SPRING GROVE AREA SCHOOL DISTRICT

PLANNED COURSE OVERVIEW

Course Title: Computer Aided Design (CAD) 1	**Length of Course:** 15 cycles
Grade Level(s): 9 - 12	**Periods Per Cycle:** 6
Units of Credit: .5	**Length of Period:** 43 minutes
Classification: Elective	**Total Instructional Time:** 64.5 hours

Course Description

Computer Aided Design 1 (CAD) 1 is a survey class that explores the fundamentals of computer-aided design. This class will use both two-dimensional and three-dimensional drafting concepts and practices designed to move students from an idea to an artifact. This is an introductory class designed to create a basic understanding of the computer-aided design process and will require the creation of a portfolio.

Instructional Strategies, Learning Practices, Activities, and Experiences

Teacher Demonstration	Formal Assessments	Bell Ringers
Online Tutorials/Resources	Guided Practice	Class Discussion
Critical Thinking		Flexible Groups

Assessments

Final Exam	Unit Projects	Skills Mastery Checklists
Student Portfolio	Design/Lesson Rubrics	

Materials/Resources

Web-Based Resources	SolidWorks Educational Package Installed on a Class Set of Computers	3D Printer Laser Cutter/Engraver

Adopted: 8/18/2008
Revised: 3/10/15, 5/21/18

Problem Solving	
CONTENT/KEY CONCEPTS	OBJECTIVES/STANDARDS
A. Engineering Problem Solving Steps B. Technological Design Process C. Prototype D. Model	The students will have the ability to look at a problem creatively and seek other options for completing the task at hand. 3.4.10.A2 ~ Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. 3.4.12.A2 ~ Describe how management is the process of planning, organizing, and controlling work. 3.4.12.A3 ~ Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics 3.4.10.C1 ~ Apply the components of the technological design process. 3.4.10.C2 ~ Analyze a prototype and/or create a working model to test a design concept by making actual observations and necessary adjustments. 3.4.10.D2 ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.

Basic Files	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Part File B. Assembly File C. Drawing Files	The students will: • Have the ability to use part, assembly, and drawing files. • Have the ability to describe and correctly use each type of file. 3.4.10.C1 ~ Apply the components of the technological design process. 3.4.10.C2 ~ Analyze a prototype and/or create a working model to test a design concept by making actual observations and necessary adjustments.

Product Design	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Prototype B. Model C. Safety D. Testing	The students will: • Be expected to design a simple object using SolidWorks. • Be required to use parts files. 3.4.10.C2 ~ Analyze a prototype and/or create a working model to test a design concept by making actual observations and necessary adjustments. 3.4.10.D1 ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of a final product. 3.4.10.B3 ~ Compare and contrast how a number of different factors, such as advertising, the strength of the economy, the goals of a company and the latest fads, contribute to shaping the design of and demand for various technologies. 3.4.10.C1 ~ Apply the components of the technological design process. 3.4.10.C2 ~ Analyze a prototype and/or create a working model to test a design concept by making actual observations and necessary adjustments. 3.4.10.E7 ~ Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.

Simple Machines	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Inclined Plane B. Pulleys C. Screw D. Wedge E. Wheel and Axel F. Lever	The students will be expected to understand and use in a product design the following simple machines: • Inclined plane • Pulleys • Screw • Wedge • Wheel and axel • Lever 3.4.10.E7 ~ Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency. 3.4.10.D2 ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it. 3.4.10.E5 ~ Analyze the development of transportation services and methods and their impact on society.

Sheet Metal Design	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Sheet Metal B. Fold C. Bend D. Sketched bend	The students will: • Use the SolidWorks Tutorials to self-learn new functions in the application, then apply that learning to an assignment. • Research the needs of the design brief and work to solve a problem within given criteria. 3.4.10.A3 ~ Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. 3.4.10.A2 ~ Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. 3.4.10.B2 ~ Demonstrate how humans devise technologies to reduce the negative consequences of other technologies. 3.4.10.C1 ~ Apply the components of the technological design process. 3.4.10.C2 ~ Analyze a prototype and/or create a working model to test a design concept by making actual observations and necessary adjustments. 3.4.10.C3 ~ Illustrate the concept that not all problems are technological and not every problem can be solved using technology. 3.4.10.D1 ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of a final product. 3.4.10.E5 ~ Analyze the development of transportation services and methods and their impact on society.

Environmental Issues in Design	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Sustainable Development B. Solar Energy C. Photovoltaic D. Floor Plan E. Lot Plan	The students will look at current best practices in environmental friendly and sustainable development to design a house with less of an environmental impact. 3.4.10.A2 ~ Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. 3.4.10.A3 ~ Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. 3.4.10.B1 ~ Compare and contrast how the use of technology involves weighing the trade-offs between the positive and negative effects. 3.4.10.B2 ~ Demonstrate how humans devise technologies to reduce the negative consequences of other technologies. 3.4.10.B4 ~ Recognize that technological development has been evolutionary, the result of a series of refinements to a basic invention. 3.4.10.E2 ~ Compare and contrast how the engineering design and management of agricultural systems require knowledge of artificial ecosystems and the effects of technological development on flora and fauna. 3.4.10.E3 ~ Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear and others. 3.4.10.E7 ~ Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency. 3.4.12.E2 ~ Compare and contrast the technologies of biotechnology, conservation, bio-fuels, and ecosystems as they relate to managing Earth's resources effectively.

Portfolio Creation	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
*Enrichment and Expanded Opportunities: The students with a greater ability in this area will be expected and encouraged to apply knowledge and skills learned in this lesson by recreating objects provided by the teacher. *Remediation and Intervention Strategies: The students with a lower ability in this area will receive greater assistance from the teacher and other students. The students will be offered assignments with a decreased level of difficulty. *Applies to Entire Course	The students will analyze work completed and provide a portfolio of work completed. 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. 3.4.10.A3 Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. 3.4.10.B1 Compare and contrast how the use of technology involves weighing the trade-offs between the positive and negative effects. 3.4.10.B2 Demonstrate how humans devise technologies to reduce the negative consequences of other technologies. 3.4.10.B3 Compare and contrast how a number of different factors, such as advertising, the strength of the economy, the goals of a company and the latest fads, contribute to shaping the design of and demand for various technologies. 3.4.10.B4 Recognize that technological development has been evolutionary, the result of a series of refinements to a basic invention. 3.4.10.C1 Apply the components of the technological design process. 3.4.10.C2 Analyze a prototype and/or create a working model to test a design concept by making actual observations and necessary adjustments. 3.4.10.E4 Evaluate the purpose and effectiveness of information and communication systems.