

# Technology Skills and Course Outline- SteamStudio Years One and Two

## DESIGN AND COMMUNICATIONS

### Graphics and Design Skills

Graphical representation of objects in the both the physical and virtual world, is the essential STEAM skill, as it lies at the intersection of technology, engineering, and art. It is what links the desires of our imagination to their implementation in reality.

- Design Thinking process skills- interviewing, brainstorming, prototyping
- Orthographic Sketching (paper and pencil)
- Adobe Illustrator- 2D Modeling
- Autodesk Fusion 360 (or Equal)-Advanced 3D Modeling

How Taught: Embedded into multiple UCCI core course projects- Engineering America, Geometry and Computer Visualization- Years One and Two. For example, designing a cotton gin model, a bridge, a model of Sputnik, etc.

### Communications for the Digital Age

To document, explain, and persuade, students need to communicate effectively with digital tools, able to manipulate text, images, and video to communicate their message, whether through text and graphics, YouTube videos, websites, or digital portfolios.

- PhotoShop
- I-Movie
- Web Design- Weebly/Google Sites
- Portfolios

How Taught: Embedded into multiple UCCI core course projects and advisory portfolio projects- Years One and Two. For example, creating marketing campaigns, personal digital portfolios, and video documentaries.

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## CODING

At the heart of much of our digital lives, whether our smartphones, pop music, or appliances and medical devices lie computer code. To become both proficient users, as well as creators of digital content, students need to understand and appreciate the basic concepts of computational thinking and computer coding.

- Scratch (Year One)
- Arduino (Year Two)
- Python (Year Three)

How taught: Crash Courses and Action Labs Years 1 and 2- Computational Thinking Through Music( Scratch)( <https://teaching.cs.uml.edu/~heines/91.212/91.212-2015-16s/212home.jsp>) [UMass Lowell] Robotics (Arduino)

## Embedded Computing

- Basic Arduino (Year One(?) and Year Two)
- Motor and Servo Control- program robotic vehicles
- Advanced Arduino/Shields- MIDI devices
- IoT Devices (Year Two)- For example, a plant that tweets when it needs water, or smartphone-app to feed fish

How taught: Crash Course Action Labs Years 1 and 2 - Robotic Vehicles/Solar Cars/Food Computers, etc.

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## **ENGINEERING**

Learning to design and fabricate devices, involving both structures, mechanisms, sensors, motors, and electronics lies at the heart of engineering design

### Electronics [MIT Edgerton Center]

- DC Circuits- LEDs, switches, voltage and current
- Passive and active sensors- light, temp, sound
- Relays
- AC circuits/Audio filters
- Transistor Circuits- Audio, Power Control
- Motors and Generators
- Solar cells/other renewables

How Taught: Crash Courses+ Action Labs Years 1 and 2( Audio Electronics/Food Computer/ Electric Vehicles/Renewable Energy.

See Outlines at:

- **ITP Physical Computing( <https://itp.nyu.edu/physcomp/>**
- **[https://www.instructables.com/class/Electronics-Class/?utm\\_medium=search%2F%5BLAB-%20Electronics/Engineering](https://www.instructables.com/class/Electronics-Class/?utm_medium=search%2F%5BLAB-%20Electronics/Engineering)**
- **[MIT- Practical Electronics\( Jim Bales\)](#)**

### Machine Tools [MIT Edgerton Center ]

- Hand Tools
- Drill Press
- Band Saw
- Sanders

### Digital Fabrication [MIT Edgerton Center ]

- Lasercutting
- 3D Printing
- ShopBot

How taught: Crash Course/Action Labs Years 1 and 2- Solar vehicles, Food computers, etc- Students will tackle design challenges that involve learning tool use and design, for example, battlebots, food computer, hydroponics, etc.

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### **Biotechnology**

Biotechnology-whether for diagnostics, genetic therapy, pharmaceuticals, or basic science- is a key area of the Massachusetts economy.

Curriculum will be based on both UCCI Technology of Biology and recommendations by Mara(?), Natalie Kuldell[MIT], Larry Murphy [ Roxbury Latin Advanced Biotechnology Institute] and others.

- Microscope Skills
- Balances
- Pipetting
- Spectrophotometry
- Solution preparation
- Spectrophotometry
- PCR
- Electrophoresis
- Enzymatic digestion
- Agar Gels and Bacteria Culture
- Horticulture/Hydroponics/Food Computer

### **Links:**

- [PCR principles and techniques](#)
- [DNA isolation and analysis](#)
- [Protein expression and purification](#)
- [Bacterial transformation](#)
- [Model organisms](#)
- <http://biotech.bio5.org/activities>
- [http://www.bio-rad.com/en-us/category/thinq-investigation-kits-for-ap-biology?pcp\\_loc=catprod](http://www.bio-rad.com/en-us/category/thinq-investigation-kits-for-ap-biology?pcp_loc=catprod)

How taught: Technology of Biology[ Years One and Two] plus Action Labs Years 1 and 2  
Action Labs

## Course Outline

### Year One

First half year : Steam Studio Exploratory [21 periods] x 6

Includes: Design Thinking Mini Project

Online Learning Module

Electronics project[BugBots]- IoT[?]

Biotech Mini Projects- DNA isolation, DNA Fingerprinting

Second Half Year:

### **Integrated Core Academics and Technology:**

UCCI Technology of Biology [45 periods + 22 periods]

UCCI Digital Media Arts [45 periods+ 22 periods]

UCCI Engineering America [45 periods+ 22 periods]

UCCI Functional Design

Through Algebra [45 periods+ 22 periods]

### **Action Learning Labs:**

Technology of Biology Lab Time [ 30 periods] -UCCI

Introduction to Electronics [30 periods]- Edgerton

Computational Thinking Through Sound [30 periods]- UML Lowell

**Crash Courses:** Design and Communications projects linked to Core Courses[90]-  
2D CAD/Graphics, Lasercutting, 3D CAD, 3D printing, video, web design, portfolios

**Performing Arts [ 45 periods]**

**Physical Education [90 periods]**

## Year Two

### Integrated Core Academics and Technology:

- ELA: [Get Reel: English Through Your Lens](#) [ 90 +22 periods]
- Math: [Geometry + Computer Visualization/Simulation](#) [90+ 22 periods]
- Science: [Technology of Biology-Part 2](#)/Plant Technology [90+ 60+22 periods]
- History/Social Studies: [World History by Design](#) [ 90 + 22 periods]
- World Language: Spanish 2 [90 periods]

### Performing Arts [90 periods]

### Physical Education [90 periods]

### Action Learning Labs:

BioTechnology-2 [60 periods]- includes [Lemelson/Growing Green -Hydroponics \[\]](#)  
Robotics/Embedded Computing [60 periods]- MIT Edgerton Center  
Electric Vehicles/Battling Machines [60 periods]

### Crash Courses: [Lemelson/New Balance Project \[20 periods\]](#)

[Lemelson/MIT- Noisemakers](#)

Renewable Energy[30]- MIT Edgerton/Lemelson/Kidwind  
Lab Time for Core Courses [90]-reflected above