

Maker's Academy (Vermont Fab Lab Workshop)

CEMS 095

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Pre college course (open to high school juniors and seniors)

2 weeks on-campus 2 weeks off-campus

- **July 6-17th on the UVM campus (Housing is available)**
- **July 18 - 31 online**

Course Description:

This course explores how innovators in engineering, contemporary art, architecture and the DIY maker movement solve problems and advance ideas. Students will learn the basics of how to design using open source hardware and programming, handmade electronics and the rapid prototyping tools in the U of Vermont Fab Lab. This course provides hands-on experience with the Arduino microcontroller, 3d printing and laser cutting and engraving. Assigned readings and teachings cover project management, presentation skills, and design thinking. The final project requires documentation of a well-developed product or concept and the presentation of an early prototype.

Course Learning Objectives:

- Critically engage in the creative and prototype design processes across engineering, art, architecture and entrepreneurship.
- Learn safety procedures for working in the U of Vermont Fab Lab and with handmade electronics projects.
- Introduction to the Arduino microcontroller, Processing programming language, development and online communities.
- Learn how to use the rapid prototyping equipment and tools of the U of Vermont Fab Lab.
- Learn how to access and contribute to open source resources for ongoing independent inquiry and experimentation.
- See a self-designed project through from early idea to prototype.

- Acquire and/or improve skills in project management and presentation.
- Gain experience implementing the ideas of eco-design thinking.

Required Texts / Materials: Materials + Lab Fee = \$175 per student

- Students will need a high functioning laptop and will need to download free open source software onto their laptops; open source Arduino and Processing software should be downloaded from arduino.cc and processing.org. (Links below)

Students should purchase the following books

Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation

by Tim Brown

HBR Guide to Persuasive Presentations (Harvard Business Review)

By Nancy Duarte

Sketchbook/notebook of your choice should be brought to every class.

Recommendation: Moleskin journal.

Other readings will be distributed in class.

Optional:

Encyclopedia of Electronic Components Volumes 1 + 2

Charles Platt

Maker Media Inc 2012, 2014

HBR Guide to Project Management

Harvard Business Review Press (January 15, 2013)

Safety and Environment Health Online Trainings

<http://www.uvm.edu/safety/lab/safetytraining#Training%20Courses%20from%20EHS>

The following online trainings are required:

- Fire and Life Safety: Fire Safety

- Specialized Lab Safety: Laser Safety

Security: Theft is not uncommon on college campuses. Students should keep an eye on valuable possessions at all times and are encouraged to have laptops and mobile devices both backed up and insured

Download the following free software to your laptop:

Processing: <https://processing.org/>

Arduino: <http://www.arduino.cc/>

Grading Criteria / Attendance Policy

Attendance, participation and assignments: 70%

Final Project: 30%

Classroom Environment Expectations

Class attendance and participation is crucial to a student's success as most of the technology and hands on skills will be taught and practiced within the classroom. The grade a student receives for attendance and participation is based on attendance, assignment completion, and on how well the student contributes to the class experience and class discussions.

Assignments outside of class will include readings and writings and the study of basic electronic components. Many points of view and different levels of technical expertise are welcome in this classroom setting; students are encouraged to take imaginative risks and to support their classmates' creative process and growth.

Attendance Requirements: For intensive summer courses students are expected to attend every class and to arrive on time. Please let the instructor know in advance if you will need to miss a class in order to arrange for make-up work. Students will have trouble completing the online portion of the course if they are traveling or do not have Internet access. If you think you have a conflict please contact the instructor, with advance notice there is room for scheduling flexibility.

Day 1: Monday, July 6

- Introductions
- Safety Trainings
- Introduction to Fab Labs and Maker and Hacker Spaces (Dayle Doherty, Neil Gershenfeld, Mitch Altman, Noisebridge, Artist's Asylum, Generator)
- Tour of the Vermont Fab Lab
- Film: *Manufactured Landscapes*

Homework:

Video and writing assignment: *The Toaster Project*

Laptop setup

Day 2: Tuesday, July 7

- Review: *The Toaster Project*
- Natalie Jeremijenko
- Richard Turere
- Reverse Engineering and Product Design
- Hands-on: Toy Hacking

Homework: Design Thinking + Mind Mapping

Day 3: Wednesday, July 8

- Review: *Design Thinking*
- Casey Reas
- Activity: Processing programming language

Home work: Processing, *Design Thinking*

Day 4: Thursday, July 9

- Homework review and presentations
- Activity: Processing programming language

Home work: Processing, *Design Thinking*

Day 5: Friday, July 10

- Homework review and presentations
- Introduction to 3D Printing, Arduino + Laser Cutting
- Introduction to the reciprocity of open source platforms Thingiverse , Arduino Playground, Wikipedia
- Massimo Banzi
- Neri Oxman
- Begin planning for final project

Weekend Assignment:

- Final Project Planning
- Film and writing assignment: *Print the Legend*

Day 6: Monday, July 13

- Homework review and presentations
- Hands-on: Arduino Microcontroller

Homework: Arduino sketch iterations

Day 7: Tuesday, July 14

- Homework review and presentations
- Hands-on: Arduino Microcontroller

Homework: Arduino sketch iterations

Day 8: Wednesday, July 15

Homework review and presentations

Working in the Vermont Fab Lab

- 3d Printing
- Laser Cutting
- Low tech/high tech projects: e-origami/e-textiles, etc.

Homework: final project planning, *Persuasive Presentations*

Day 9: Thursday, July 16

- Open Lab
- 3d Printing
- Laser Cutting
- Low tech/high tech projects: e-origami/e-textiles, etc.

Homework: final project planning, *Persuasive Presentations*

Day 10: Friday, July 17

Final Project planning + presentations

July 18 – 31, online

Work on final projects, assigned readings and writings.

Students must have Internet access and time to work on final projects.

