

FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT



INTRODUCTION TO INNOVATION AND PRODUCT DESIGN

Board Approval Date: June 20, 2019	Course Length: 2 Semesters
Grading: A-F	Credits: 5 Credits per Semester
Proposed Grade Level(s): 9, 10	Subject Area: Elective Elective Area (if applicable): Career Technical Education
Prerequisite(s): N/A	Corequisite(s): N/A
CTE Sector/Pathway: Manufacturing & Product Development, Product Innovation & Design	
Intent to Pursue 'A-G' College Prep Status: Yes	
A-G Course Identifier: (g) Elective	
Graduation Requirement: No	
Course Intent: District Course Program (if applicable): CTE	

COURSE DESCRIPTION:

This course applies the Principles of Design to problem solve and create a series of unique products. This course will provide an introduction to tools, materials, and maker culture. Students will learn how the available tools function and utilize a variety of software programs to communicate with the 3D printer and laser cutter. Makerspace are a place for students to develop creative solutions to authentic challenges and real-world problems. Students will learn design thinking and explore making with both physical and digital materials.

DETAILED UNITS OF INSTRUCTION:

Unit Number/Title	Unit Essential Questions	Examples of Formative Assessments	Examples of Summative Assessment
1. Product Design Cycle	What is the design process and how is it used? What are the steps to research a topic and how do you apply the proper citations (works cited and in-text)? What are the basic 2D and 3D sketching techniques? What makes ideation useful and how can they be used to develop creative solutions?	*Sketching samples. *Practice Ideation sessions.	*Create a video prompting an improved version of a current product.
2. Laser Cut Game	How do you accurately use calipers and rulers in metric and standard units? Which level of precision is needed and what tool is most appropriate? What is the difference between vector cut, vector engrave, and raster engrave lines? How do you prepare files for the laser cutter? What safety and maintenance procedures does the laser cutter require?	*Sample ruler and caliper work. *Practice laser cut keychain.	*A unique laser cut board game.
3. Laser and Lights	How is a soldering iron used safely? What is a proper solder joint? How do you read the resistance of a resistor using its colored bands? How do you choose a current limiting resistor for an LED? How do you create a	* Solder a wire bracelet. * Resistor reading practice. * Resistor sorting activity. * Light up 1-3 LEDs on a breadboard.	*An acrylic sign lit with LEDs in a unique wooden base.

	simple circuit on a breadboard? What are the considerations when cutting and engraving acrylic versus wood? How do I make improvements to an existing design?		
4. 3D Printing Basics	How are additive and subtractive processes used to transform real life objects into a 3D model? How do you interpret the information communicated about an object in a technical drawing? How is a simple technical drawing created in the computer showing an object's length, width and height? How does a 3D printer use a 3D model to create an object? When a 3D print fails, what troubleshooting techniques can be employed to resolve the issue?	*Practice inventor models using various 2D and 3D modelling features practice technical drawings and development of a drawing template.	*Create a small 3D modelled object and associated technical drawing.
5. Advanced 3D Printing	How are parts assembled using constraints in 3D modelling software? When do tolerances matter and how is this included in the 3D model?	*Create and assemble a five-part puzzle to form a 3x3x3 cube.	*Measure, model and assemble a real life multi-part product. *Create a new, improved part that fits the assembly.
6. Making Choice Project	What projects are best suited to the laser cutter? What projects are best suited for the 3D printer? For a given project, what materials are best suited and most cost effective? Given the constraints of time, quality and cost, what tools and materials should be used?	*Written assignments on material and tool choice.	*Final project to explore students' knowledge of the various tools.

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ESSENTIAL STANDARDS:

CTE Product Innovation & Design Pathway Standards: Essential standards addressed:

D2.1 - Employ research methodologies, using primary research and electronic reference materials, to gather information relevant to the topic or area of study.

D2.2 - Organize information to identify and define an area of opportunity, need, or problem that can be resolved through design.

D3.0 - Understand and apply various ideation techniques to develop ideas and concepts.

D4.0 - Apply various two-dimensional (2-D) graphic and/or three-dimensional (3-D) modeling techniques to development concept.

D6.1- Build a looks-like, works-like prototype of the model using the appropriate fabrication, manufacturing, or reproduction techniques or technologies.

D6.3 - Resolve and/or redesign issues with a prototype.

D7.1 - Create a performance criteria and a quality standard to measure and evaluate a prototype.

D7.3 - Identify any redesigning or additional corrections required to improve the overall quality, look and performance of the prototype model.

D8.0 - Understand and apply basic business and entrepreneurial principles and identify potential markets and/or other business opportunities for distribution of the product.

RELEVANT STANDARDS AND FRAMEWORKS, CONTENT/PROGRAM SPECIFIC STANDARDS:

Link to Common Core Standards (if applicable):

Educational standards describe what students should know and be able to do in each subject in each grade. In California, the State Board of Education decides on the standards for all students, from kindergarten through high school.

<https://www.cde.ca.gov/be/st/ss/documents/finalelaccssstandards.pdf>

Link to Framework (if applicable):

Curriculum frameworks provide guidance for implementing the content standards adopted by the State Board of Education (SBE). Frameworks are developed by the Instructional Quality Commission, formerly known as the Curriculum Development and Supplemental Materials Commission, which also reviews and recommends textbooks and other instructional materials to be adopted by the SBE.

Link to Subject Area Content Standards (if applicable):

Content standards were designed to encourage the highest achievement of every student, by defining the knowledge, concepts, and skills that students should acquire at each grade level.

CA Standards for Career Ready Practice and Knowledge and Performance Anchor Standards:

<https://www.cde.ca.gov/ci/ct/sf/documents/manproddev.pdf>

Link to Program Content Area Standards (if applicable):

Program Content Area Standards applies to programs such as International Baccalaureate, Advanced Placement, Career and Technical Education, etc.

TEXTBOOKS AND RESOURCE MATERIALS:

Textbooks

Board Approved	Pilot Completion Date (If applicable)	Textbook Title	Author(s)	Publisher	Edition	Date
		<i>N/A</i>				

Other Resource Materials

Teacher recommended resource materials

Supplemental Materials

Board approved supplemental materials (Including but not limited to: Film Clips, Digital Resources, Supplemental texts, DVDs, software programs (Pebble Creek, DBQ, etc.)

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