

Winthrop High School

Science Technology Engineering Art Mathematics STEAM Syllabus

Course Overview

STEAM is a course that integrates components of **Science & Technology** through **Engineering** and **Artistic** design all based in **Mathematical** elements. Students will learn and then apply technology skills to solve problems, communicate with others, locate information, teach, entertain and inspire. The contextual curriculum coordinates each subject area to support one another in a formal educational structure. The STEAM curriculum is a standard based NGSS curriculum with a focus on science and engineering practices and core concepts in science education as well as an introduction to computer science. The curriculum will be delivered through several curriculum offerings including but not limited to [CS First by Google Education](#) and [FUSE](#), an interest-driven learning experience developed at Northwestern University.

Materials

Chromebook
Headphones
2 Pocket Folder

Pen/Pencil/ Highlighters/ Sharpies
Composition Notebook
Expo Markers

Accounts needed to set-up for use in the class

FUSE Account
Google CS First Account
Schoolology Account

Curriculum Content Map

Course Structure

Content	Description	Honors	College Prep
FUSE	FUSE challenges, the learning activities of the program, are designed to introduce STEAM concepts and skills in a engaging and enjoyable way. Students choose the challenges they want to work on and progress at their own pace, working alone or with others. Challenges are based in STEAM topics likes 3D design and printing, robotics, architecture, music mixing, animation and more.	X	X
Coding	Coding weeks are intended to introduce students to coding and fun projects/ websites devoted to teaching various forms of coding in a student driven learning environment.	X	X

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Weekly Reading and Writing Assignment	Each week you will have to read/watch/listen to a science text (video, article, audio file). Some weeks the article will be assigned to you. Other weeks, you will have the opportunity to find an article that interests you. Each visual assignment will be accompanied with a writing assignment.	X	
Science Research or Engineering Design Project	Curriculum is provided by the Google Education - Science Fair. The objective of the STEAM project is to find a scientific question or engineering problem you are interested in and conduct an independent research project to answer the question or solve the problem. Students will utilize the Google Education - Science Fair Curriculum to organize their project. Each STEAM project will be presented at a school wide STEAM Project Expo in January. The top 5 projects will be chosen to represent Winthrop at the Massachusetts State Region IV Science Fair at Somerville High School in March. It is important parents understand that students enrolled in the Honors curriculum will be REQUIRED to complete this comprehensive year long science research or engineering design project. The project will have a large portion that must be completed at home and will require supervision and support.	X	
Portfolio Website	Students will create a Portfolio Google Site as a formal assessment of their work in the STEAM course.	X	X

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FUSE Challenges

Your work in this course will center around a set of leveled challenges designed by the FUSE program. The challenges have been organized in the following groups. Each semester will have FUSE cycles. During the cycle you will have 2 weeks to work on projects in one challenge group. When the cycle ends you will move on to the next challenge group.

Challenge Groups	Scale	Energy	Cause and Effect	Structure
Driving Question	How does real-world scale, proportion and quantity play a role in designing your digital and physical artifacts?	How does the conservation of energy play a role designing solutions to your challenges?	How did the cause and effect of your design choices impact your final solution?	How did the structure of your designs impact their real-world function?
Challenges	3D You	Coaster Boss	Ringtones	Eye Candy
	Dream Home	Electric Apparel	Game Designer	Just Bead It
	Dream Home 2	LED Color Lights	Get in the Game	Selfie Stickers
	Jewelry Designer	Music Amplifier	How to Train Your Robot	Spaghetti Structures
	Keychain Customizer	Party Lights	Mini Me Animation	Laser Defender
	Print my Ride	Solar Roller	Wind Commander	

Challenge Completion Requirements

Within each challenge group you must meet one of the following requirements per quarter:

- Depth: Complete all levels in two challenges.
- Breadth: Complete all levels in one challenge and the first level in three other challenges.

Coding

[Google Education - CS First Club](#) is a free web-based program that exposes students to computer science through video tutorials and modules that students participate in as after-school, in-school and summer programs. Designed as an introduction to computer science, the clubs teach students about computer science and coding in a hands-on, learning-by-doing way.

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Grading Information

STEAM is offered in an open honors class environment. An open honors course offers students the choice to take the science elective for CP or Honors level credit towards their GPA calculation. The following table outlines expectations for each curriculum level within course.

Honors - Quarter Grades

Category	Weight
Individual Learning: Weekly reading and writing assignment. Science Research or Engineering Design Project	20%
Project-Based Learning: FUSE challenge completion Coding Modules STEAM Project and Exploration	50%
Work Habit:	10%
Formal Assessments: Portfolio Google Website	20%

College Prep - Quarter Grades

Category	Weight
Project-Based Learning: FUSE challenge completion Coding Modules STEAM Project and Exploration	60%
Work Habit:	20%
Formal Assessments: Portfolio Google Website	20%

Midterm Project **Create an Infomercial to “Sell your favorite FUSE Challenge”**

Final Project **Design your own FUSE Challenge Level**

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NGSS and Common Core Standards Alignment

KEY of NGSS Terms

CCC Cross Cutting Concepts

DCI Disciplinary Core Ideas

SEPs Science Engineering Practices

FUSE

Challenge Alignment to [NGSS Standards](#):

Challenge Name	Description	CCC	DCI	SEPs
3D You	Use 3D scanner and 3D design software to create models of your head.	Scale, proportion, and quantity	PS4	- Developing and using models - Analyzing and interpreting data
Coaster Boss	Design a roller coaster that can meet various design goals given material and space constraints.	Energy and matter	PS2	- Defining problems - Analyzing and interpreting data - Designing solutions
Dream Home	Design a home using 3D design software that meets various design goals given space constraints.	Scale, proportion, and quantity	ETS1	- Using mathematics and computational thinking - Designing solutions
Dream Home 2	Design a home for a client using 3D design software that balances the competing needs of your clients and space	Scale, proportion, and quantity	ETS1	- Defining problems - Using mathematics and computational thinking - Designing solutions
Electric Apparel	Use e-textile components to design wearable circuits and modify a garment to be interactive and light up.	Energy and matter	PS4	- Developing and using models - Designing solutions - Planning and carrying out investigations
Eye Candy	Design a pair of eyeglasses frames that can be printed out on a 3D printer.	Structure and function	ETS1	- Developing and using models - Designing solutions - Using mathematics and computational thinking
Game Designer	Use a powerful game design software to fix a broken game and create your own levels that meet various design goals.	Cause and effect	ETS2	- Defining problems - Using mathematics and computational thinking

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Get in the Game	Use a Makey Makey to design and build embodied controllers for online games.	Cause and effect	ETS1	- Defining problems - Developing and using models - Designing solutions
How to Train Your Robot	Use block based coding to program a robot to complete various goals.	Cause and effect	ETS2	- Defining problems - Analyzing and interpreting data - Using mathematics and computational thinking
Jewelry Designer	Use 3d design software to design your own jewelry and print them out on a 3D printer.	Scale, proportion, and quantity	ETS1	- Developing and using models - Designing solutions - Using mathematics and computational thinking
Just Bead It	Create gel beads using the same technique scientists use to grow human cells.	Structure and function	LS1	- Planning and carrying out investigations - Designing solutions
Keychain Customizer	Use 3D design software to create custom keychain designs that can be printed out on a 3D printer	Scale, proportion, and quantity	ETS1	- Developing and using models - Designing solutions - Using mathematics and computational thinking
Laser Defender	Use mirrors and a laser pointer to create a laser defense grid.	Structure and function	PS4	- Developing and using models - Designing solutions - Analyzing and interpreting data
LED Color Lights	Build a circuit capable of lighting up three LED's.	Energy and matter	PS3	- Developing and using models - Designing solutions
MiniMe Animation	Use 3D animation software to bring a CGI figure to life and meet various design goals.	Cause and effect	ETS2	- Developing and using models - Using mathematics and computational thinking
Music Amplifier	Using electrical components to build a circuit capable of playing music from your phone.	Energy and matter	PS4	- Developing and using models - Designing solutions
Party Lights	Use a programmable micro-controller to build and control a light display.	Energy and matter	PS3	- Developing and using models - Designing solutions - Using mathematics and computational thinking

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Print my Ride	Use 3D design software to build a model of your favorite car that can be 3D printed.	Scale, proportion, and quantity	ETS1	- Developing and using models - Designing solutions - Using mathematics and computational thinking
Ringtones	Use a music mixing software to create your own custom tracks.	Cause and effect	ETS2	- Developing and using models - Using mathematics and computational thinking
Spaghetti Structures	Use spaghetti and marshmallows to build a tower that can pass various tests.	Structure and function	PS2	- Planning and carrying out investigations - Designing solutions
Selfie Sticker	Use 2D design software and a vinyl cutter to create custom multi-layer vinyl stickers.	Structure and function	ETS2	- Developing and using models - Designing solutions
Solar Roller	Design and engineer a solar powered car to meet various design goals.	Energy and matter	PS3	- Planning and carrying out investigations - Analyzing and interpreting data - Designing solutions
Wind Commander	Design and engineer a wind turbine to achieve various design goals.	Cause and effect	PS2	- Planning and carrying out investigations - Analyzing and interpreting data - Designing solutions

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[Google Education - CS First Club](#) - NGSS Alignment

NGSS Science and Engineering Practices
1. Ask questions and define problems
2. Develop and use models
3. Plan and carry out investigations
4. Analyze and interpret data
5. Use mathematics and computational thinking
6. Construct explanations and design solutions
7. Engage in argument from evidence
8. Obtain, evaluate, and communicate information

Multi-Day Activities						
Storytelling 	Friends 	Fashion & Design 	Art 	Sports 	Music & Sound 	Game Design 
X	X	X	X	X	X	X
X	X	X	X	X	X	X
X	X	X	X	X	X	X
	X	X	X	X	X	X
X	X	X	X	X	X	X
X	X	X	X	X	X	X
	X	X	X	X	X	X
	X	X	X	X	X	X

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Vision of the Graduate

Winthrop High School strives to ensure its graduates are able to become productive citizens of their town, their state, and their nation. To do this, the school in 2011 embraced the following learning objectives, on which students are evaluated quarterly. Taken together, they express a community vision for what we want our graduates to be, know, and do.

WHS Students will become...

Critical Thinkers

- They will use, apply, and evaluate multiple problem-solving strategies in a variety of Disciplines.
- They will be able to select, organize, and evaluate new ideas.
- They will demonstrate the ability to actively and critically read.
- They will develop the skills and acquire the knowledge necessary to prepare them for college and career success
- They will be able to set priorities, and manage their time and tasks.

Effective Communicators

- They will communicate ideas and information with clarity and with an understanding of their audience.
- They will integrate and use a variety of communication forms.
- They will listen effectively and respond appropriately to spoken communication.
- They will master standard English-language conventions.

Conscientious Citizens

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- They will be aware of, and follow, their community's rules and laws
- They will respect themselves and the community at large.
- They will be aware of and respect social and cultural diversity.
- They will understand, promote, and show the importance of hard work to achieve success.
- They will own their mistakes, and will learn from them.

Creative Achievers

- They will show curiosity and enthusiasm in everything they do.
- They will work and think originally.
- They will appreciate the arts in their many forms.
- They will select, organize, and develop innovative ideas.
- They will build off the ideas of others.