

Course Title – Drafting and Design 2	
Implement start year – 2018-2019	
Revision Committee Members – Stef Kirk skirk@lrhsd.org x8314; Carl Kralik ckralik@lrhsd.org x8595 ; Jason Pitner jpitner@lrhsd.org x8177 ; Erika Rakow erakow@lrhsd.org x8613	
Unit # 4 - Prototyping and Design	
Transfer Goal – Students will be able to independently produce a prototype based on their 3D design.	
Stage 1 – Desired Results	
<p style="text-align: center;"><u>Established Goals</u></p> <p style="text-align: center;"><u>2014 New Jersey Student Learning Standards, Strand(s)/CPI #</u></p> <p>8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge. A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.</p> <p>8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment. C. Design: The design process is a systematic approach to solving problems.</p> <ul style="list-style-type: none"> • 8.2.12.C.7 Use a design process to devise a technological product or system that addresses a global problem, provide research, identify trade-offs and constraints, and document the process through drawings that include data and materials. 	<p style="text-align: center;"><u>21st Century Themes</u> <u>(www.21stcenturyskills.org)</u></p> <p><input checked="" type="checkbox"/>_X_ Global Awareness <input type="checkbox"/>_ Financial, Economic, Business and Entrepreneurial Literacy <input type="checkbox"/>_ Civic Literacy <input type="checkbox"/>_ Health Literacy <input checked="" type="checkbox"/>_X_ Environmental Literacy</p> <hr/> <p style="text-align: center;"><u>21st Century Skills</u></p> <p><i>Learning and Innovation Skills:</i> <input checked="" type="checkbox"/>_X_ Creativity and Innovation <input checked="" type="checkbox"/>_X_ Critical Thinking and Problem Solving <input checked="" type="checkbox"/>_X_ Communication and Collaboration</p> <p><i>Information, Media and Technology Skills:</i> <input checked="" type="checkbox"/>_X_ Information Literacy <input checked="" type="checkbox"/>_X_ Media Literacy <input checked="" type="checkbox"/>_X_ ICT (Information, Communications and Technology) Literacy</p>

<p>9.1 21st-Century Life & Career Skills All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.</p> <p>9.1.12.A.1 Apply critical thinking and problem-solving strategies during structured learning experiences.</p>	<p><i>Life and Career Skills:</i> _X_Flexibility and Adaptability _X_Initiative and Self-Direction _X_Social and Cross-Cultural Skills _X_Productivity and Accountability _X_Leadership and Responsibility</p>
<p><u>Enduring Understandings:</u> <i>Students will understand that . . .</i></p> <p><i>EU 1</i> prototypes are an integral part of the design process.</p> <p><i>EU 2</i> additive and subtractive printing are valuable tools in prototyping.</p>	<p><u>Essential Questions:</u></p> <p><i>EU 1</i></p> <ul style="list-style-type: none"> • Why do designers make prototypes? • How do prototypes evolve over time? • What considerations would a designer make when choosing a material for a prototype? • Why is a physical model helpful when designing? <p><i>EU 2</i></p> <ul style="list-style-type: none"> • How has 3D printing impacted the design world? • Why is a 3D printed model helpful when designing? • Why would you pick an additive process over a subtractive process and vice versa?
<p><u>Knowledge:</u> <i>Students will know . . .</i></p> <p><i>EU 1</i></p> <ul style="list-style-type: none"> • prototypes are not a final product. • prototypes are physical representations from designed ideas. • designers use prototypes to test and evaluate ideas. • proper material selection is essential in building a successful prototype. <p><i>EU 2</i></p> <ul style="list-style-type: none"> • various types of modeling technologies, such as: 3D printer, CNC, laser engraver, vinyl cutter. • effective use of modeling technologies. 	<p><u>Skills:</u> <i>Students will be able to . . .</i></p> <p><i>EU 1</i></p> <ul style="list-style-type: none"> • create multiple types of prototypes. • document the prototyping process through the use of images and technical reports. • present the prototyping process to a group of peers. • justify the materials used to create a specific prototype. <p><i>EU 2</i></p> <ul style="list-style-type: none"> • make printed parts. • convert CAD files to 3D printing files.

<ul style="list-style-type: none"> • constraints and limitations of modeling technologies. • acceptable file types to send to modeling technologies. • the 3D printing process. 	<ul style="list-style-type: none"> • design a model for the capabilities of the printer. • assemble printed parts to create functional prototypes.
--	--

Stage 2 – Assessment Evidence

--

<p>Other Recommended Evidence:</p> <ul style="list-style-type: none"> • Design Challenges • Teacher observations • Project rubric(s) • Worksheets • Quizzes/tests • Drawing Packets • Engineering notebook
--

Stage 3 – Learning Plan

Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections:

- Teacher led discussions about prototyping and design uses, functions, and real-world applications (A)
- Printing technology user interface worksheet (A,M)
- Demonstrate part file conversion (A)
- Demonstrate 3D printer process (A)
- 3D printer component handout (A)
- 3D print technical models (M)
- Architectural Model design (M, T)
- Teacher led discussions on the proper prototyping techniques (A)
- Practice new prototyping skillsets (M)
- Reproduce various models (M,T)
- Demo-a-Day (explaining a new tool each day) (A)
- Question-a-Day (posting EQ on the board) (A)
- Teacher led discussion/demonstration on components of modeling techniques and their applications (A, M)
- Modeling objects brought in from home (M,T)
- 3D Mobile Design (A,M,T)
- Maze Design (A,M,T)
- Catapult/Marshmallow Launcher Design (A,M,T)
- Soma Cube Design (A,M,T)
- Toy Truck/Race Car Design (A,M,T)
- Flashlight Design (A M,T)
- Teacher created Design Challenges using the engineering design process (M, T)