.08.03, CADD.08.04

**Unit Objectives**

Students will be able to:

- create basic sketches of their design ideas.
- identify the properties of the components within the alphabet of lines.
- describe the types of multi-view drawings.
- use measurement tools to mathematically describe features of a design.
- apply basic drafting conventions to properly dimension a drawing.
- use a coordinate system to locate exact locations of design features.
- create simple storyboards to plan and coordinate computer animations.

**Essential Question**

- Why is effective communication necessary for transferring technical design information?

**Focus Questions**

- How can I communicate my design ideas clearly and efficiently?
- What conventions exist to ensure all architectural and mechanical drawings are uniform?

**Assessments**

- One point perspective drawing
- Two point perspective drawing
- Alphabet of Lines Quiz
- Dimensioned Orthographic Drawing of a basic 3D object
- Storyboard of animated short

**Skill Objectives**

Students will:

- select and use the appropriate pencil type for constructions and object lines.
- create hand drawings of two dimensional primitives.
- create hand drawings of one and two point perspectives.
- list the common types of lines used in architectural and mechanical drawings.
- create simple orthographic drawings of 3 dimensional objects.
- apply the Cartesian Coordinate system to create precise representations of 3D objects.
- draw a storyboard of a simple scene.

**Unit 2 - Intro to Architectural Design, 10 weeks [top](#)**

**Standards**

***Essential Skills and Knowledge***

**EKS.03 Demonstrate mathematics knowledge and skills required to pursue the full range of post-secondary education and career opportunities.**

EKS.03.01, EKS.03.02

**EKS.05 Employ critical thinking skills independently and in teams to solve problems and make decisions (e.g., analyze, synthesize and evaluate).**

EKS.05.02, EKS.05.03, EKS.05.04, EKS.05.05, EKS.05.07

**EKS.08 Identify and demonstrate positive work behaviors and personal qualities needed to be employable.**

EKS.08.01, EKS.08.02

***Computer Aided Drafting and Design (CADD)***

**CADD.02 Analyze the use of current CADD design technology.**

CADD.02.01 through .12

**CADD.03 Utilize measurement and annotation systems as they apply to CADD technology design.**

CADD.03.01 through .08

**CADD.05 Utilize Proper projection techniques to develop orthographic and pictorial drawings.**

CADD.05.01 through .17

**CADD.07 Create assemblies and views in 3-D format.**

CADD.07.01 & .02

**CADD.08 Explain and Utilize the concepts of sketching and the sketching process used in preliminary design and development.**

CADD.08.01 through .04

**Unit Objectives**

Students will be able to:

- list and describe architectural drawing types.
- create residential floor plans utilizing accepted room planning strategies.
- use basic CAD tools to create 2D computer sketches.
- manipulate 2D & 3D objects using basic transforms (i.e. move, scale, mirror).
- load and customize component files.
- apply standard materials in preparation for rendering.
- create cameras and animate a walk-through.
- demonstrate mastery of basic computer skills to

**Essential Question**

- How has architectural design been impacted by CADD technology?

**Focus Questions**

- How can I utilize computer technology to design functional and aesthetic buildings and spaces?
- What tools are there in a CAD program to help me test concepts and modify designs?

**Assessments**

- Basic 2D floor plan
- 3D house model with materials
- Rendered video walk through
- Simple House design and plan views
- Simple House design and dimensioned plan views

**Skill Objectives**

Students will:

- create 2D CAD sketches of floor plans.
- manipulate 2D sketches using editing tools and transforms.
- create 3D building models from 2D sketches

<p>produce scaled &amp; printed drawings of a design.</p> <ul style="list-style-type: none"><li>• dimension architectural drawings using ANSI standards.</li><li>• utilize basic modeling materials and techniques to create physical models of their building designs.</li></ul>		<ul style="list-style-type: none"><li>• insert and modify furniture and fixtures as component files.</li><li>• use CAD tools to apply realistic materials to 3D models.</li><li>• create elevation and dimensioned floor plan drawings.</li><li>• render realistic still images of their CAD model.</li><li>• create a walkthrough animation.</li><li>• construct physical display models of their building design.</li></ul>
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**Unit 3 – Intro to Engineering Design, 10 weeks** [top](#)

**Standards**

*Essential Skills and Knowledge*

**EKS.03 Demonstrate mathematics knowledge and skills required to pursue the full range of post-secondary education and career opportunities.**

EKS.03.01, EKS.03.02

**EKS.05 Employ critical thinking skills independently and in teams to solve problems and make decisions (e.g., analyze, synthesize and evaluate).**

EKS.05.02, EKS.05.03, EKS.05.04, EKS.05.05, EKS.05.07

**EKS.08 Identify and demonstrate positive work behaviors and personal qualities needed to be employable.**

EKS.08.01, EKS.08.02

*Computer Aided Drafting and Design (CADD)*

**CADD.02 Analyze the use of current CADD design technology.**

CADD.02.01 through .12

**CADD.03 Utilize measurement and annotation systems as they apply to CADD technology design.**

CADD.03.01 through .08

**CADD.05 Utilize Proper projection techniques to develop orthographic and pictorial drawings.**

CADD.05.01 through .17

**CADD.07 Create assemblies and views in 3-D format.**

CADD.07.01 & .02

**CADD.08 Explain and Utilize the concepts of sketching and the sketching process used in preliminary design and development.**

CADD.08.01 through .04

*Pre-Engineering Technology*

**ENG.02 Use the design process to solve problems by creating and refining prototypes.**

ENG.02.02 , ENG.02.05 , ENG.02.09, ENG.02.10, ENG.02.11

**Unit Objectives**

Students will be able to:

- use basic CAD tools to create 2D computer sketches.
- create 2D objects using basic primitives.
- create 3D objects using basic primitives.
- create 3D objects from 2D sketches using basic modeling tools (i.e. extrude, revolve).
- manipulate 2D & 3D objects using basic transforms (i.e. move, scale, mirror).
- describe parametric modeling.

**Essential Question**

- How is engineering design enhanced by utilizing a CADD software application?

**Focus Questions**

- How can I utilize computer technology to design functional machines and products?
- What tools are there in a CAD program to help me test concepts and modify designs?

**Assessments**

- Basic product model (i.e. ring, keychain)
- Parametric mechanism model
- Simple machine simulation
- Turntable assembly animation
- Engineering drawing conventions
- Personal Electronic Device Design
- Power transmission mechanism model

<ul style="list-style-type: none"><li>• use basic 2D &amp; 3D constraints.</li><li>• combine multiple part files into assemblies.</li><li>• create assembly drawing &amp; animations.</li><li>• run a dynamic simulation.</li><li>• demonstrate mastery of basic computer skills to produce printed drawings of a design.</li></ul>		<p><b><u>Skill Objectives</u></b></p> <p>Students will:</p> <ul style="list-style-type: none"><li>• create fully constrained 2D CAD sketches.</li><li>• manipulate 2D sketches using editing tools and transforms.</li><li>• create 3D part models from 2D sketches.</li><li>• create fully constrained 3D part assemblies.</li><li>• create dimensioned drawings from part files and assembly files.</li><li>• create turntable animations from assembly files.</li><li>• test design functionality using dynamic simulations.</li></ul>
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**Unit 4 - Intro to 3-D Modeling & Animation, 10 weeks [top](#)**

**Standards**

*Essential Skills and Knowledge*

**EKS.03 Demonstrate mathematics knowledge and skills required to pursue the full range of post-secondary education and career opportunities.**

EKS.03.01, EKS.03.02

**EKS.05 Employ critical thinking skills independently and in teams to solve problems and make decisions (e.g., analyze, synthesize and evaluate).**

EKS.05.02, EKS.05.03, EKS.05.04, EKS.05.05, EKS.05.07

**EKS.08 Identify and demonstrate positive work behaviors and personal qualities needed to be employable.**

EKS.08.01, EKS.08.02

*Computer Aided Drafting and Design (CADD)*

**CADD.02 Analyze the use of current CADD design technology.**

CADD.02.01 through .12

**CADD.05 Utilize Proper projection techniques to develop orthographic and pictorial drawings.**

CADD.05.01 through .17

**CADD.08 Explain and Utilize the concepts of sketching and the sketching process used in preliminary design and development.**

CADD.08.01 through .04

**Unit Objectives**

Students will be able to:

- navigate the complex user interface.
- create basic 3D primitives.
- modify 3D primitive properties.
- create simple 3D model using basic tools and modifiers.
- apply standard materials and create their own materials.
- use key framing to animate 3D models.
- apply basic special effects.
- render still images and animated video.

**Essential Question**

- What is the impact of computer software on the digital media industry?

**Focus Questions**

- How can I utilize computer technology to design 3D models for use in animated movies and video games?
- How can I create rendered images and video of 3D models?

**Assessments**

- 3D Primitive modeling
- Material Shaders
- Key Frame Animation
- storyboard
- Solar System with Lens Glare Effect
- Guided Low Polygon Character Model
- Self-chosen Low Polygon Character Model

**Skill Objectives**

Students will:

- create basic primitive shapes and prepare them for modeling.
- apply materials to primitives to represent real world objects.
- use the internet and computer software to create and apply their own material shaders.
- render still images of 3D models.
- utilize key frame animating techniques to produce a short video.
- learn to use basic special effects such as glow and lens glare.
- create an original low polygon character model.