



**Computer Aided Design III:
Intermediate CAD for 3D Animation (Special Effects),
Architecture, or Engineering**

First Semester

Course Information

Grade(s):	11-12
Discipline/Course:	Technology Education
Course Title:	Computer Aided Design III: Intermediate CAD for 3D Animation, Architecture, or Engineering, Semester 1
Prerequisite(s):	Computer Aided Design II: Beginner CAD for Architecture, Engineering, and 3D Animation (Full Year); <i>or</i> Computer Aided Design II: Beginner CAD for Architecture, Engineering, and 3D Animation (Semester) with teacher’s permission, <i>or</i> Teacher’s Permission.
Course Description: <i>Program of Studies</i>	This first semester course expands on the focused skills learned in previous courses. Students will learn advanced level application and may concentrate in any of the areas: 3D Animation, Architecture or Engineering. Examples include: fine animation of character’s eyes and mouth, computer special effects (such as fire, tornados, and lightsabers), building design portfolios for college, creating architectural detail plans, “Green Building”, and engineering products or inventions to solve real world problems. (Software: Inventor, Revit, 3ds Max, Maya, Mudbox, MotionBuilder, iPi Motion Capture)
Course Essential Questions:	<ul style="list-style-type: none"> ● What conventions exist to ensure all architectural, mechanical, etc. drawings are uniform? ● How can CAD be used to enhance our quality of life, convey complex emotions and ideas, and educate and inform people about important issues? ● What are the different ways that we can measure the success of a Design? ● What conventions exist to ensure all architectural, mechanical, etc. drawings are uniform? ● What common considerations must be taken into account when designing spaces, products or videos? ● How can architecture be used to enhance our quality of life? ● What is the role of technology in the future of animation? ● What is the role of creativity and innovation in engineering and Design? ● How can animation be used to convey complex emotions and ideas? ● How can CAD be used to enhance our quality of life, convey complex emotions and ideas, and educate and inform people about important issues?

Course Enduring Understandings:	<ul style="list-style-type: none"> • Design has a significant impact on our lives. The buildings we live in, products we use and entertainment we watch can shape our moods, our productivity, and even our sense of well-being. • Design is a creative, problem-solving discipline using knowledge and skills to design and build solutions to complex problems. • Design is done through a systematic approach to identify, analyze, and solve problems. • Design is a creative discipline that allows us to express ourselves in unique ways. • 3D drawings can be beautiful, inspiring, and even transformative. • 3D artists use a variety of software and tools to create their work, and they must have a strong understanding of the principles of 3D modeling and animation. • The understanding of spatial reasoning and geometry required for 3D modeling and animation can be useful in everyday life, from navigating to playing sports. • Design is a creative problem-solving discipline allowing one to express ourselves in unique ways. • 3D artists use a variety of software and tools to create their work, and they must have a strong understanding of the principles of 3D modeling and animation. • 3D modeling and animation is a technical art form that can be used to create engaging educational experiences that can be more effective than traditional methods. • Architecture, Design and Animation are creative disciplines through which practitioners use their knowledge and skills to design and build solutions to complex problems.
Duration/Credit:	Semester /0.5 credit
Course Materials/ Resources:	Drawing tools, computers, software, projector/screen, 3D printing technology, basic hand tools.
FPS Course Academic Expectation(s):	CI: Conveying Ideas, CC: Creating and Constructing, UCT: Using Communication Tools
Semester at a Glance (Units):	Unit 1: Sketching, Drawing, Schematics and Character Sketching (3 weeks). Unit 2: CAD Tools, 3D Modeling Techniques, & Construction Techniques (4 weeks). Unit 3: CAD Tools, Intermediate Simulations, Texture Mapping & Unwrapping (5 weeks). Unit 4: Final Summative Project and Portfolio Expansion (8 weeks).

Unit Number and Title:	Unit 1 - Sketching, Drawing, Schematics and Character Sketching
Duration:	3 weeks
Resource(s):	Computers, projector, paper, pencils, erasers
Unit Overview:	Students with a basic understanding of sketching will develop their skills further. Students will learn more advanced perspective drawing techniques, shading techniques, and how to sketch different types of buildings, engineered products, characters and miscellaneous detail elements and poses. Students will learn to read and interpret drawings, drawing conventions, engineering schematics, diagrams while creating their own drawings.
Learning Goals	
Standard(s):	CADD.02.01 Apply conventional Computer Aided Drafting and Design processes and procedures accurately, appropriately, and safely CADD.02.04 Describe and demonstrate the use of graphic communication skills through sketching. CADD.02.05 Evaluate and select appropriate methods of communication for a given problem. CADD.02.07 Express a design of an object as a 3D model.
Essential Question(s):	<ul style="list-style-type: none"> ● What conventions exist to ensure all architectural, mechanical, etc. drawings are uniform? ● How can CAD be used to enhance our quality of life, convey complex emotions and ideas, and educate and inform people about important issues? ● What are the different ways that we can measure the success of a Design?
Enduring Understanding(s):	<ul style="list-style-type: none"> ● Design has a significant impact on our lives. The buildings we live in, products we use and entertainment we watch can shape our moods, our productivity, and even our sense of well-being. ● Design is a creative, problem-solving discipline using knowledge and skills to design and build solutions to complex problems. ● Design is done through a systematic approach to identify, analyze, and solve problems.

	<ul style="list-style-type: none"> ● 3D artists use a variety of software and tools to create their work, and they must have a strong understanding of the principles of 3D modeling and animation.
<p>Learning Goal(s): <i>Students will know and will be able to use their learning to:</i> (Content/ Skills)</p>	<p>Content: (Students will know...)</p> <ul style="list-style-type: none"> ● standard views and projection systems, and detail and section views. ● standard drawing formats architects and advanced formats use to convey their designs. ● the ‘Perspective Drawing System’ . <p>Skills: (Students will be able to...)</p> <ul style="list-style-type: none"> ● sketch complex architectural forms and spaces using advanced perspective drawing techniques. ● create realistic and expressive architectural sketches with a variety of shading techniques. ● construct two and three point perspective drawings of three-dimensional objects. ● sketch different types of buildings, products or characters . ● apply their sketching skills to real-world design projects, such as developing detailed design proposals or creating presentation drawings.

Unit Number and Title:	Unit 2 - CAD Tools, 3D Modeling Techniques, & Construction Technique
Duration:	4 weeks
Resource(s):	Computers, projector, paper, pencils, erasers
Unit Overview:	In this unit, students will learn about the design and construction of commercial buildings while exploring the unique challenges and opportunities of commercial architecture, including the need to balance functionality, aesthetics, and cost. Students learn advanced 3D modeling techniques for hard surface models, such as vehicles and props, as well as organic models, such as characters and animals. This course will introduce students to more advanced CAD tools and construction techniques. Students will learn how to create complex 2D sketches and 3D models, and use advanced editing commands.
Learning Goals	
Standard(s):	CADD.02.01 Apply conventional Computer Aided Drafting and Design processes and procedures accurately, appropriately, and safely CADD.02.04 Describe and demonstrate the use of graphic communication skills through sketching. CADD.02.05 Evaluate and select appropriate methods of communication for a given problem. CADD.02.07 Express a design of an object as a 3D model.
Essential Question(s):	<ul style="list-style-type: none"> ● What conventions exist to ensure all architectural, mechanical, etc. drawings are uniform? ● What common considerations must be taken into account when designing spaces, products or videos? ● How can architecture be used to enhance our quality of life? ● What are the different ways that we can measure the success of a Design project?
Enduring Understanding(s):	<ul style="list-style-type: none"> ● Design is a creative discipline that allows us to express ourselves in unique ways. ● 3D drawings can be beautiful, inspiring, and even transformative. ● 3D artists use a variety of software and tools to create their work, and they must have a strong understanding of the principles of 3D modeling and animation.

	<ul style="list-style-type: none"> ● The understanding of spatial reasoning and geometry required for 3D modeling and animation can be useful in everyday life, from navigating to playing sports.
<p>Learning Goal(s): <i>Students will know and will be able to use their learning to:</i> (Content/ Skills)</p>	<p>Content: (Students will know...)</p> <ul style="list-style-type: none"> ● major Design styles that have been used for buildings, products and public spaces over the centuries. ● factors influencing design, such as climate, budget, and the needs of the users or audience. ● multiple methods for creating the same shape. ● polygon modeling, spline modeling, edge loop modeling and other 3D models. ● how to modify 3D shapes using basic modifiers . <p>Skills: (Students will be able to...)</p> <ul style="list-style-type: none"> ● define and explain the different types of commercial buildings. ● explain how the factors such as climate, budget, and the needs of the end-user influenced their design decisions. ● apply the principles of design, such as balance, proportion, and unity, and how to apply them to commercial or public spaces and design. ● utilize CAD tools in increasingly creative ways to create more complex shapes and interesting designs. ● accurately express their creative visions by creating their own custom shapes and components. ● choose which modeling methods they are most comfortable with.

Unit Number and Title:	Unit 3 - CAD Tools, Intermediate Simulations, Texture Mapping & Unwrapping
Duration:	5 weeks
Resource(s):	Computers, projector, paper, pencils, erasers
Unit Overview:	This unit will introduce students to intermediate level CAD architecture tools and techniques. Students will learn how to use CAD software to create detailed 3d models and drawings of buildings and other structures, including floor plans, elevations, sections, and details. They will also learn basics of texture mapping and unwrapping, how to use CAD to create detailed landforms for use in site plans, how to create and manipulate CAD models of physical systems, and then use these models to predict the behavior of the systems under different conditions.
Learning Goals	
Standard(s):	CADD.02.01 Apply conventional Computer Aided Drafting and Design processes and procedures accurately, appropriately, and safely. CADD.02.04 Describe and demonstrate the use of graphic communication skills through sketching. CADD.02.05 Evaluate and select appropriate methods of communication for a given problem. CADD.02.07 Express a design of an object as a 3D model.
Essential Question(s):	<ul style="list-style-type: none"> ● How can architecture be used to enhance our quality of life? ● What are the different ways that we can measure the success of a Design project? ● What is the role of technology in the future of animation?
Enduring Understanding(s):	<ul style="list-style-type: none"> ● Design is a creative discipline that allows us to express ourselves in unique ways. ● 3D drawings can be beautiful, inspiring, and even transformative. ● 3D artists use a variety of software and tools to create their work, and they must have a strong understanding of the principles of 3D modeling and animation. ● The understanding of spatial reasoning and geometry required for 3D modeling and animation can be useful in everyday life, from navigating to playing sports.

Learning Goal(s):

Students will know and will be able to use their learning to:
(Content/ Skills)

Content: (Students will know...)

- how to build more challenging geometry in structures.
- how to build custom components.
- know about standard conventions in drawing and what makes a complete design packet.

Skills: (Students will be able to...)

- create detailed drawings of buildings and other structures using CAD software.
- create floor plans, elevations, sections, and details using CAD software.
- render and animate their designs using CAD software.
- demonstrate an understanding of basic architectural principles, such as scale, proportion, and perspective.

Unit Number and Title:	Unit 4 – Final Summative Project and Portfolio Expansion.
Duration:	8 weeks
Resource(s):	Computers, projector, paper, pencils, erasers.
Unit Overview:	Students will use their knowledge of the design process to create hand sketches of their designs. Using teacher feedback students make any improvements needed to demonstrate learning by designing a final project in the form of a computer model. Students will then put together finished drawings and renderings for use in their portfolios. Students assemble their best work from this and prior years to continue a design portfolio demonstrating their talent and skill. Students will go beyond a basic portfolio to include customized detail content.
Learning Goals	
Standard(s):	<p>CADD.07 Create assemblies and views in 3-D format.</p> <p>CADD.10 Maintain a portfolio to document knowledge, skills, materials and experience in CAD.</p> <p>CADD.10.01 Gather educational and work highlights to include in portfolio.</p> <p>ENG.02.06 Analyze and research between alternate solutions.</p> <p>ENG.02.09 Build a prototype from working drawings using appropriate materials.</p> <p>ENG.02.10 Test prototype to defined criteria.</p>
Essential Question(s):	<ul style="list-style-type: none"> ● What is the role of creativity and innovation in engineering and Design? ● What is the role of technology in the future of animation? ● How can animation be used to convey complex emotions and ideas? ● How can CAD be used to enhance our quality of life, convey complex emotions and ideas, and educate and inform people about important issues?
Enduring Understanding(s):	<ul style="list-style-type: none"> ● Design is a creative problem-solving discipline allowing one to express ourselves in unique ways.

	<ul style="list-style-type: none"> ● 3D artists use a variety of software and tools to create their work, and they must have a strong understanding of the principles of 3D modeling and animation. ● 3D modeling and animation is a technical art form that can be used to create engaging educational experiences that can be more effective than traditional methods. ● Architecture, Design and Animation are creative disciplines through which practitioners use their knowledge and skills to design and build solutions to complex problems.
<p>Learning Goal(s): <i>Students will know and will be able to use their learning to:</i> (Content/ Skills)</p>	<p>Content: (Students will know...)</p> <ul style="list-style-type: none"> ● multiple methods of displaying their work from physical portfolios to digital portfolios. ● which elements of a design portfolio are the most important. ● strategies for effective communication. ● how to identify and define a real-world problem. ● how to conduct research and gather evidence to inform their work. ● how to analyze and interpret complex information. ● how to develop and implement a plan to solve a problem. <p>Skills: (Students will be able to...)</p> <ul style="list-style-type: none"> ● use a variety of communication tools and strategies to effectively convey their design concepts to an audience.