Audubon Public School District

APSD Computer Aided Drafting & Design

Curriculum Guide

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Course Description

Computer Aided Drafting & Design

This course is intended to introduce students to the field of drafting and design with hands-on opportunities to be creative and apply their decision making and problem solving skills to real world problems. Students use powerful computer hardware and software (Autodesk's AutoCAD 2019, Inventor and more) to develop 2D and 3D models. Students will learn the product design process through creating, analyzing, rendering and producing models. The techniques learned and equipment used are state of the art and are currently being used by engineers throughout the United States. Topics covered in the field of drafting are Architecture, Engineering, Problem Solving, and Mechanical. This is a great hands on course for anyone thinking of going into the field of engineering.

The current New Jersey standards do not include the topics involved with this class. It has been decided to include the International Technology and Engineering Educators Association (ITTEA) standards. This set of international standards has a better fit for the Audubon technology classes.

Overview / Progressions

Overview	Standards / Performance Expectations	Unit Focus
Unit 1 Hand Drafting	● ITEEA 7.G ● ITEEA 11.M-K	● History of drafting ● How to do hand drawings
Unit 2 Intro to CAD	● ITEEA 11.M-K	● Learning AutoCAD basics ● Finding measurements through context
Unit 3 3D & Isometric	● ITEEA 11.M-K	● Learning isometric drawings ● Intro to 3D Modeling
Unit 4 Project Work	● ITEEA 8.H-K ● ITEEA 11.M-k	● Design Process ● Bluetooth Speaker

Subject: CADD	Grade: 9-12	Unit: 1 Hand Drafting	6 Weeks
Standard / Performance Expectation	**Critical Knowledge & Skills & Associated Activity**		
ITEEA 7.G - Most technological development has been evolutionary, the result of a series of refinements to a basic invention. ITEEA 11.M - Identify the design problem to solve and decide whether or not to address it. ITEEA 11.N - Identify criteria and constraints and determine how these will affect the design process. ITEEA 11.O - Refine a design by using prototypes and modeling to ensure quality, efficiency, and	Concept(s): ● History of Drafting Students are able to: ● Understand the need for drafting and where it started ● Learn how to read a scale/ruler Learning Goal 1: Reading a ruler and having an appreciation for drafting Concept(s): ● How to do hand drawings Students are able to: ● Hand Draft ● Use drafting tools ● Produce a professional sketch for potential employer Learning Goal 2: Have a basic knowledge of hand drafting to further appreciate		

productivity of the final product. ITEEA 11.P - Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed. ITEEA 11.Q - Develop and produce a product or system using a design process. ITEEA 11.R - Evaluate final solutions and communicate observation, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to	AutoCAD and its improvements on drafting

three-dimensional models.	

Cross-Curricular Connections & 21st Century Skills
● History (History of drafting, architecture, and engineering)

Formative Assessments	Summative Assessments
● Class time check-ins	● Drafting Packet
Essential Questions	**Enduring Understanding**
● What are the classroom procedures? ● What is Grit/Effort? ● What is hand drafting? ● What can we use it for?	● Hand drafting ● Sketching

Differentiation		
504	● preferential seating ● extended time on tests and assignments ● reduced homework or classwork ● verbal, visual, or technology aids	● modified textbooks or audio-video materials ● behavior management support ● adjusted class schedules or grading ● verbal testing

Enrichment	- Utilize collaborative media tools - Provide differentiated feedback - Opportunities for reflection	- Encourage student voice and input - Model close reading - Distinguish long term and short term goals
IEP	- Utilize "skeleton notes" where some required information is already filled in for the student - Provide access to a variety of tools for responses - Provide opportunities to build familiarity and to practice with multiple media tools - Graphic organizers	- Leveled text and activities that adapt as students build skills - Provide multiple means of action and expression - Consider learning styles and interests - Provide differentiated mentors
ELLs	- Pre-teach new vocabulary and meaning of symbols - Embed glossaries or definitions - Provide translations - Connect new vocabulary to background knowledge	- Provide flash cards - Incorporate as many learning senses as possible - Portray structure, relationships, and associations through concept webs - Graphic organizers
At-risk	- Purposeful seating - Counselor involvement - Parent involvement	- Contracts - Alternate assessments - Hands-on learning

21st Century Skills

- Creativity - Innovation - Critical Thinking	- Problem Solving - Communication - Collaboration

Integrating Technology

● Chromebooks ● Internet research ● Online programs	● Virtual collaboration and projects ● Presentations using presentation hardware and software

Subject: CADD	Grade: 9-12	Unit: 2 AutoCAD	10 Week
Content Standards	**Critical Knowledge & Skills**		
ITEEA 11.M - Identify the design problem to solve and decide whether or not to address it.	Concept(s): ● AutoCAD Basics		

ITEEA 11.N - Identify criteria and constraints and determine how these will affect the design process. ITEEA 11.O - Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. ITEEA 11.P - Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed. ITEEA 11.Q - Develop and produce a product or system using a design process. ITEEA 11.R -	Students are able to: ● Produce drawings in AutoCAD ● Identify drawing types and read plans Learning Goal 1: Understand and use AutoCAD in any field or profession Concept(s): ● Context Dimensions Students are able to: ● Read plans to determine missing dimensions Learning Goal 2: Reading plans to get information that might not be easily read

Evaluate final solutions and communicate observation, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.	

Cross-Curricular Connections & 21st Century Skills
● Math (Using feet and inches to recreate drawings)

Formative Assessments	**Summative Assessments**
● Class time check-ins	● Drafting Packet
Essential Questions	**Enduring Understanding**
● What AutoCAD ● How do we use AutoCAD? ● How do I get this dimension? ● What can I draw?	● Basic understand of AutoCAD ● Finding dimensions ● Knowing AutoCAD is a tool you can use for anything

504	- preferential seating - extended time on tests and assignments - reduced homework or classwork - verbal, visual, or technology aids	- modified textbooks or audio-video materials - behavior management support - adjusted class schedules or grading - verbal testing
Enrichment	- Utilize collaborative media tools - Provide differentiated feedback - Opportunities for reflection - Opportunities for self-evaluation	- Encourage student voice and input - Model close reading - Distinguish long term and short term goals
IEP	- Utilize "skeleton notes" where some required information is already filled in for the student - Provide access to a variety of tools for responses - Provide opportunities to build familiarity and to practice with multiple media tools - Graphic organizers	- Leveled text and activities that adapt as students build skills - Provide multiple means of action and expression - Consider learning styles and interests - Provide differentiated mentors
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At-risk	- Purposeful seating - Counselor involvement - Parent involvement	- Contracts - Alternate assessments - Hands-on learning
21st Century Skills		
Creativity		Problem Solving

● Innovation ● Critical Thinking	● Communication ● Collaboration

Integrating Technology	
● Chromebooks ● Internet research ● Online programs	● Virtual collaboration and projects ● Presentations using presentation hardware and software

Career education	
● Weekly Discussions: The value of mastering multiple languages in the workforce.	● Equity Discussions: People who benefit from knowing multiple languages.

Subject: CADD	Grade: 9-12	Unit: 3 3D & Isometric	10 Week
Content Standards	**Critical Knowledge & Skills**		
ITEEA 11.M - Identify the design problem to solve and decide	Concept(s): ● 3D Drafting		

whether or not to address it. ITEEA 11.N - Identify criteria and constraints and determine how these will affect the design process. ITEEA 11.O - Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. ITEEA 11.P - Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed. ITEEA 11.Q - Develop and produce a product or system	Students are able to: ● Take a 2D drawing and produce a 3D model ● Measure 3D objects and make a model Learning Goal 1: Learning how to use 3D Autocad Concept(s): ● Isometric Students are able to: ● Draw a 3D object in 2D ● Represent an object in 3D Learning Goal 2: Produce an object that looks 3D (exploded view of an object)

using a design process. ITEEA 11.R - Evaluate final solutions and communicate observation, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.	

Cross-Curricular Connections & 21st Century Skills
● Math (Spacial awareness using the x, y , and z axises

Formative Assessments	Summative Assessments
● Class time check-ins	● Drawing Packets
Essential Questions	**Enduring Understanding**
● What is a 3D model? ● What is an isometric ● What are these used for?	● 3D Modeling ● Isometrics ● Visual Representation

504	• preferential seating • extended time on tests and assignments • reduced homework or classwork • verbal, visual, or technology aids	• modified textbooks or audio-video materials • behavior management support • adjusted class schedules or grading • verbal testing
Enrichment	• Utilize collaborative media tools • Provide differentiated feedback • Opportunities for reflection • Opportunities for self-evaluation	• Encourage student voice and input • Model close reading • Distinguish long term and short term goals
IEP	• Utilize "skeleton notes" where some required information is already filled in for the student • Provide access to a variety of tools for responses • Provide opportunities to build familiarity and to practice with multiple media tools • Graphic organizers	• Leveled text and activities that adapt as students build skills • Provide multiple means of action and expression • Consider learning styles and interests • Provide differentiated mentors
ELLs	• Pre-teach new vocabulary and meaning of symbols • Embed glossaries or definitions • Provide translations • Connect new vocabulary to background knowledge	• Provide flash cards • Incorporate as many learning senses as possible • Portray structure, relationships, and associations through concept webs • Graphic organizers
At-risk	• Purposeful seating • Counselor involvement • Parent involvement	• Contracts • Alternate assessments • Hands-on learning
21st Century Skills		
• Creativity		• Problem Solving

| Innovation | Communication |
| Critical Thinking | Collaboration |

Integrating Technology

● Chromebooks ● Internet research ● Online programs	● Virtual collaboration and projects ● Presentations using presentation hardware and software

Career education

● Weekly Discussions: The value of mastering multiple languages in the workforce.	● Equity Discussions: People who benefit from knowing multiple languages.

Subject: CADD	Grade: 9-12	Unit: 4 Project Work	10 Weeks
Content Standards	**Critical Knowledge & Skills**		
ITEEA 8.H - The design process includes defining a problem, brainstorming, researching and generating ideas,	Concept(s): ● Design Process Students are able to:		

| identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results. ITEEA 8.I - Design problems are seldom presented in a clearly defined form. J. The design needs to be continually checked and critiqued, and the ideas of the design must be redefined and improved. ITEEA 8.K - Requirements of a design, such as criteria, constraints, and efficiency, sometimes | ● Define the design process
● Plan and create a design

Learning Goal 1: Planning and organization is imperative to all aspects

Concept(s):

● Bluetooth Speaker

Students are able to:
● Design and create a box for a bluetooth speaker

Learning Goal 2: Use the engineering design process to design and create anything. Basics of engineering. |

compete with each other. ITEEA 11.M - Identify the design problem to solve and decide whether or not to address it. ITEEA 11.N - Identify criteria and constraints and determine how these will affect the design process. ITEEA 11.O - Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. ITEEA 11.P - Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where	

improvements are needed. ITEEA 11.Q - Develop and produce a product or system using a design process. ITEEA 11.R - Evaluate final solutions and communicate observation, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.	

Cross-Curricular Connections & 21st Century Skills
● Math (calculating and planning the size of an object based on the criteria)

Formative Assessments	Summative Assessments

● Class time check-ins	● Finished project
Essential Questions	**Enduring Understanding**
● What should I do? ● What shape do I make the speaker? ● What makes the sound quality better?	● Design process to make anything ● Its ok to fail if you keep improving

504	● preferential seating ● extended time on tests and assignments ● reduced homework or classwork ● verbal, visual, or technology aids	● modified textbooks or audio-video materials ● behavior management support ● adjusted class schedules or grading ● verbal testing
Enrichment	● Utilize collaborative media tools ● Provide differentiated feedback ● Opportunities for reflection ● Opportunities for self-evaluation	● Encourage student voice and input ● Model close reading ● Distinguish long term and short term goals
IEP	● Utilize "skeleton notes" where some required information is already filled in for the student ● Provide access to a variety of tools for responses ● Provide opportunities to build familiarity and to practice with multiple media tools ● Graphic organizers	● Leveled text and activities that adapt as students build skills ● Provide multiple means of action and expression ● Consider learning styles and interests ● Provide differentiated mentors

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21st Century Skills

- Creativity - Innovation - Critical Thinking	- Problem Solving - Communication - Collaboration

Integrating Technology

- Chromebooks - Internet research - Online programs	- Virtual collaboration and projects - Presentations using presentation hardware and software

Career education

Weekly Discussions: The value of mastering multiple languages in the workforce.	Equity Discussions: People who benefit from knowing multiple languages.

Appendix A

Course Title: Architectural Design I
Unit Name Introduction and Foundation
Grade Level: 10 to 12

Content Statements In the first semester, students will explore the world of AutoCAD 2017	**NJSLS:** *9.1.12.A.1,2,3,4, 9.4.12.B.18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33, 34,40,47,59,61,73,74,75* **Companion Standards:** *RL.11-12.1, SL.11-12.1, SL.11-12.2, SL.11-12.4*
Overarching Essential Questions What is AutoCAD? What is AutoCAD used for? How is AutoCAD used in place of technical drawing?	**Overarching Enduring Understandings** AutoCAD is used to draw ideas and communicate with the world in the same format.
Unit Essential Questions How do I use AutoCAD? Why is AutoCAD the standard for the world? How do I start a drawing? How do I use the mouse with the AutoCAD program? How does the keyboard interface with AutoCAD? What is the difference between the four tool bars?	**Unit Enduring Understandings** I understand how to use the AutoCAD program in order to draw. I know how to edit a drawing and add more information to it.

Where an AutoCAD drawing created? What is the Command window and what is it used for? Where is the status bar and where is it located? What is the difference between model space and paper space? How do I specify points in AutoCAD? What is the difference between absolute, rectangular, and polar coordinates? How do I draw lines? What are pan, zoom, and offset used for? When do I use ortho and object snap? How can I draw circles and rectangles? What is trim and extend used for? How can I draw with reference frames? How can I copy and move objects? How can I create an Architectural drawing in AutoCAD? What is text and how do I use the test editor? How do I put dimension on a drawing?	I understand how to enter commands in AutoCAD.
Unit Rationale Students must be able to use AutoCAD in order to communicate their ideas and draw using the same standard as the rest of the world.	Unit Overview: Students will explore the world of AutoCAD 2017 by drawing with the help of the AutoCAD program.

Authentic Learning Experiences
Page setup in AutoCAD
Drawings 1 to 30
Module 1
Module 2

21st Century Skills and Themes

Global: communicate ideas through technical drawing
Problem solving: solve problems with technical drawing
Technology: use technical tools and Auto CAD 2017 to draw
Collaboration: some of the activities are collaborative in nature

Unit Learning Targets/Scaffolding to CPIs
In this unit students will take their knowledge of technical drawings and learn how draw using computerized drafting tool, AutoCAD or CAD for short.

Key Terms
ANSI- American National Standard Institute; produces general drafting standards in the United states
Balloon framing- a construction style in which two stories share studs that run from the foundation to the top of the second floor
CAD- computer aided design or computer aided drafting
Coordinate pair- two coordinates that locate an exact location in 2D space by specifying the distance from the origin along the X axis and the distance from the origin along the Y axis
Descriptive geometry- the grammar of the graphic language; it is the three-dimensional geometry forming the background for the practical application of the language and through which many of its problems may be solved
Engineering- the combination of knowledge of science, mathematics, and technology, and communication to solve technology problems
Floor plans- a drawing that shows the location of rooms, walls, windows, and other features of a structure
Foundation- the part of a structure that rests on the earth and supports the superstructure
Framing- The construction of the rough structure of a building, including the floors, exterior and interior walls, stairs, and roof
Isometric- a drawing in which the object is tilted forward 30 degrees and rotated 30 degrees so that its edges form equal angles
Layout- the arrangement of views on a technical drawing
Modeling- the process of creating full size 3D objects in a CAD file
Model space- the space in AutoCAD in which almost all drawing geometry is created
Origin- the point on a Cartesian coordinate system at which the X and Y axes cross
Paper space-the space in AutoCAD in which multiple views of an object can be laid out on a border and title block for printing
Site plane- a working drawing that shows the layout of a building lot and the arrangement of the building and utilities on the lot
Technology- processes and knowledge that can be used to extend human abilities as well as satisfy human needs and wants

Instructional Strategies
Lecture
Monitor
Facilitate
Model and demonstrate

Customizing Learning/ Differentiation
Special Needs
Students are engaged in small group work, where students of differing abilities and learning styles should be grouped together. Students act as peer coaches to support students with special needs.
ELL
Allow English Language Learners to play a very active role in selecting their hotspots to study. Many students' families may have immigrated from countries or regions that feature hotspots. The process of sharing their own perspective or cultural ties to their native region's biodiversity is invaluable to the group's work.
Gifted Learners
Offer scientific journal articles as sources for research to gifted students. The vocabulary and writing style is very advanced, but gifted students might be able to garner the needed information and data from these primary sources.
Mainstream Learners
Throughout the unit during class time, plan and hold small learning sessions/work groups where students can selectively attend to learn more about a specific topic. Hold these sessions often, changing the topic every week. Topics can include, but not be limited to using maps, planning an interview, interpreting scientific data, reading graphs and charts, etc. Allow students to select the sessions they would like to attend, based on their perceived need, and they should plan the sessions into their research schedule ahead of time.

Formative Assessments
Portfolio
Class participation
Drawings
Projects

Interdisciplinary Connections
Language arts- writing, logging, oral communication
Math-measurements, angles, radius
Science- environmental factors
Art- sketching and drawing

Resources
Book (Hands on AutoCAD)
Module 1 Basic 2D Drawing
Module 2 Advanced 2D Drawing
www.autodesk.com
Auto CAD 2017

Suggested Activities for Inclusion in Lesson Planning
Module 1
    Lesson 1- drawing lines and specifying points
    Lesson 2- pan, zoom, and offset
    Lesson 3- ortho and object snap
    Lesson 4- circles and rectangles
    Lesson 5- trim and extend
    Lesson 6- drawing with reference frames
    Lesson 7- copy and move
    Lesson 8- creating an architectural drawing
    Lesson 9- drawing with linotypes
    Lesson 10- layers and construction lines
    Lesson 11- Architectural drawing with layers
    Lesson 12- text and text editing
    Lesson 13- dimensioning
Module 2
    Lesson 1- More editing tools
    Lesson 2- More Drawing tools
    Lesson 3- Polylines and Polyline editing
    Lesson 4- Advanced editing and drawing tools
    Lesson 5- Hatching
    Lesson 6- Test Styles
    Lesson 7- Dimension Styles
    Lesson 8- Blocks and groups
    Lesson 9- External References
    Lesson 10- Multiple drawing environment
    Lesson 11- Design center
    Lesson 12- Layouts and plotting

Additional drawings- will be used to reinforce information learned in Module 1 and 2   Drawings 1 to 30- will give students practice
Unit Timeline   1st and 2nd Marking Period

Appendix

Differentiation	
Enrichment	- Utilize collaborative media tools - Provide differentiated feedback - Opportunities for reflection - Encourage student voice and input - Model close reading - Distinguish long term and short term goals
Intervention & Modification	- Utilize "skeleton notes" where some required information is already filled in for the student - Provide access to a variety of tools for responses - Provide opportunities to build familiarity and to practice with multiple media tools - Leveled text and activities that adapt as students build skills - Provide multiple means of action and expression - Consider learning styles and interests - Provide differentiated mentors - Graphic organizers

ELLs	- Pre-teach new vocabulary and meaning of symbols - Embed glossaries or definitions - Provide translations - Connect new vocabulary to background knowledge - Provide flash cards - Incorporate as many learning senses as possible - Portray structure, relationships, and associations through concept webs - Graphic organizers

21st Century Skills

- Creativity
- Innovation
- Critical Thinking
- Problem Solving
- Communication
- Collaboration

Integrating Technology

- Chromebooks
- Internet research
- Online programs
- Virtual collaboration and projects
- Presentations using presentation hardware and software