Board/Authority Authorized Course Framework Template

School District/Independent School Authority Name: Okanagan Skaha	**School District 67**
Developed by: Nicolas Kast	**Date Developed:**
School Name: Summerland Secondary School	**Principal's Name:** Alan Stel
Superintendent Approval Date (for School Districts only):	**Superintendent Signature (for School Districts only):**
Board/Authority Approval Date:	**Board/Authority Chair Signature:**
Course Name: Maker 11	**Grade Level of Course:** 11
Number of Course Credits: 4	**Number of Hours of Instruction:** 120

Board/Authority Prerequisite(s):

At least two previous courses in the Applied Design, Skills, and Technologies (grade 9-10)

Special Training, Facilities or Equipment Required:

Computer lab, CNC router, 3D printer, laser cutter, electronics testing and prototyping equipment

Course Synopsis:

This course allows students to experience the act of making. It encourages students to pursue their personal interests, passions and knowledge through the process of making personally significant projects. Along the journey, students will gain experience being a

creator, inventor, designer and builder of their ideas. Students are encouraged to develop and create customized projects utilizing classroom resources in conjunction with online resources and digital media. Students are expected to create a project plan elaborating the following key elements: project goals, project schedule, supporting plans and ideas, and supporting resources and references. They will also maintain a digital journal to record and reflect on weekly progress and milestones, obstacles and setbacks, mistakes and accomplishments along their individualized learning path.

Goals and Rationale:

Rationale

The maker movement emphasizes learning-through-doing. The Maker 11 curriculum aims to bring this philosophy into the classroom. It emphasizes project-based learning driven by personal interest, knowledge sharing and gathering via the internet and digital media. This class encourages students to take knowledge acquired from STEM subjects (science, technology, engineering and mathematics) and apply it in a meaningful hands-on approach in combination with natural curiosity, inventiveness and the intrinsic desire to create. The course takes curricular knowledge and content and blends it with student passions and interests letting them become the creator, designer and builder of their own project from conception to completion.

Goals

Upon successful completion of this course, the student will be able to:

- acquire practical skills and knowledge that they can use to bring their ideas from ideation to creation
- develop a “Learning for Life” passion that will allow students to be influential inventors, innovators, and entrepreneurs in a rapidly changing world
- understand the environmental implications of the products and services they are designing
- investigate and actively explore areas of personal interest, including aspects of 3D design software, electronics, robotics, coding, 3D printing, CNC laser cutting, CNC routing and other emerging fields
- develop practical hands-on skills and make informed decisions about pursuing specialized interests for personal enjoyment or careers
- develop a lifelong interest in designing, creating, making, and evaluating products, services, and processes, and contributing through informed citizenship, volunteer work, and career opportunities, to finding and addressing practical challenges

- Contribute to the sharing philosophy of the maker movement by sharing knowledge, learning experiences, and expertise on an online digital journal

Aboriginal Worldviews and Perspectives:

- The ethics of cultural appropriation and plagiarism
- explore how First Nations used natural resources to produce tools, art, structures and cultural artifacts
- Respect for community elders as the knowledge holders

Course Name: Maker **Grade:11**

BIG IDEAS

User needs and interest drive the design process	Makers require multiple tools, skills and technologies to create	Adapting scientific knowledge and interests for specific purposes	Making is fundamental to what it means to be human	Collaborative approach to learning, sharing knowledge and experiences

Learning Standards

Curricular Competencies	Content
Students are expected to do the following: **Applied Design** ***Understanding context*** • Engage in a period of **self-efficacy** to assess personal skills and abilities needed to meet future challenges ***Defining*** • Establish a point of view for a chosen design opportunity • Identify potential users, intended impact, and possible unintended negative consequences • Make decisions about premises and **constraints** that define the design space, and identify criteria for success • Determine whether activity is collaborative or self-directed ***Ideating*** • Generate ideas and add to others' ideas to create possibilities, and prioritize them for prototyping • Critically analyze how competing social, ethical, and sustainability considerations impact design • Choose an idea to pursue based on success criteria and maintain an open mind about potentially viable ideas	*Students are expected to know the following:* • **technology to support collaboration** and interaction with others • **technical communication** skills • modelling using computer-aided design (CAD) and computer-aided manufacturing (CAM) software • use of scale and proportion when outputting to 3D models • use of **hand tools** and **power tools** • function and use of 3D printer, laser cutter and CNC router • simple circuit design and construction • purpose and operation of microcontrollers/microprocessors • **programming languages** for robotics and computer numerical control (CNC) • recognition of entrepreneurial **opportunities** • emerging career options for young entrepreneurs • **design for the life cycle** • website design planning tools

Prototyping • Choose a form for prototyping and develop a **plan** that includes key stages and resources • Analyze the design for life cycle and evaluate its **impacts** • Visualize and construct prototypes, making changes to tools, materials, and procedures as needed • Record **iterations** of prototyping ***Testing*** • Identify and communicate with **sources of feedback** • Develop an appropriate test of the prototype, conduct the test, and collect and compile data • Apply information from critiques, testing results, and success criteria to make changes ***Making*** • Identify appropriate tools, **technologies**, materials, processes, cost implications, and time needed • Create design, incorporating feedback from self, others, and testing prototypes • Use materials in ways that minimize waste ***Sharing*** • Decide on how and with whom to **share** design and processes for feedback • Share the product with users and critically evaluate its success • Critically reflect on plans, products and processes, and identify new design goals • Identify and analyze new design possibilities, including how they or others might build on their concept **Applied Skills** • Apply safety procedures for themselves, co-workers, and users in both physical and digital environments • Identify and assess skills needed for project manufacturing, individually or collaboratively, and develop specific plans to learn or refine them over time • Demonstrate competency and proficiency in a large skill set • Develop specific plans to learn or refine identified skills over time	• ethics of **cultural appropriation** and plagiarism

Applied Technologies • Explore existing, new, and emerging tools, technologies, and systems to evaluate suitability for their design interests • Evaluate impacts, including unintended negative consequences, of choices made about technology use • Examine the role that advancing technologies play in the maker community	

Big Ideas – Elaborations

Curricular Competencies – Elaborations

- **Self-efficacy** is the belief we have in our own abilities, specifically our ability to meet the challenges ahead of us and complete a task successfully (Akhtar, 2008).
- **constraints:** limiting factors, such as task or user requirements, materials, expense, environmental impact
- **plan:** for example, pictorial drawings, sketches, flow charts
- **impacts:** including social and environmental impacts of extraction and transportation of raw materials; manufacturing, packaging, transportation
  to markets; servicing or providing replacement parts; expected usable lifetime; and reuse or recycling of component materials
- **iterations:** repetitions of a process with the aim of approaching a desired result
- **sources of feedback:** may include peers; users; First Nations, Métis, or Inuit community experts; other experts and professionals both online and offline
- **technologies:** tools that extend human capabilities
- **share:** may include showing to others, use by others, giving away, or marketing and selling

Content – Elaborations

- **cultural appropriation:** use of a cultural motif, theme, “voice,” image, knowledge, story, song, or drama, shared without permission or without appropriate context or in a way that may misrepresent the real experience of the people from whose culture it is drawn
- **design for the life cycle:** taking into account economic costs, and social and environmental impacts of the product, from the extraction of raw materials to eventual reuse or recycling of component materials
- **hand tools:** for example, hammer, mallet, screwdriver, sanding block, chisel, pliers, ruler, square, hand saw
- **opportunities:** identification of gaps where entrepreneurial opportunities might exist; experimentation with small-scale entrepreneurial ventures
- **power tools:** for example, band saw, scroll saw, drill press, portable drill, belt and disk sander, mitre saw, soldering pen, power supply,

Content – Elaborations
• **programming languages:** - in robotics: pictorial/block coding, C, python -in computer numerical control (CNC): G code • **technology to support collaboration:** online multi-user tools and services to facilitate collaboration and communication on common projects, regardless of their physical location; for example, online chat/video communication services, document sharing services or sophisticated project management software • **technical communication:** for example, sketching, technical drawing, computer-aided drafting (CAD), orthographic and pictorial drawings, technical reports, technical journals, end-user documentation, product manuals, catalogues

Recommended Instructional Components:

- Direct Instruction
- Demonstrations
- Simulations
- Experiential Learning
- Peer Teaching
- Reflective Journaling

Recommended Assessment Components: Ensure alignment with the Principles of Quality Assessment

- Digital Journaling
- Self-Assessment
- Instructor Assessment

Learning Resources: note: the following are all web-based resources and are continually changing

Lynda.com	autodesk.com/education/home	hackaday.com
makezine.com	hackspace.raspberrypi.org	wordpress.com
instructables.com	adafruit.com	tinkercad.com
arduino.cc	lulzbot.com	shopbottools.com

Additional Information: