ADVANCED COMPUTER AIDED DESIGN 30

Students can pursue an emphasis on any 1 of 3 disciplines: Architecture, Engineering Design, or Animation

Description

This course expands on the focused skills learned in CAD 20. Students will learn advanced level application of Architecture, Animation, or Engineering concepts. Students may concentrate study in any of the 3 areas. Examples of activities include: building design portfolios for college, creating architectural detail plans, "Green Building", fine animation of character's eyes and mouth, Computer special effects (such as fire, tornados, and light saber effect) and engineering products or inventions to solve real world problems.

(Software: Inventor, Revit, 3ds Max, Maya, Mudbox, Motion Builder, iPi Motion Capture, Photoshop)

Course Overview

Course Objectives

Students should be able to:

- maintain a portfolio to document knowledge, skills, materials and experience in CAD.
- list the training, education and certification requirements for the CAD related career of their choice.
- identify and demonstrate positive work behaviors and personal qualities needed to be employable.
- complete the application and interview process.
- employ critical thinking skills independently and in teams to solve problems and make decisions.
- employ leadership skills to accomplish organizational goals and objectives.
- effectively communicate design ideas through hand drawn sketches.
- utilize Proper projection techniques to develop orthographic and pictorial drawings.
- demonstrate use and application of alternate view applications and functions.
- clearly communicate design ideas through oral and written presentation.
- effectively communicate design ideas through fully dimensioned, annotated plans, rendered images and animation techniques.
- demonstrate a proficient knowledge of the standard drafting conventions for mechanical and

Essential Questions

- How is computer technology used to create designs and to effectively communicate ideas?
- How are designs driven by cost, environmental, social, and manufacturing concerns?
- How can I as a designer create products with minimal impact on the environment?
- How do I balance function and aesthetics to create designs that are both effective and attractive designs?
- What are the steps to obtain a career in design?

Assessments

Architecture

Formative Performance Assessment

- Advanced 2D&3D Sketching Quiz
- Principles of Design Hand sketching
- Dimensioning challenge
- Room Plan Bubble Diagram Challenge
- presentation on defining characteristics of architectural styles
- Research Presentation on a contemporary Famous Contemporary Architect
- Lighting Plan
- Window and Door Schedule
- Plumbing plan
- HVAC plan
- Research Presentation on Environmentally Sustainable Building Construction
- Kitchen Renovation Plan Set and Foam Core Model Section views of multiple construction methods
- Mock Client Interview
- Mock Job Interview

Summative Performance Assessment

- Famous Architect Inspired Structure
- "Green" College Student Center Design
- Self-chosen, teacher approved Project

architectural drawings. • employ engineering design process to achieve desired outcomes. • brainstorm several solutions to a problem and evaluate alternatives to discover the best solution. • describe characteristics and determine appropriate applications for various building material selections. • develop an understanding of local, state and global building and construction issues using critical and creative thinking skills, logical reasoning, analytical thinking, and problem solving techniques. • apply mathematical data, social concerns, financial constraints, and the principles of design to create a product that is balanced and effective. • use the design process to solve problems by creating and refining prototypes. • use engineering equipment, laboratory materials and tools appropriately and safely. • demonstrate the application of science and math principles to the engineering process. • demonstrate proficiency in intermediate 3D modeling techniques. • apply effects, materials, and lighting to enhance the realism of renderings.		**Engineering Design** Formative Performance Assessment • Advanced 2D&3D Sketches • Principles of Design Hand sketches • Dimensioning challenge • Sweep Project • Lofting Project • Project including Ribs, bosses & Shells • Fluid Power System • Trebuchet Dynamic Simulation • Sustainable Design Research Paper • Mock Client Interview • Mock Job Interview Summative Performance Assessment – Pneumatic Trebuchet design drawings – Pneumatic Trebuchet Competition – Student Chosen Team Project (teacher approved) **Animation** Formative Performance Assessment • Advanced 2D&3D Sketching Techniques • Environment Design Sketch • Character Design Sketch • Storyboarding details • Environment model with props • Character model • Vehicle Model • lighting placement exercise • Still life rendering • walkthrough rendering • Creating custom biped cycles • Motion Capture Techniques • Applying and Editing MO Cap Data • Helper rigs and Facial Animation • Explosion effect • Lens effects • Fire effect

		• Wind effect • Water effect • Video transition edits • Multi-track Sound Effects • Mock Client Interview • Mock Job Interview Summative Performance Assessment • Complete Short Film with Story Boards and Concept Sketches • Student Chosen Team Project (teacher approved)
Content Outline ***Architecture Emphasis*** I. Unit 1 – Review & Fundamentals II. Unit 2 – Modern & Future Architectural Styles III. Unit 3 – Construction Systems IV. Unit 4 – Advanced Architectural Modeling V. Unit 5 – Advanced Set of Plans VI. Unit 6 – Final Summative Project ***Engineering Design Emphasis*** I. Unit 1 – Review & Fundamentals II. Unit 2 – Advanced Parametric Modeling III. Unit 3 – Creating Dimensioned Plans IV. Unit 4 – Creating and Testing Prototypes V. Unit 5 – Final Summative Project ***Animation Emphasis*** I. Unit 1 – Review & Fundamentals II. Unit 2 – Advanced 3D Modeling III. Unit 3 – Photorealistic Rendering IV. Unit 4 – Advanced Animation Techniques V. Unit 5 – Special Effects VI. Unit 6 – Video Editing & Sound FX VII. Unit 7 – Final Summative Project	**Standards** Connecticut Technology Education Standards have been met in the following areas: • ***Essential Knowledge and Skills*** • ***Computer Aided Drafting and Design (CADD)*** • ***Pre-Engineering Technology*** • ***Communications***	

Pacing Guide - Architecture Emphasis										
1st Marking Period			2nd Marking Period			3rd Marking Period			4th Marking Period		
September	October	November	December	January	February	March	April	May	June		
Unit 1 **Review & Fundamentals** 6 weeks	Unit 2 **Modern & Future Architectural Styles** 4 weeks	Unit 3 **Construction Systems** 8 weeks			Unit 4 **Advanced Architectural Modeling** 4 weeks	Unit 5 **Advanced Set of Plans** 6 weeks			Unit 6 **Final Summative Project** 8 weeks	

Pacing Guide – Engineering Design Emphasis										
1st Marking Period			2nd Marking Period			3rd Marking Period			4th Marking Period	
September	October	November	December	January	February	March	April	May	June	
Unit 1 **Review & Fundamentals** 6 weeks	Unit 2 **Advanced Parametric Modeling** 10 weeks				Unit 3 **Creating Dimensioned Plans** 4 weeks	Unit 4 **Creating and Testing Prototypes** 8 weeks			Unit 5 **Final Summative Project** 8 weeks	

Pacing Guide - Animation Emphasis										
1st Marking Period			2nd Marking Period			3rd Marking Period			4th Marking Period	
September	October	November	December	January	February	March	April	May	June	
Unit 1 **Review & Fundamentals** 6 weeks	Unit 2 **Advanced 3D Modeling** 6 weeks	Unit 3 **Photorealistic Rendering** 3 weeks	Unit 4 **Advanced Animation Techniques** 8 weeks		Unit 5 **Special Effects** 3 weeks	Unit 6 **Video Editing & Sound FX** 2 weeks			Unit 7 **Final Summative Project** 8 weeks	

CAD 30 - *Architecture Emphasis*

Unit 1 – Review & Fundamentals, 6 weeks **top**

Standards

Pre-Engineering Technology

ENG.02 Use the design process to solve problems by creating and refining prototypes.
ENG.02.01

Computer Aided Drafting and Design (CADD)

CADD.02 Analyze the use of current CADD design technology.
CADD.02.04, CADD.02.05, CADD.02.09

CADD.03 Utilize measurement and annotation systems as they apply to CADD technology design.
CADD.03.04, CADD.03.05, CADD.03.06, CADD.03.08

CADD.05 Utilize Proper projection techniques to develop orthographic and pictorial drawings.
CADD.05.09, CADD.05.11, CADD.05.12, CADD.05.13, CADD.05.14, CADD.05.16, CADD.05.17

CADD.06 Demonstrate use and application of alternate view applications and functions.
CADD.06.01

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:

- list and describe the steps of the design process.
- list and describe the Principles of Design.
- list and describe the intermediate set of views/plans from CAD 20.
- apply dimensions & annotations.
- apply advanced sketching techniques.
- apply room planning techniques to design floor plans.

Essential Questions

- How can I effectively communicate my design ideas to others?
- How do I balance function and aesthetics to create designs that are both effective and attractive designs?

Focus Questions

- What methods have I learned to effectively communicate design ideas so far?
- What sketching techniques can I utilize to increase the aesthetics of my drawings?
- How can I utilize the principles of design to create attractive designs?

Assessments

- Advanced 2D&3D Sketches
- Principles of Design Hand sketches
- Dimensioning challenge
- Room Plan Bubble Diagram challenge

Skill Objectives

Students will:

- use various types of shading, and color to enhance the aesthetics of their design sketches.
- demonstrate understand of the principles of design through hand drawings.
- create fully dimensioned floor plans & elevations using ANSI dimensioning standards.
- design floor layouts using bubble diagrams based on accepted room planning strategies for residential and commercial applications.

Unit 2 – Modern & Future Architectural Styles, 4 weeks top

Standards

Computer Aided Drafting and Design (CADD)

CADD.01 Demonstrate an understanding of the historical and current events related to CADD and the impact on society.
CADD.01.02, CADD.01.04

CADD.02 Analyze the use of current CADD design technology.
CADD.02.07, CADD.02.09, CADD.02.12

CADD.03 Utilize measurement and annotation systems as they apply to CADD technology design.
CADD.03.04, CADD.03.05, CADD.03.06, CADD.03.07

CADD.04 Identify, describe, and utilize the basic hardware and operating systems used in CADD.
CADD.04.05, CADD.04.06

CADD.05 Utilize Proper projection techniques to develop orthographic and pictorial drawings.
CADD.05.01, CADD.05.06, CADD.05.11, CADD.05.12, CADD.05.13, CADD.05.14, CADD.05.15, CADD.05.16

CADD.06 Demonstrate use and application of alternate view applications and functions.
CADD.06.02, CADD.06.03, CADD.06.04, CADD.06.05, CADD.06.06

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.10 Maintain a portfolio to document knowledge, skills, materials and experience in CADD.
CADD.10.01, CADD.10.03

Unit Objectives

Students will be able to:

- list and describe the styles of architecture.
- design a structure that incorporates a major style of architecture.
- discuss the future of architecture citing researched examples of emerging trends.

Essential Questions

- How is computer technology used to create designs and to effectively communicate ideas?
- How are designs driven by cost, environmental, social, and manufacturing concerns?

Focus Questions

- How does geography and culture impact architectural styles?
- How will cultural shifts today impact future architecture?
- How are shifting trends in architecture affecting cultural paradigms?
- How does the development of new technologies impact architecture?

Assessments

- presentation on defining characteristics of architectural styles
- research presentation on a famous contemporary architect
- famous architect inspired building model with dimensioned drawings

Skill Objectives

Students will:

- create a presentation on one architectural style explaining how geography and culture both shaped and was shaped by that style.
- write a two page research paper summarizing a famous architect within their chosen architectural style and describe the motivations and major contributions of the architect.
- present research on one emerging building technology and will predict how this innovation will alter the future of architecture.
- design a residential or commercial structure based on key characteristics of a distinct architectural style.

Unit 3 - Construction Systems, 8 weeks top

Standards

Computer Aided Drafting and Design (CADD)

CADD.01 Demonstrate an understanding of the historical and current events related to CADD and the impact on society.
CADD.01.02, CADD.01.04

CADD.02 Analyze the use of current CADD design technology.
CADD.02.04, CADD.02.05, CADD.02.06, CADD.02.07, CADD.02.08, CADD.02.09, CADD.02.10, CADD.02.12

CADD.03 Utilize measurement and annotation systems as they apply to CADD technology design.
CADD.03.03, CADD.03.04, CADD.03.06, CADD.03.07

CADD.05 Utilize Proper projection techniques to develop orthographic and pictorial drawings.
CADD.05.01, CADD.05.12

CADD.06 Demonstrate use and application of alternate view applications and functions.
CADD.06.05, CADD.06.06

CADD.09 Identify various symbols to interpret and read technical drawings.
CADD.09.01, CADD.09.03

CADD.10 Maintain a portfolio to document knowledge, skills, materials and experience in CADD.
CADD.10.02

Unit Objectives

Students will be able to:

- describe the differences between Suburban & Urban Residential Construction systems.
- describe the differences between Residential & Commercial Construction systems.
- explain the need for Alternative, sustainable Construction Methods.
- incorporate green building technology into renovation plans.

Essential Questions

- How is computer technology used to create designs and to effectively communicate ideas?
- How are designs driven by cost, environmental, social, and manufacturing concerns?

Focus Questions

- Besides the basic construction systems covered in CAD 20, what other commonly used systems exist?
- What newer systems of construction exist to address the trend of sustainable design?
- How can I incorporate my new knowledge of "green" building to renovate existing spaces?
- How do I choose the construction/manufacturing system most appropriate for my design parameters?

Assessments

- Section views of multiple construction methods
- Research Presentation on Environmentally Sustainable Building Construction
- Kitchen Renovation Plan Set and Foam Core Model
- "Green" College Student Center Design

Skill Objectives

Students will:

- communicate their knowledge of construction systems through section views.
- locate and summarize an article on a sustainable building technology and present their finding to the class.
- incorporate green building technology into renovation plans.
- create a CAD model and set of drawings for a new building that coincide with current sustainable design conventions.

Unit 4 – Advanced Architectural Modeling, 4 weeks top

Standards

Computer Aided Drafting and Design (CADD)

CADD.02 Analyze the use of current CADD design technology.
CADD.02.07, CADD.02.12

CADD.04 Identify, describe, and utilize the basic hardware and operating systems used in CADD.
CADD.04.05, CADD.04.06

CADD.05 Utilize Proper projection techniques to develop orthographic and pictorial drawings.
CADD.05.15, CADD.05.16

CADD.06 Demonstrate use and application of alternate view applications and functions.
CADD.06.03, CADD.06.04, CADD.06.06

CADD.08 Explain and Utilize the concepts of sketching and the sketching process used in preliminary design and development.
CADD.08.03

CADD.10 Maintain a portfolio to document knowledge, skills, materials and experience in CADD.
CADD.10.01, CADD.10.03

Unit Objectives

Students will be able to:

- describe the construction of complex walls.
- describe the construction of custom roofs.
- generate custom stairs from sketches.
- incorporate advanced massing techniques.

Essential Questions

- How is computer technology used to create designs and to effectively communicate ideas?

Focus Questions

- Am I limited to simple primitives when creating a CAD model?
- How can I take advantage of CAD tools to increase the complexity of my designs?

Assessments

- Complex wall and roof building challenge
- Custom stair making quiz
- Massing challenge – complex examples of the principles of design

Skill Objectives

Students will:

- utilize the extrusion tool to create complex custom walls.
- utilize the extrusion tool to create complex custom roofs.
- utilize the extrusion tool to create custom stairs from 2D sketches.
- create CAD models of a complex structure by combining solid and void forms.

communicate the solutions of a given architectural challenge through a design presentation.

Unit 5 - Advanced Set of Plans, 6 weeks top

Standards

Computer Aided Drafting and Design (CADD)

CADD.02 Analyze the use of current CADD design technology.
CADD.02.09, CADD.02.10

CADD.03 Utilize measurement and annotation systems as they apply to CADD technology design.
CADD.03.03, CADD.03.04, CADD.03.05, CADD.03.06, CADD.03.07, CADD.03.08

CADD.05 Utilize Proper projection techniques to develop orthographic and pictorial drawings.
CADD.05.03, CADD.05.09, CADD.05.11, CADD.05.12, CADD.05.13, CADD.05.16, CADD.05.17

CADD.06 Demonstrate use and application of alternate view applications and functions.
CADD.06.05

CADD.10 Maintain a portfolio to document knowledge, skills, materials and experience in CADD.
CADD.10.02

Unit Objectives

Students will be able to:

- use critical thinking and problem solving skills to create architectural drawings from an existing design.
- utilize multimedia technology to communicate their solution to an architectural challenge.

Essential Questions

- How is computer technology used to create designs and to effectively communicate ideas?

Focus Questions

- What advanced software tools are available to aid me in designing more elaborate, creative products?
- How do architects collaborate with the building and construction trades to create fully functional structures?
- What types of rules must I follow when placing electrical, plumbing, and HVAC systems within a design?

Assessments

- given a premade floor plan, elevation, and 3D CAD model of a house students add:
  - Window and Door Schedule
  - Lighting Plan
  - Plumbing plan
  - HVAC plan
- Present your set of plans to the class using presentation software and multimedia technology

Skill Objectives

Students will:

- create a Window and Door Schedule.
- create a Lighting/Electrical plan.
- create a Plumbing plan.
- create a HVAC plan.
- communicate the solutions of a given architectural challenge through a design presentation.

Unit 6 – Final Summative Project, 8 weeks top

Standards

Essential Knowledge and Skills

EKS.01 Complete required training, education, and certification to prepare for employment in a particular career field.
EKS.01.01, EKS.01.02

EKS.09 Demonstrate skills related to seeking and applying for employment to find and obtain a desired job.
EKS.09.02, EKS.09.03, EKS.09.04, EKS.09.05

Computer Aided Drafting and Design (CADD)

CADD.02 Analyze the use of current CADD design technology.
CADD.02.01, CADD.02.07

CADD.03 Utilize measurement and annotation systems as they apply to CADD technology design.
CADD.03.03

CADD.05 Utilize Proper projection techniques to develop orthographic and pictorial drawings.
CADD.05.14, CADD.05.15, CADD.05.16

CADD.08 Explain and Utilize the concepts of sketching and the sketching process used in preliminary design and development.
CADD.08.03

CADD.10 Maintain a portfolio to document knowledge, skills, materials and experience in CADD.
CADD.10.01, CADD.10.02, CADD.10.03

Unit Objectives

Students will be able to:

- explain the skills necessary to complete a successful Mock Job Interview.
- explain the skills necessary to complete a successful Mock Client Interview.
- work independently to complete a summative project incorporating all previously learned skills and knowledge.

Essential Questions

- How can I best prepare myself for a career in architecture?

Focus Questions

- What are the steps to obtain a career in design?
- As an architect, how do I ensure my designs are functional, aesthetic, and satisfy my customer's requests?
- How can I effectively work as a member of a team to satisfy the client?
- How can I as a designer create products with minimal impact on the environment?

Assessments

- Mock Job Interview
- Mock Client Interview
- Self-chosen, teacher approved Project

Skill Objectives

Students will:

- complete a successful Mock Job Interview.
- complete a successful Mock Client Interview.
- design a building of their choice incorporating all previously learned skills and knowledge.

CAD 30 - *Engineering Design Emphasis*

Unit 1 – Review & Fundamentals, 6 weeks top

Standards

Pre-Engineering Technology

ENG.02 Use the design process to solve problems by creating and refining prototypes.
ENG.02.01

Computer Aided Drafting and Design (CADD)

CADD.02 Analyze the use of current CADD design technology.
CADD.02.03, CADD.02.04, CADD.02.09

CADD.03 Utilize measurement and annotation systems as they apply to CADD technology design.
CADD.03.03, CADD.03.07, CADD.03.08

CADD.05 Utilize Proper projection techniques to develop orthographic and pictorial drawings.
CADD.05.12, CADD.05.16

CADD.06 Demonstrate use and application of alternate view applications and functions.
CADD.06.05

CADD.08 Explain and Utilize the concepts of sketching and the sketching process used in preliminary design and development.
CADD.08.01, CADD.08.04, CADD.08.03

Unit Objectives

Students will be able to:

- list and describe the steps of the design process.
- list and describe the Principles of Design.
- list and describe the intermediate set of views/plans from CAD 20.
- apply dimensions & annotations.
- apply advanced sketching techniques.
- apply room planning techniques to design floor plans.

Essential Questions

- How can I effectively communicate my design ideas to others?
- How do I balance function and aesthetics to create designs that are both effective and attractive designs?

Focus Questions

- How do I balance function and aesthetics to create designs that are both effective and attractive designs?
- What methods have I learned to effectively communicate design ideas so far?
- What sketching techniques can I utilize to increase the aesthetics of my drawings?

Assessments

- Advanced 2D&3D Sketches
- Principles of Design Hand sketches
- Dimensioning challenge

Skill Objectives

Students will:

- use various types of shading, and color to enhance the aesthetics of their design sketches.
- demonstrate understand of the principles of design through hand drawings.
- create fully dimensioned assembly and part drawings using ANSI dimensioning standards.

Unit 2 – Advanced Parametric Modeling, 10 weeks top

Standards

Computer Aided Drafting and Design (CADD)

CADD.02 Analyze the use of current CADD design technology.
CADD.02.07

CADD.06 Demonstrate use and application of alternate view applications and functions.
CADD.06.03, CADD.06.04, CADD.06.05, CADD.06.06

CADD.07 Create assemblies and views in 3-D format.
CADD.07.01

Pre-Engineering Technology

ENG.02 Use the design process to solve problems by creating and refining prototypes.
ENG.02.02, ENG.02.05, ENG.02.06, ENG.02.10, ENG.02.11, ENG.02.12

ENG.07 Identify and demonstrate the use of various software programs used in the engineering field.
ENG.07.04

Unit Objectives

Students will be able to:

- apply Advanced Sweeps & Lofts to create complex model designs.
- apply Ribs, bosses & Shells to create complex model designs.
- utilize the Coil & Thread tools to indicate applicable fastener systems for a given purpose.
- utilize Assembly Strategies to more effectively create models composed of multiple components.
- apply Advanced Constraints in order to allow for easy modification of part sizes.
- synthesize knowledge of simple machines and fluid dynamics to create hydraulic & pneumatic mechanisms.
- test mechanisms for functionality using advanced digital prototyping.

Essential Questions

- How is computer technology used to create designs and to effectively communicate ideas?
- How is computer technology used to analyze designs for functionality?

Focus Questions

- What advanced modeling tools can I use to create increasing complex designs?
- How can I streamline my workflow using smart dimensioning and constraints on part files and assembly files?
- What types of computer simulation tools are available to help me create and test digital prototypes?

Assessments

- Sweep Project
- Lofting Project
- Project including Ribs, bosses & Shells
- Fluid Power System
- Trebuchet Dynamic Simulation

Skill Objectives

Students will:

- design a product using advanced sweeps.
- design a product using advanced lofts.
- design a product using ribs, bosses & shells.
- utilize the Coil & Thread tools to indicate an applicable fastener systems for a given purpose.
- create streamlined assembly file systems.
- modify part sizes in an assembly using the database functions.
- design and build hydraulic & pneumatic mechanisms.
- test mechanisms for functionality using advanced digital prototyping.

Unit 3 - Creating Dimensioned Plans, 4 weeks top

Standards

Computer Aided Drafting and Design (CADD)

CADD.02 Analyze the use of current CADD design technology.
CADD.02.09, CADD.02.05

CADD.03 Utilize measurement and annotation systems as they apply to CADD technology design.
CADD.03.03, CADD.03.06, CADD.03.07, CADD.03.08

CADD.05 Utilize Proper projection techniques to develop orthographic and pictorial drawings.
CADD.05.01, CADD.05.12, CADD.05.14, CADD.05.16

CADD.06 Demonstrate use and application of alternate view applications and functions.
CADD.06.05

CADD.07 Create assemblies and views in 3-D format.
CADD.07.02

Pre-Engineering Technology

ENG.07 Identify and demonstrate the use of various software programs used in the engineering field.
ENG.07.04

Unit Objectives

Students will be able to:

- use critical thinking and problem solving skills to create multiple types of engineering drawings from an existing design
- utilize 21st century multimedia technology to communicate their solution to an architectural challenge

Essential Questions

- How is computer technology used to create designs and to effectively communicate ideas?

Focus Questions

- How do engineers collaborate with the design and manufacturing trades to create fully functional products?
- What types of rules must I follow when placing section, auxiliary, and detail views within a set of engineering drawings?

Assessments

- Set of dimensioned drawings created from the Sweep Project
- Set of dimensioned drawings created from the Lofting Project
- Set of dimensioned drawings created from the Project including Ribs, bosses & Shells

Skill Objectives

Students will:

- represent a design as an orthographic drawing.
- represent a design as an isometric view.
- supplement a design drawing with a sectional view.
- supplement a design drawing with an auxiliary view.
- supplement a design drawing with a detail view.
- supplement a design drawing with an exploded views of assemblies.

Unit 4 - Creating and Testing Prototypes, 8 weeks top

Standards

Pre-Engineering Technology

ENG.02 Use the design process to solve problems by creating and refining prototypes.
ENG.02.01, ENG.02.02, ENG.02.05, ENG.02.06, ENG.02.07, ENG.02.08, ENG.02.09, ENG.02.10, ENG.02.11, ENG.02.12

ENG.06 Use engineering equipment, laboratory materials and tools appropriately and safely.
ENG.06.02 ENG.06.03

ENG.07 Identify and demonstrate the use of various software programs used in the engineering field.
ENG.07.03, ENG.07.04, ENG.07.05

Unit Objectives

Students will be able to:

- explain the rationale behind the lab safety rules.
- list the names of common hand and machine tools.
- set up a 3D Printing job optimized for strength and efficiency of materials.
- create physical prototypes of their designs and record the results of its testing.
- modify and improving their designs based on prototype tests.

Essential Questions

- Are computer simulations enough to prove a concept is valid?

Focus Questions

- Once a solution to a problem is developed how do I know if it will actually work?
- How can I safely use hand and power tools to build a working prototype?
- After I build and test my prototype what do I do with the data?

Assessments

- Pneumatic Trebuchet design drawings
- Pneumatic Trebuchet Competition

Skill Objectives

Students will:

- demonstrate understanding of the lab safety rules.
- demonstrate safe use of common hand and machine tools.
- set up a 3D Printing job optimized for strength and efficiency of materials.
- use real world skills to create physical prototypes of their designs.
- record prototype testing results using spreadsheet software.
- modify and improving their designs based on prototype testing results.
- work independently to complete a summative project incorporating all previously learned skills and knowledge.

Unit 5 - Final Summative Project, 8 weeks top

Standards

Essential Knowledge and Skills

EKS.01 Complete required training, education, and certification to prepare for employment in a particular career field.
EKS.01.01, EKS.01.02

EKS.09 Demonstrate skills related to seeking and applying for employment to find and obtain a desired job.
EKS.09.02, EKS.09.03, EKS.09.04, EKS.09.05

Computer Aided Drafting and Design (CADD)

CADD.02 Analyze the use of current CADD design technology.
CADD.02.01, CADD.02.07

CADD.03 Utilize measurement and annotation systems as they apply to CADD technology design.
CADD.03.03

CADD.05 Utilize Proper projection techniques to develop orthographic and pictorial drawings.
CADD.05.14, CADD.05.15, CADD.05.16

CADD.08 Explain and Utilize the concepts of sketching and the sketching process used in preliminary design and development.
CADD.08.03

CADD.10 Maintain a portfolio to document knowledge, skills, materials and experience in CADD.
CADD.10.01, CADD.10.02, CADD.10.03

Pre-Engineering Technology

ENG.01 Identify the roles, responsibilities and requirements of engineering.
ENG.01.01, ENG.01.02, ENG.01.03, ENG.01.05

ENG.07 Identify and demonstrate the use of various software programs used in the engineering field.
ENG.07.04

Unit Objectives

Students will be able to:

- explain the skills necessary to complete a successful Mock Job Interview.
- explain the skills necessary to complete a successful Mock Client Interview.
- work as a team to complete a summative project incorporating all previously learned skills and knowledge.

Essential Questions

- How can I best prepare myself for a career in architecture?

Focus Questions

- What are the steps to obtain a career in design?
- How can I best prepare myself for a career in engineering or industrial design?
- As an engineer, how do I ensure my designs are functional, aesthetic, and satisfy my customer's requests?

Assessments

- Mock Job Interview
- Mock Client Interview
- Self-chosen, teacher approved Project

Skill Objectives

Students will:

- complete a successful Mock Job Interview and Mock Client Interview.
- work independently to complete a summative project incorporating all previously learned

	• How can I effectively work as a member of a team to satisfy the client? • How can I as a designer create products with minimal impact on the environment?	skills and knowledge. • work as a team to complete a summative project incorporating all previously learned skills and knowledge.

CAD 30 - *Animation Emphasis*

Unit 1 – Review & Fundamentals, 6 weeks **top**

Standards

Pre-Engineering Technology

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

ENG.02.01

Computer Aided Drafting and Design (CADD)

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

CADD.02.04, CADD.02.05

CADD.06 Demonstrate use and application of alternate view applications and functions.

CADD.06.05

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

CADD.08.01, CADD.08.03, CADD.08.02

Unit Objectives

Students will be able to:

- apply the steps of the design process.
- apply the Principles of Design.
- apply advanced sketching techniques.
- Intermediate environment design.
- Intermediate Character Design.
- Intermediate Storyboarding.

Essential Questions

- How can I effectively communicate my design ideas to others?
- How do I balance function and aesthetics to create designs that are both effective and attractive designs?

Focus Questions

- How can I create more accurate sketches in order to communicate my design ideas more effectively?
- What sketching techniques can I utilize to increase the aesthetics of my drawings?

Assessments

- Advanced 2D&3D Sketches
- Principles of Design Hand sketches
- Environment Design Sketch
- Character Design Sketch
- Storyboarding details

Skill Objectives

Students will:

- use various types of shading, and color to enhance the aesthetics of their design sketches.
- demonstrate understand of the principles of design through hand drawings.
- design elaborate scenery that fit the overall style of the entire animation project.
- create character design sketches that match a particular art style of an entire animation project.
- create detailed storyboards communicating how characters interacts with other characters and their environment.

Unit 2 – Advanced 3D Modeling, 6 weeks top

Standards

Computer Aided Drafting and Design (CADD)

CADD.02 Analyze the use of current CADD design technology.
CADD.02.01, CADD.02.07, CADD.02.12

CADD.03 Utilize measurement and annotation systems as they apply to CADD technology design.
CADD.03.03

CADD.05 Utilize Proper projection techniques to develop orthographic and pictorial drawings.
CADD.05.14, CADD.05.15

CADD.06 Demonstrate use and application of alternate view applications and functions.
CADD.06.06

CADD.08 Explain and Utilize the concepts of sketching and the sketching process used in preliminary design and development.
CADD.08.03

CADD.10 Maintain a portfolio to document knowledge, skills, materials and experience in CADD.
CADD.10.01, CADD.10.02, CADD.10.03

Unit Objectives

Students will be able to:

- utilize NURBS modeling techniques to create intricate models.
- utilize low polygon modeling techniques to create intricate models.
- utilize advanced mapping techniques to apply detailed material maps to complex models.
- import low poly models into a digital sculpting program to add details and realism.

Essential Questions

- How is computer technology used to create designs and to effectively communicate ideas?

Focus Questions

- What advanced modeling tools can I use to create increasing complex designs?
- How do transfer files between software packages to maximize the quality of my models?
- How can I add details to my simple 3D models to create more interesting productions?
- How can I create and apply custom built material maps to increase aesthetics and realism?

Assessments

- Environment model with props
- Character model
- Vehicle Model

Skill Objectives

Students will:

- utilize environment concept sketches to create a 3D digital set for an animation short film.
- increase the realism of environment models and props using UVW mapping tools.
- create a basic character model based on a 2D sketch utilizing low polygon modeling techniques.
- utilize Autodesk Mudbox to sculpt and paint a high quality, detailed character from a low polygon model.
- create a futuristic 3D model of a vehicle based on a 2D sketch utilizing NURBS modeling techniques.
- utilize Autodesk Mudbox to sculpt and paint a high quality, detailed vehicle from a NURBS model.

Unit 3 - Photorealistic Rendering, 3 weeks top

Standards

Computer Aided Drafting and Design (CADD)

CADD.02 Analyze the use of current CADD design technology.
CADD.02.07

CADD.05 Utilize Proper projection techniques to develop orthographic and pictorial drawings.
CADD.05.01

CADD.06 Demonstrate use and application of alternate view applications and functions.
CADD.06.06

CADD.10 Maintain a portfolio to document knowledge, skills, materials and experience in CADD.
CADD.10.01

Communications

AVC.03 Demonstrate the use of appropriate communication equipment for the delivery of a message.
AVC.03.10, AVC.03.16

Unit Objectives

Students will be able to:

- increase the realism of rendered images and video using photometric lighting.
- utilize Mental Ray renderer maximize render quality.
- utilize Mental Ray material shaders to maximize render quality.

Essential Questions

- What advanced software tools are available to aid me in designing more elaborate, creative products?

Focus Questions

- How can I use lighting and materials to enhance the realism of rendered images?

Assessments

- Lighting placement exercise
- Still life rendering
- Walkthrough rendering

Skill Objectives

Students will:

- create and modify photometric lights to boost the realism of renderings.
- create and customize Mental Ray shaders to produce photorealistic images.
- modify Mental Ray renderer settings to optimize render quality.

Unit 4 - Advanced Animation Techniques, 8 weeks top

Standards

Computer Aided Drafting and Design (CADD)

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

CADD.02.07

CADD.10 Maintain a portfolio to document knowledge, skills, materials and experience in CADD.

CADD.10.01

Communications

AVC.03 Demonstrate the use of appropriate communication equipment for the delivery of a message.

AVC.03.16, AVC.03.17, AVC.03.18

Unit Objectives

Students will be able to:

- basic character animation tools to create custom movement cycles.
- use motion capture technology to record and translate human movement into digital animation information.
- apply and Edit motion capture data to create realist character movement.
- utilize helper rigs to animate a face.

Essential Questions

- What advanced software tools are available to aid me in designing more elaborate, creative products?

Focus Questions

- How can I increase the realism of my character's movements?
- What animation tools exist to help increase my productivity?

Assessments

- Creating custom biped cycles
- Motion Capture Techniques
- Applying and Editing MO Cap Data
- Helper rigs and Facial Animation

Skill Objectives

Students will:

- use 3dsMax character animation tools to create and apply a custom run cycle to a standard biped model.
- use motion capture technology to record and process a human actor's movement.
- apply the motion capture data using MotionBuilder and edit the bone rig to create realist character movement.
- utilize helper rigs to animate basic facial emotions on a low polygon character.

Unit 5 - Special Effects, 3 weeks top

Standards

Computer Aided Drafting and Design (CADD)

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

CADD.02.07

CADD.10 Maintain a portfolio to document knowledge, skills, materials and experience in CADD.

CADD.10.01

Communications

AVC.03 Demonstrate the use of appropriate communication equipment for the delivery of a message.

AVC.03.10, AVC.03.17, AVC.03.18

Unit Objectives

Students will be able to:

- apply various render effects to enhance the excitement of their animation.
- configure various video post effects.
- use particle systems to simulate materials and physics.

Essential Questions

- What advanced software tools are available to aid me in designing more elaborate, creative products?

Focus Questions

- How can I create common visual effects used in the film industry?
- How do I use special effects strategically to enhance the production value of an animation without overdoing it?

Assessments

- Explosion effect
- Lens effects
- Fire effect
- Wind effect
- Water effect

Skill Objectives

Students will:

- create explosions using the atmospheric apparatus effects.
- create lava using materials and lens effect glow.
- use particle systems and mapping to create realistic fire and smoke.
- apply space warps to particle systems to simulate physics.
- create flowing water using particles and the blobmesh modifier.

Unit 6 – Video Editing & Sound FX, 2 weeks top

Standards

Computer Aided Drafting and Design (CADD)

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

CADD.02.07

CADD.10 Maintain a portfolio to document knowledge, skills, materials and experience in CADD.

CADD.10.01

Communications

AVC.03 Demonstrate the use of appropriate communication equipment for the delivery of a message.

AVC.03.01, AVC.03.03, AVC.03.06, AVC.03.08, AVC.03.16, AVC.03.17, AVC.03.18

Unit Objectives

Students will be able to:

- splice video clips together to create a complete production.
- use video transitions to enhance production value of animations.
- record and mix multiple audio tracks into one video.
- time sound effects to enhance production value.

Essential Questions:

- What video and audio editing tools are available to aid me in designing more elaborate, creative products?

Focus Questions

- How can I convey subtle messages with video transitions?
- How do I combine sound effects to enhance the impact of special effects such as explosions?

Assessments

- Video transition edits
- Multi-track Sound Effects
- Complete Short Film with Story Boards and Concept Sketches

Skill Objectives

Students will:

- work as a team to plan and choreograph multiple video renderings into a complete animation short film.
- strategically place video transition effects to enhance the looks of their final productions.
- mix sound effects with ambient sounds, music, or narrations to add complexity and depth to their shorts.

Unit 7 – Final Summative Project, 8 weeks **top**

Standards

Essential Knowledge and Skills

EKS.01 Complete required training, education, and certification to prepare for employment in a particular career field.
EKS.01.01, EKS.01.02

EKS.09 Demonstrate skills related to seeking and applying for employment to find and obtain a desired job.
EKS.09.02, EKS.09.03, EKS.09.04, EKS.09.05

Computer Aided Drafting and Design (CADD)

CADD.02 Analyze the use of current CADD design technology.
CADD.02.01, CADD.02.07

CADD.05 Utilize Proper projection techniques to develop orthographic and pictorial drawings.
CADD.05.14, CADD.05.15, CADD.05.16

CADD.08 Explain and Utilize the concepts of sketching and the sketching process used in preliminary design and development.
CADD.08.03

CADD.10 Maintain a portfolio to document knowledge, skills, materials and experience in CADD.
CADD.10.01, CADD.10.02, CADD.10.03

Unit Objectives

Students will be able to:

- explain the skills necessary to complete a successful Mock Job Interview.
- explain the skills necessary to complete a successful Mock Client Interview.
- work independently and as a team to complete a summative project incorporating all previously learned skills and knowledge.

Essential Questions

- How can I best prepare myself for a career in 3D modeling or animation?

Focus Questions

- What are the steps to obtain a career in design?
- How can I best prepare myself for a career in 3D modeling or digital animation?
- As a digital artist, how do I ensure my designs are functional, aesthetic, and satisfy my customer's requests?
- How can I effectively work as a member of a team to satisfy the client?

Assessments

- Mock Job Interview
- Mock Client Interview
- Student Chosen Team Project

Skill Objectives

Students will:

- apply learned interview strategies complete a successful mock job interview.
- apply learned skills to interview a mock client in order to extract information for planning an animation production.
- work as a team to complete a summative project incorporating all previously learned skills and knowledge.