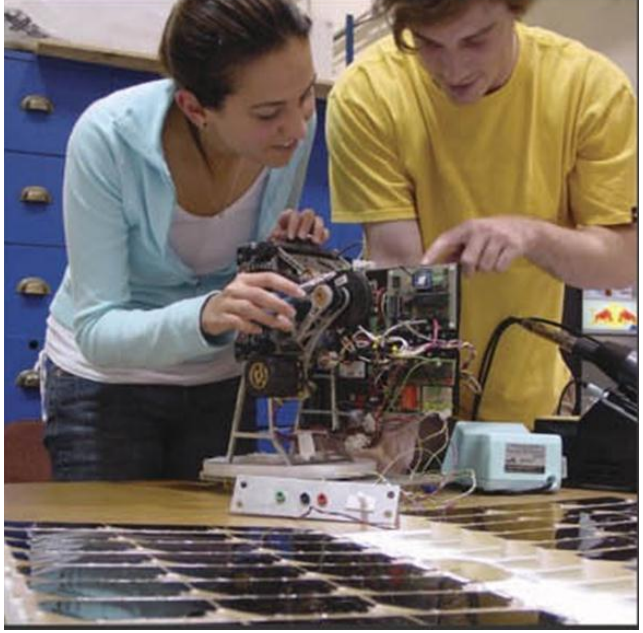
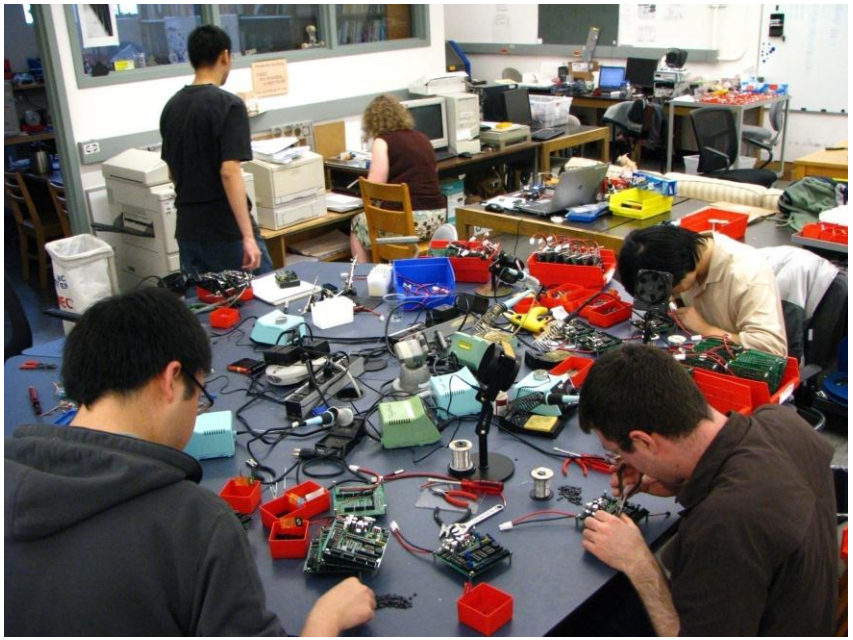
# Prototyping -
## How we solve problems in Engphys

**Please google "apsc 150 prototyping"**

**Jon Nakane, PhD PEng**
**Lab Director, UBC Engineering Physics Project Lab**
Apsc 150 - 2012 Sept 20

**Students in a lecture theatre.  Thinking.**





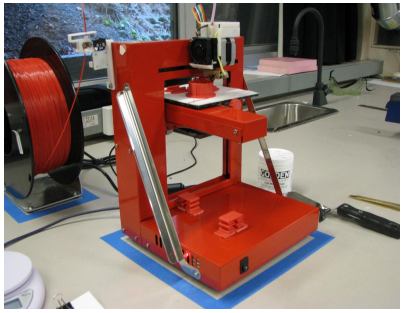
**Open-ended projects build your skillset.**

**In EngPhys, most students use our Project Lab (in Hennings)**

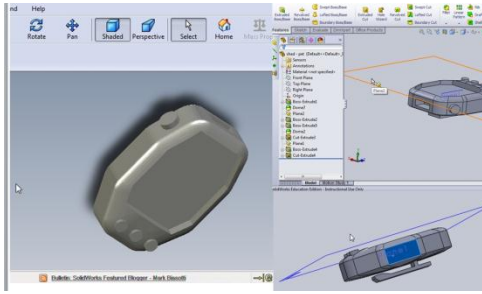
# 1.
# Ideas to Reality

100m underwater drop camera

NMR using the earth's magnetic field



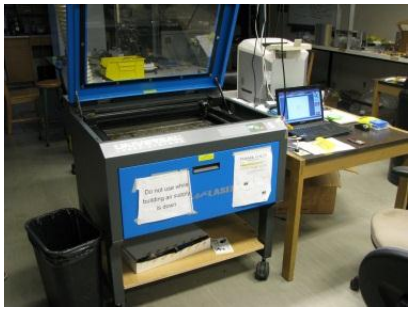
Automated kite for power generation



Automated stepper motor identification system

Variable blend biodiesel dispenser

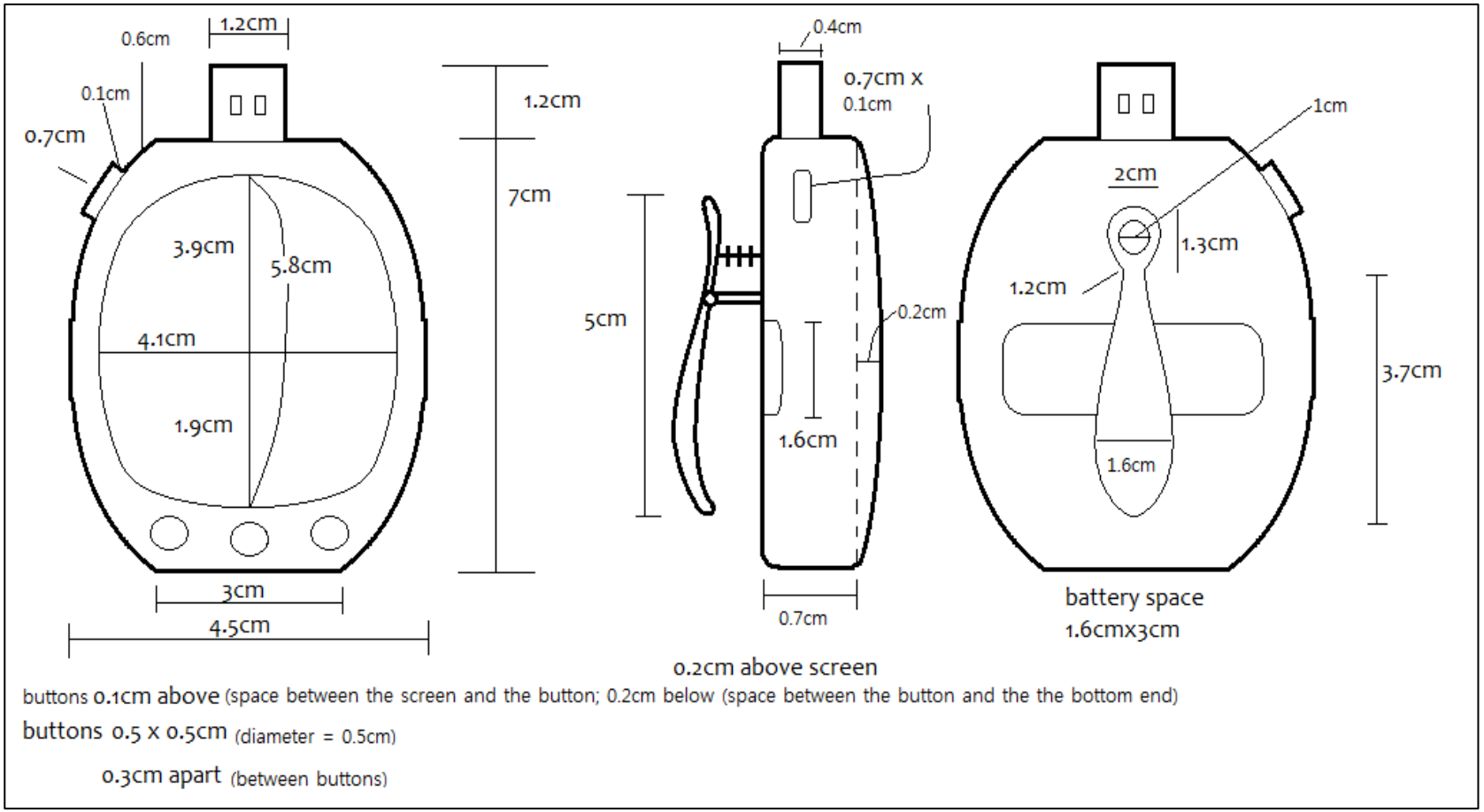
Wireless wearable LED display



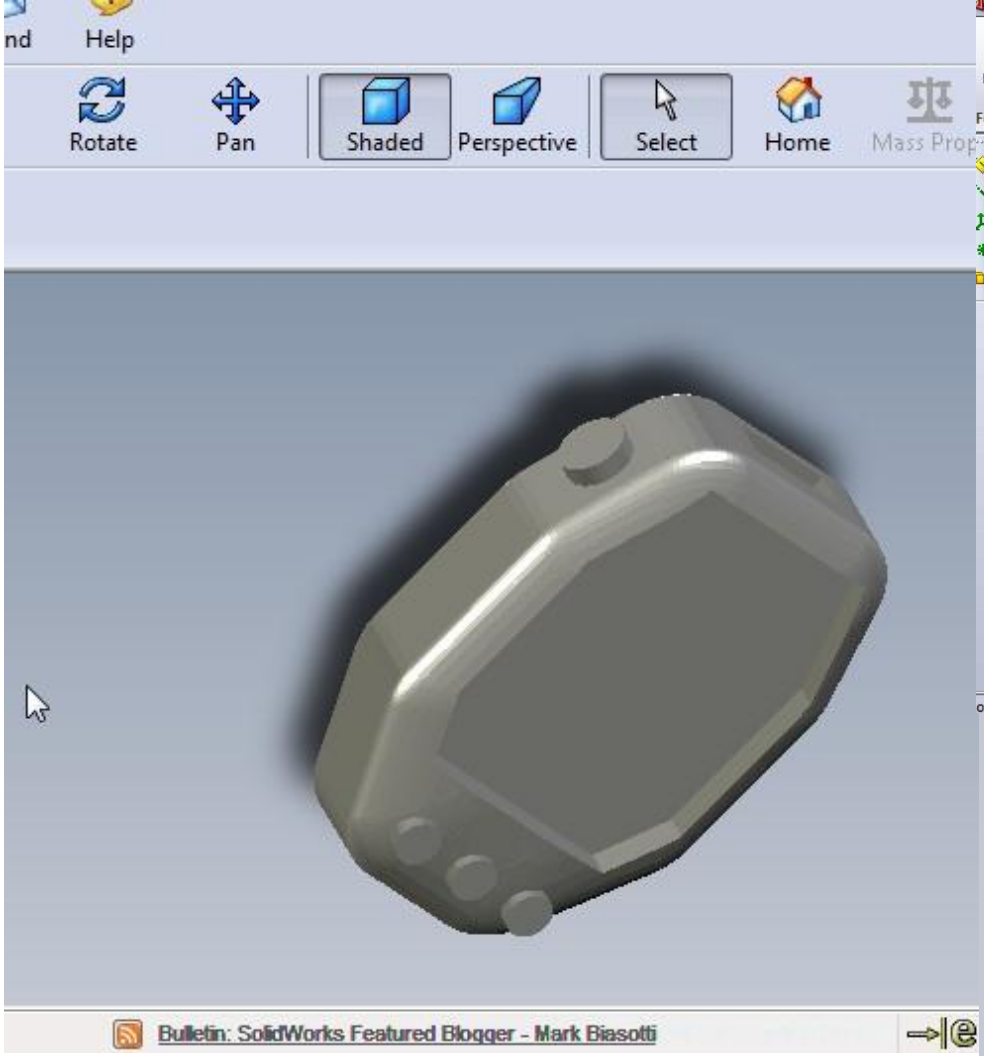
Laser acoustic shockwaves for tumor identification

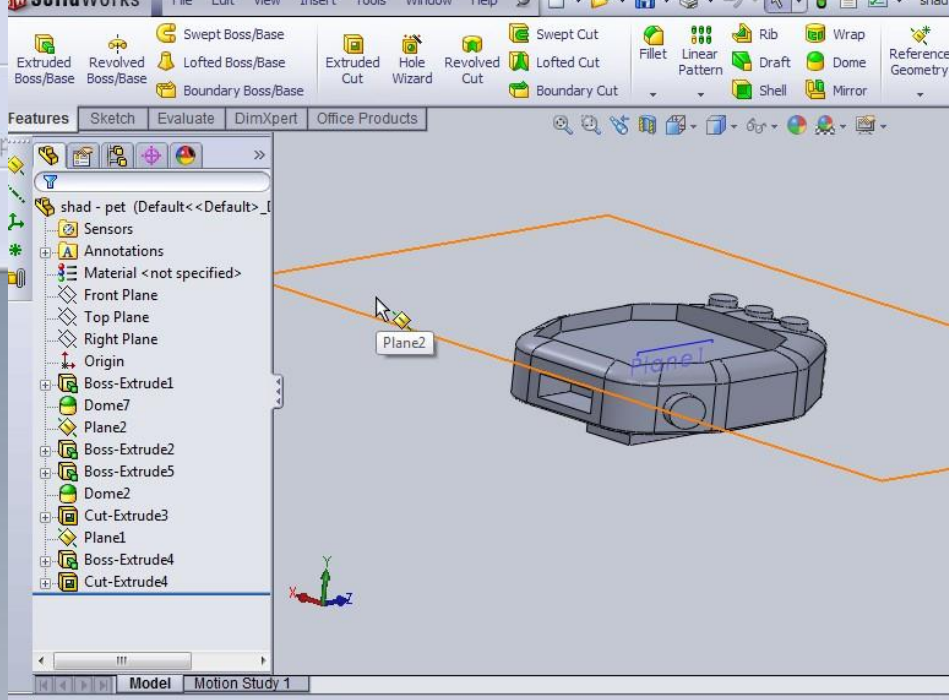
Robotic origami

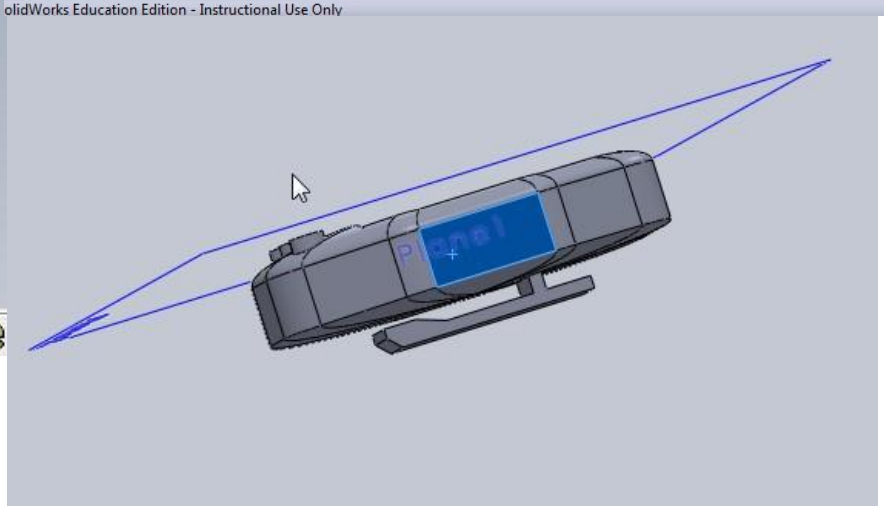
# Match the problem with the right tools.



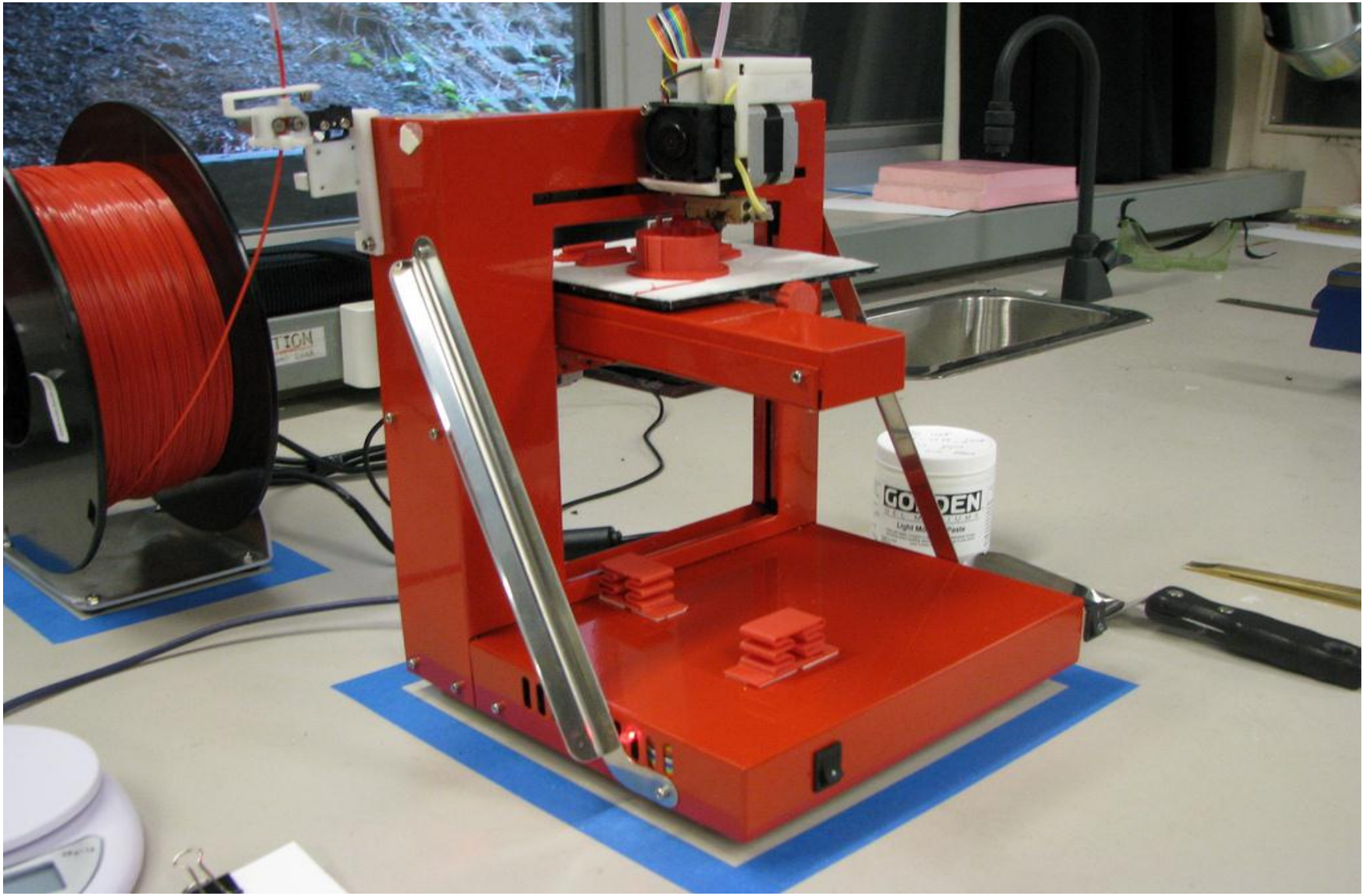

**Example – handheld interactive "pet" to encourage kids to be active. Non-functional prototype desired.**
**Gave me drawings (I think it's MS Paint?) A pretty good start!**



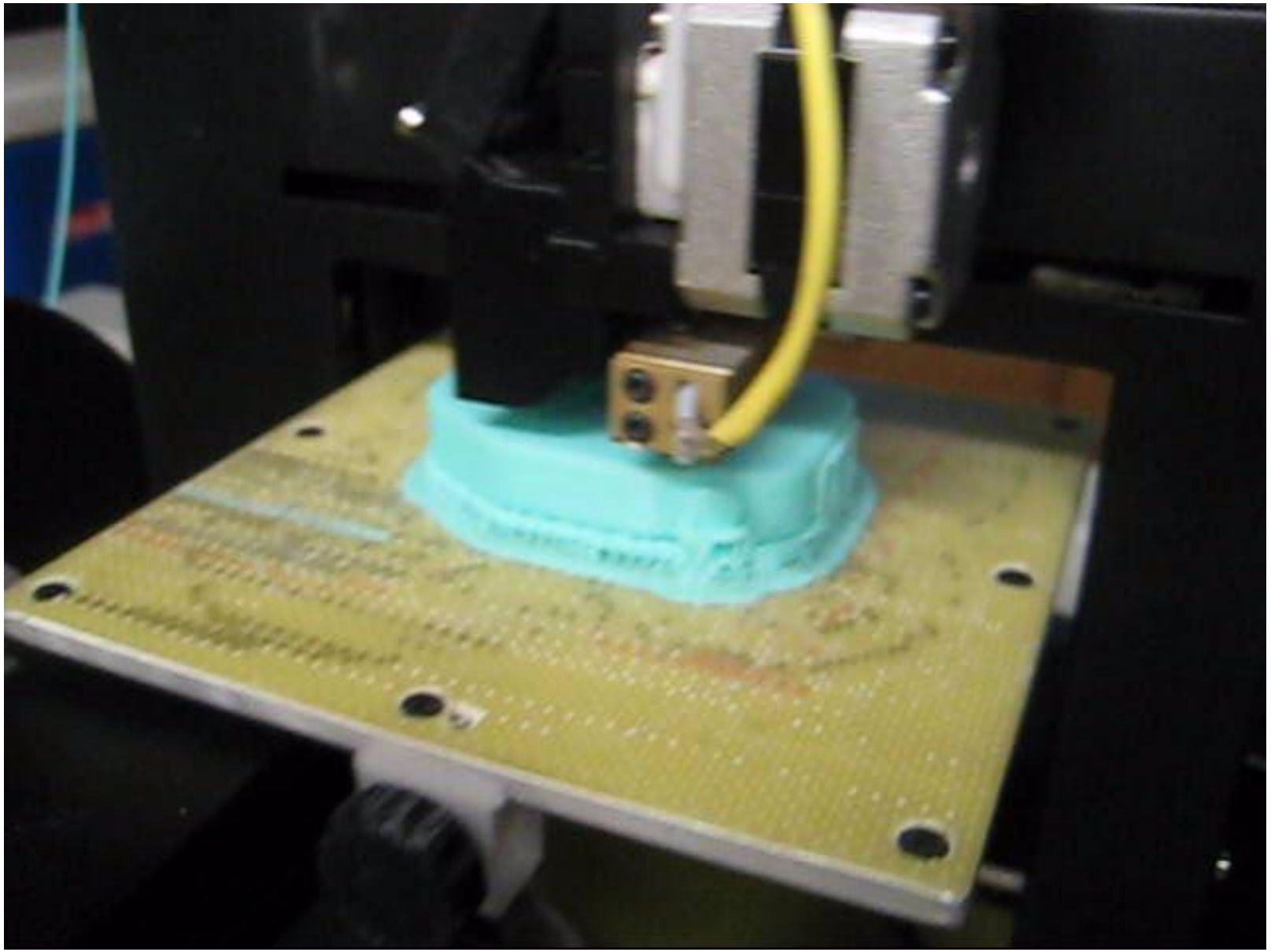



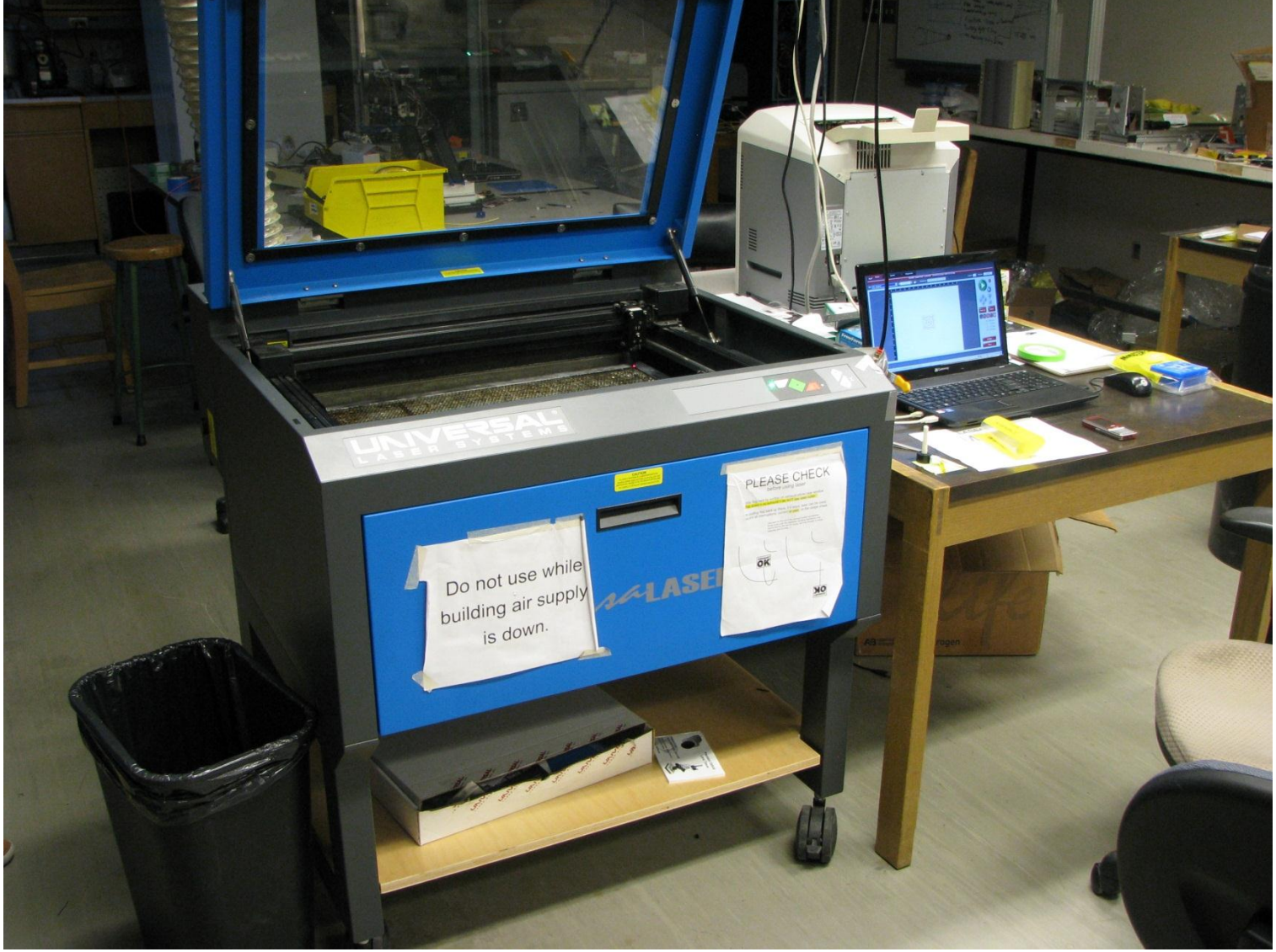

**Converted to Computer Aided Design (CAD) software (solidworks)**



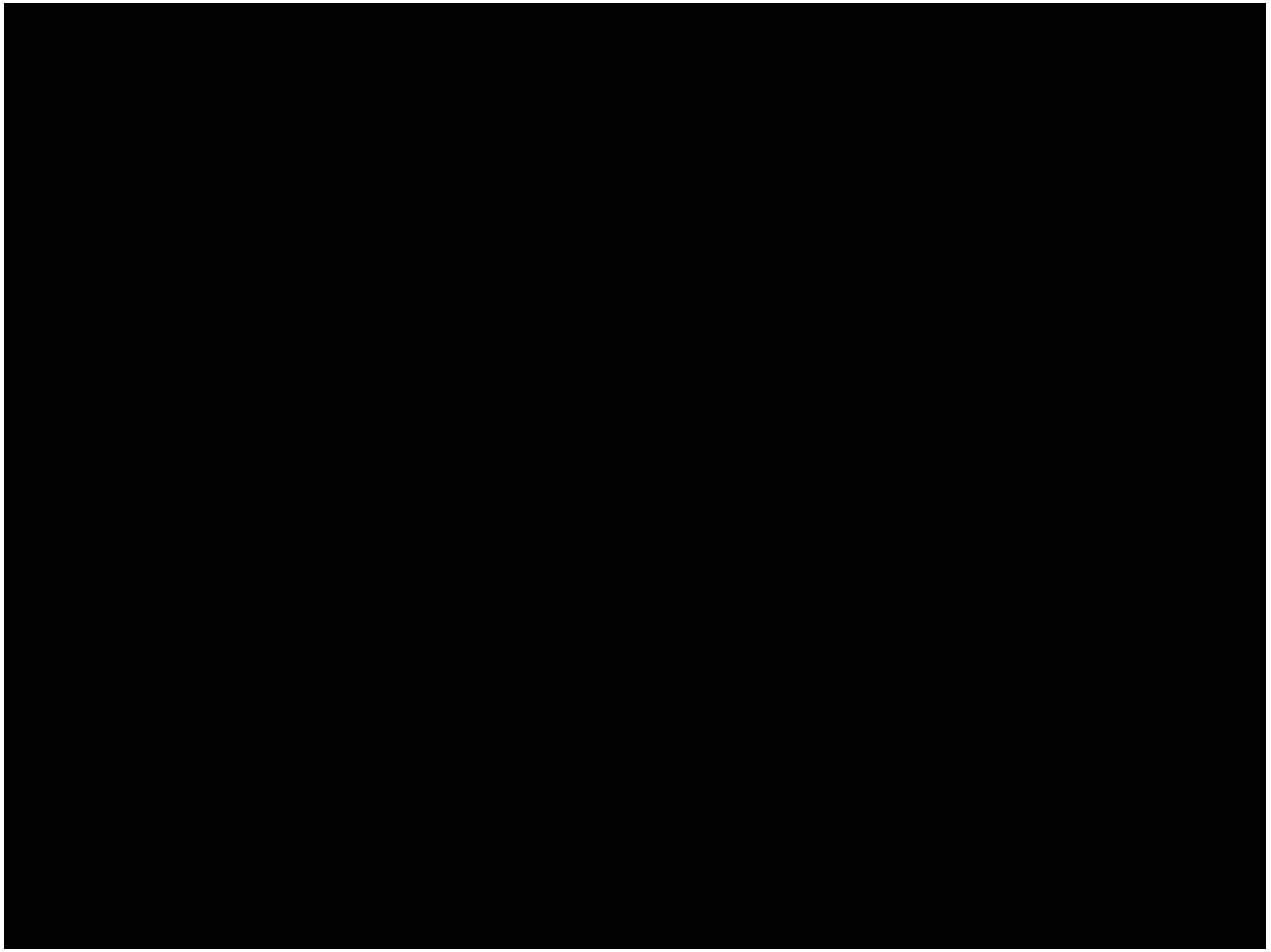
**Housing printed on a 3D Printer – uses ABS plastic**



# 3D printing - video

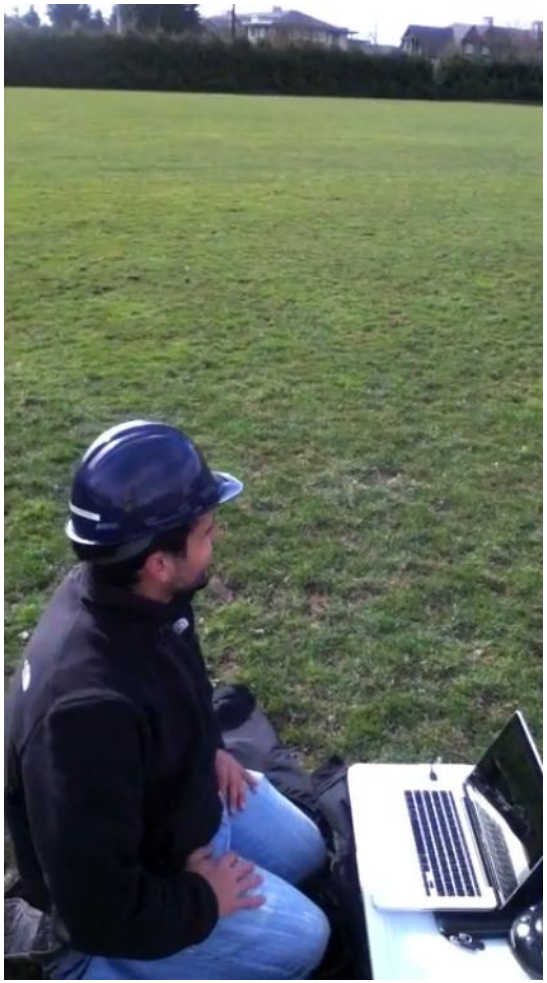



**Faceplate cut out of acrylic on a Laser Cutter – good for plastics, wood, paper, etching…**



# Laser cutting in acrylic (video)


**Finished – idea on Thurs night, item on Sun night.**

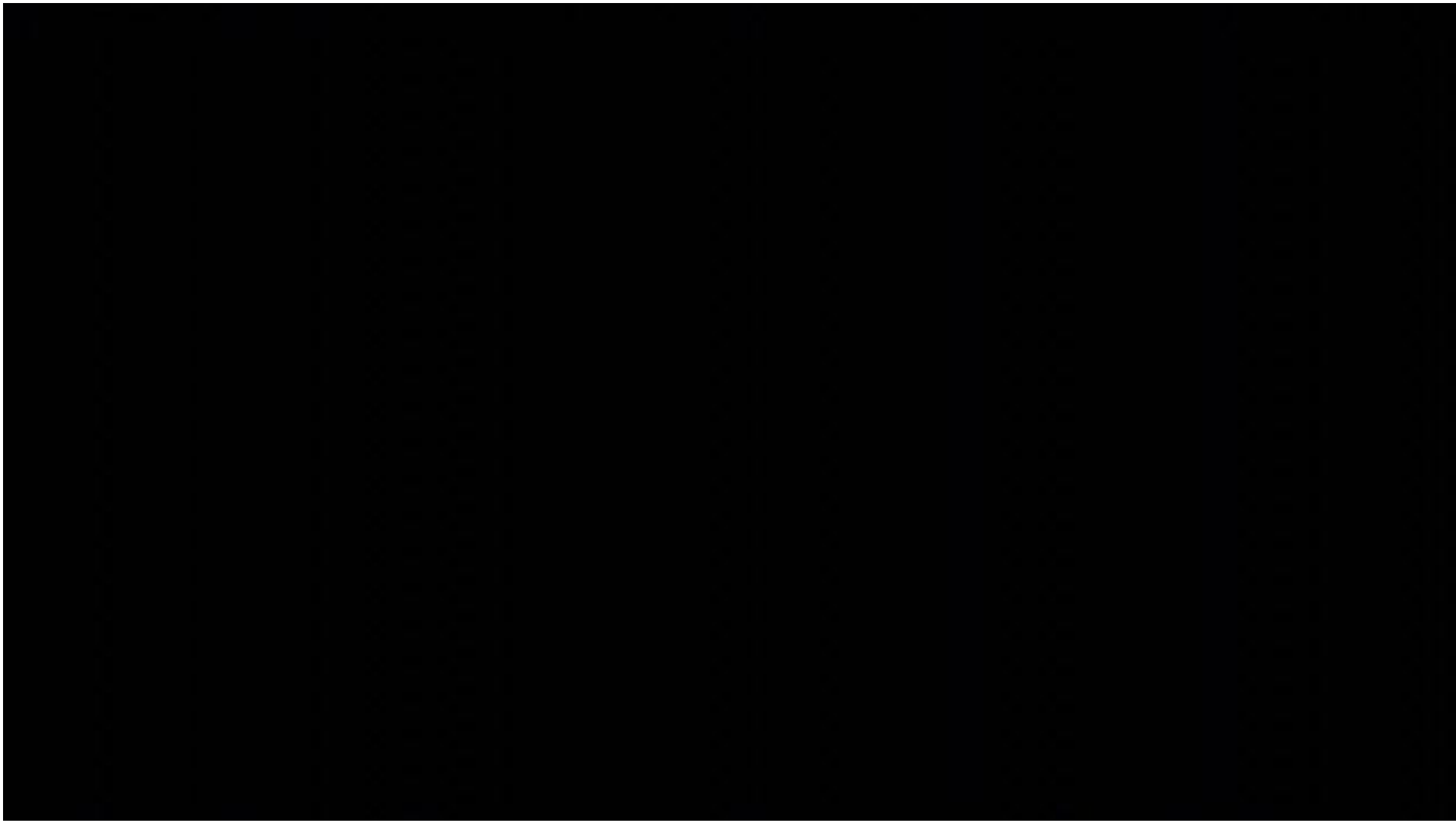


**Example:**

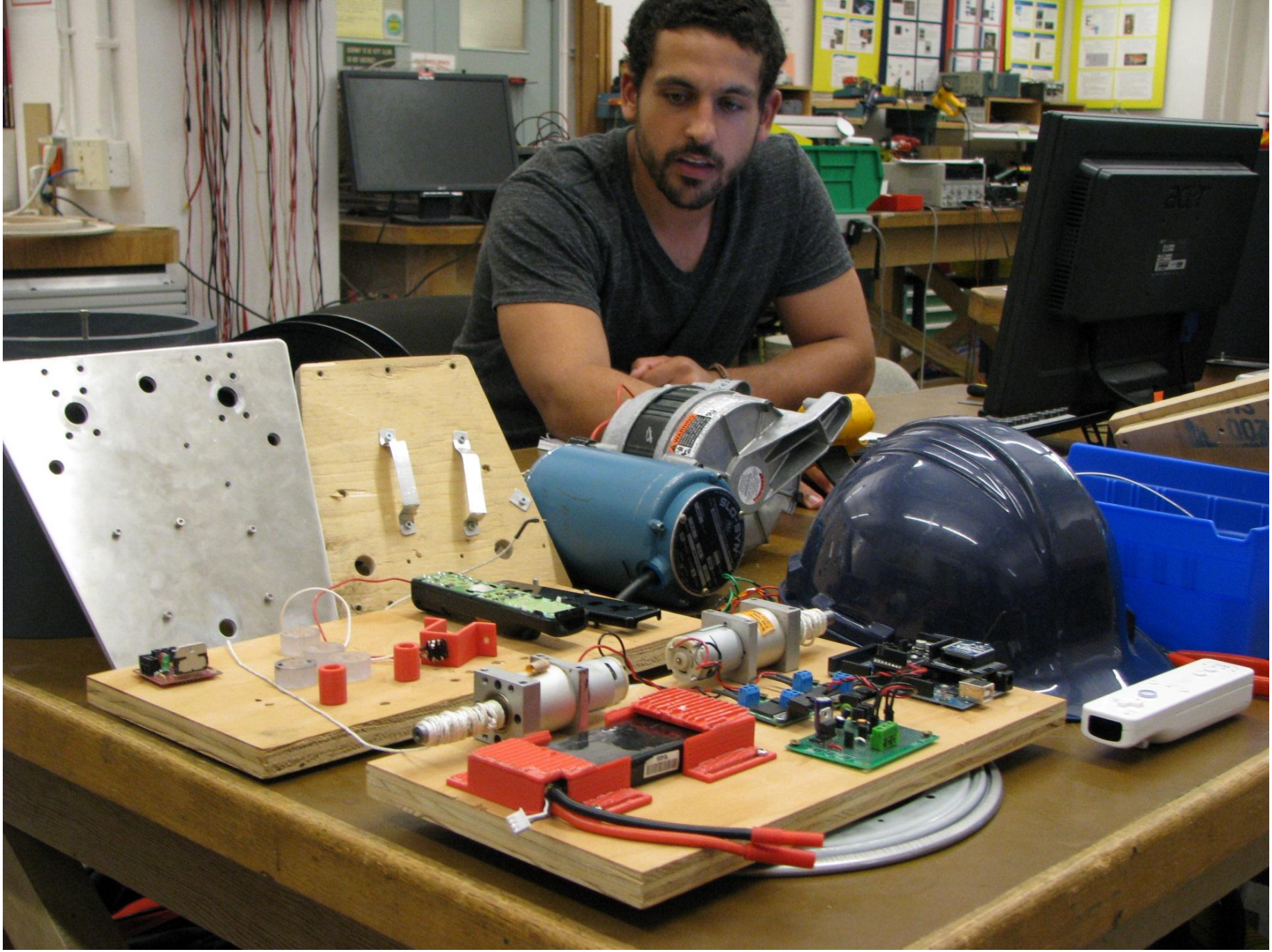
**Autonomous kite for wind power generation**

**Self-sponsored Entrepreneurial Project**

**9 academic credits + financial support**

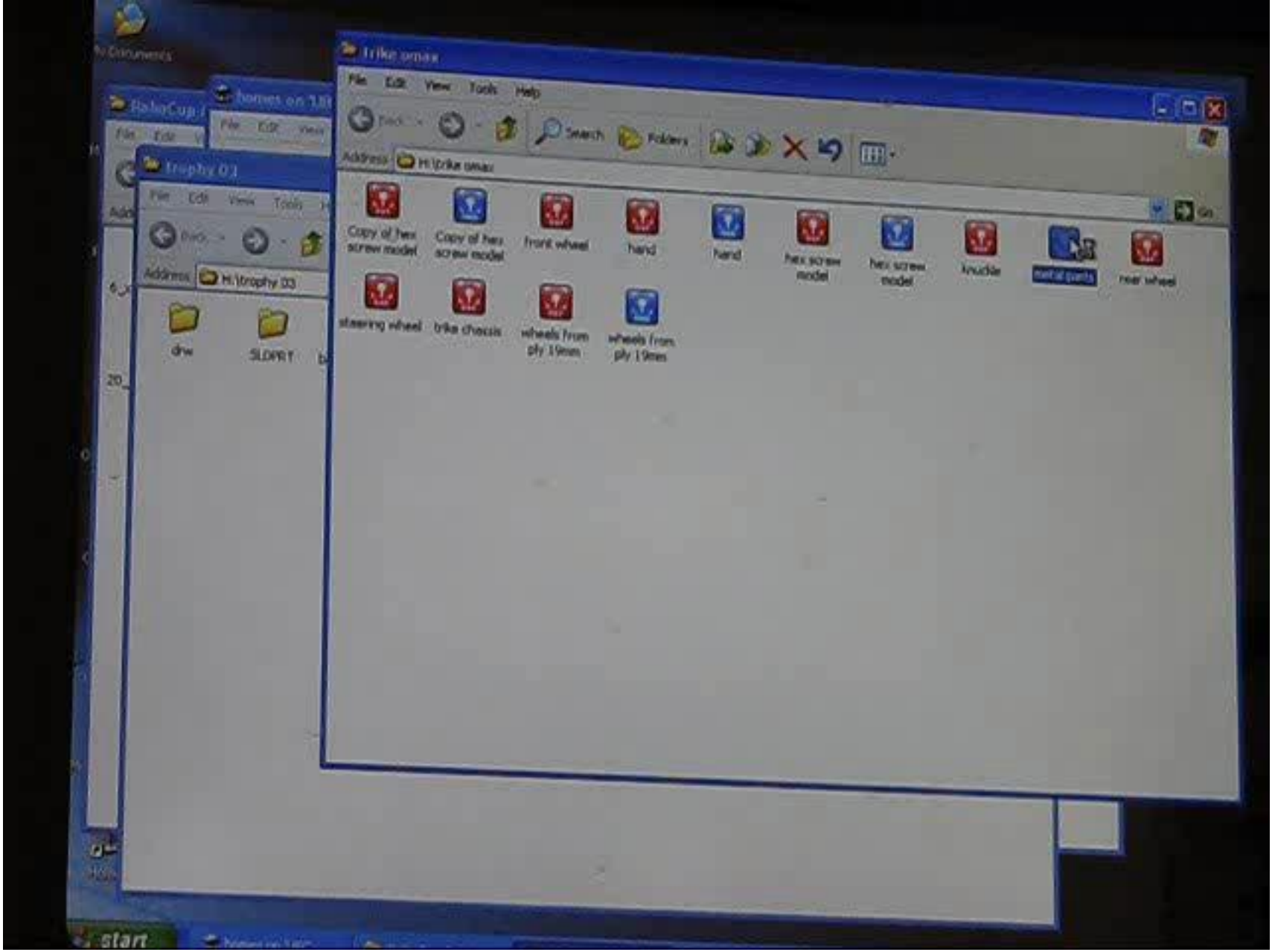


# Kite video

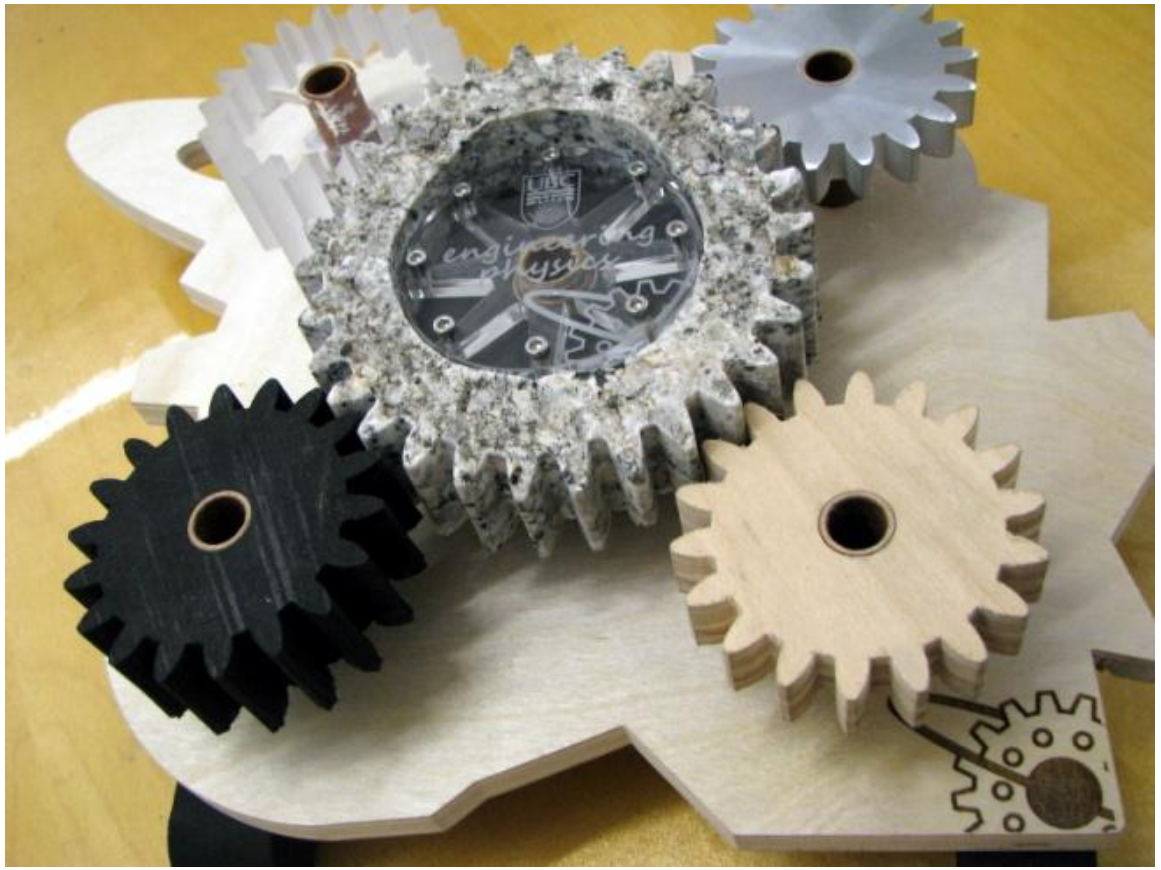


# WaterJet cutter

- Our most versatile prototyping machine
- Cuts everything



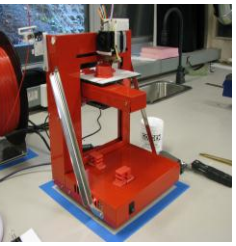

# Waterjet Cutter - video

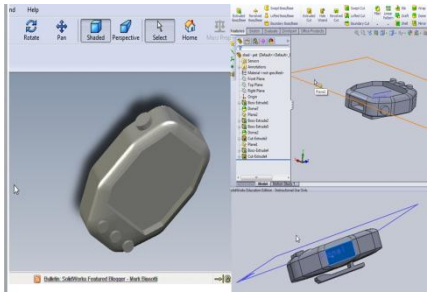


**Waterjet cutting times for different materials.**

**Gears ~12cm diameter**

| Material | Time to cut the piece (approx) |
|---|---|
| Black Plastic (Delrin) | 4 minutes |
| Aluminum | 4 minutes |
| Plexiglass (clear plastic) | 12 minutes |
| Plywood | 1 minute |
| Large Stone Gear | ~60 minutes (brittle material) |





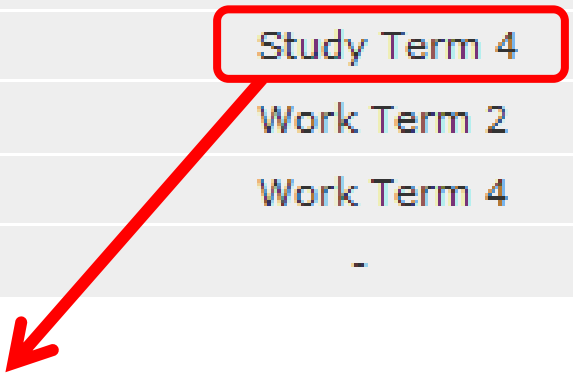
## c. List of Projects

1. [ % ] Optical fiber polishing station with real-time microscop
2. Solar Blind Extreme Ultraviolet (XUV) Detectors (Jones)
3. [ & ] Magnetic Resonance Imaging Field Stabilizer (Michal)
4. Circular Saw Vibration Frequency and Mode Shape Indicat
5. Accurate drug dosing in children (AnserminoDumontLarson
6. Five projects from Zaber (Zaber Technologies)
7. [ & ] Pan & Tilt Drop Camera (Dennison/HarveyClark)
8. Bidirectional Single Cable Power and Signal to ROV (Denn
9. ROV (Dennison/HarveyClark)
10. Inkjet micropatterning process for nanostructured field emi
11. Acoustic Imaging (Waltham)
12. [ & ] Field Test and Modify Plumbing Endoscope for Seawa
13. Development of an electric bike mapping, performance ana
14. Building acoustical-environment monitoring system (Hodgs
15. [ & ] Robotic Origami (Olson)
16. Design and construction of an instrument for 2D conductiv

**Use the tools to solve problems – e.g. a list of 80 projects from Faculty & Industry for senior EngPhys students for Sept 2012**

# 2.
# training

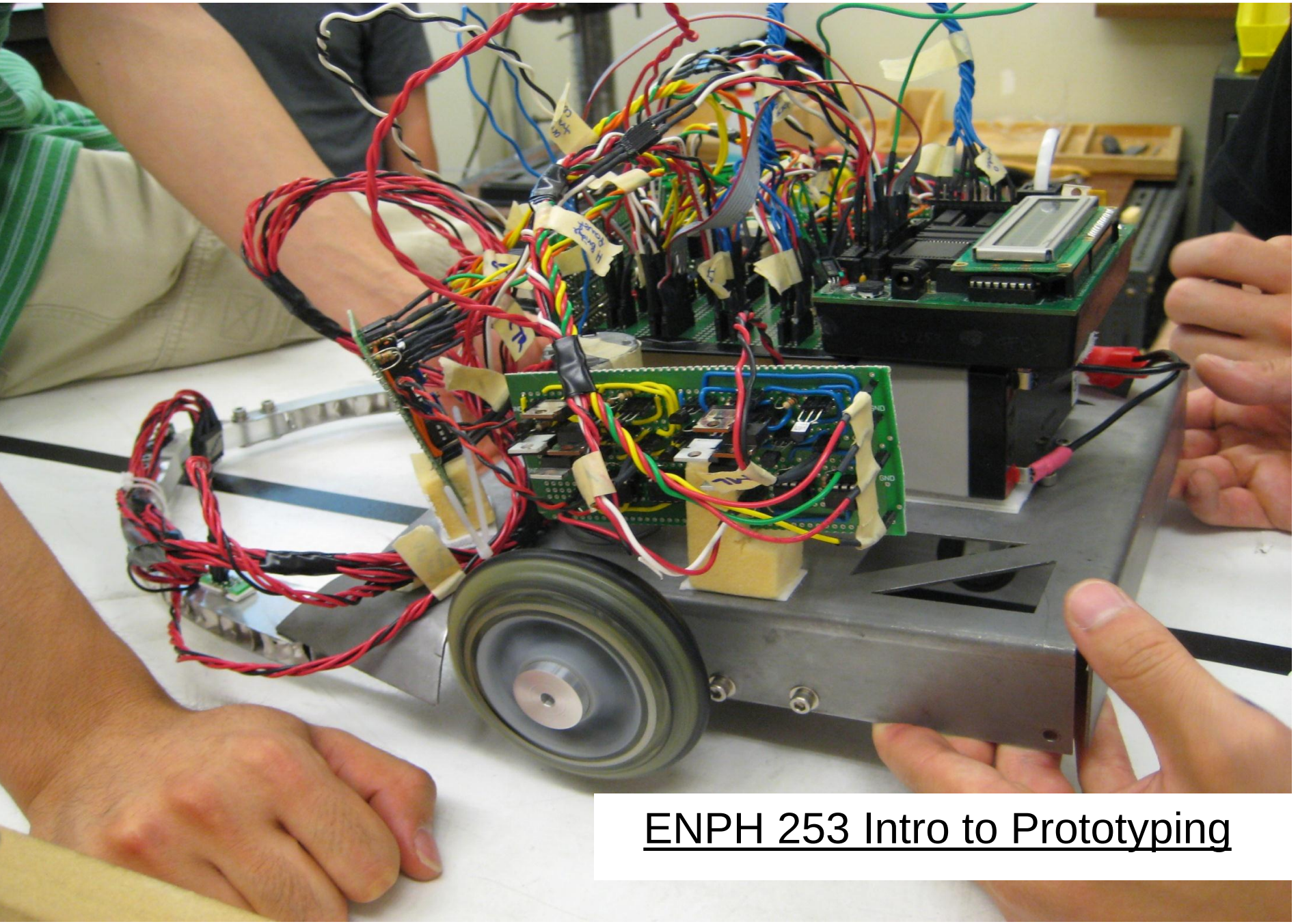
| Year | Fall | Winter | Summer |
|---|---|---|---|
| 1 | Study Term 1 | Study Term 2 | - |
| 2 | Study Term 3 | Work Term 1 | Study Term 4 |
| 3 | Study Term 5 | Study Term 6 | Work Term 2 |
| 4 | Work Term 3 | Study Term 7 | Work Term 4 |
| 5 | Study Term 8 | Study Term 9 | - |



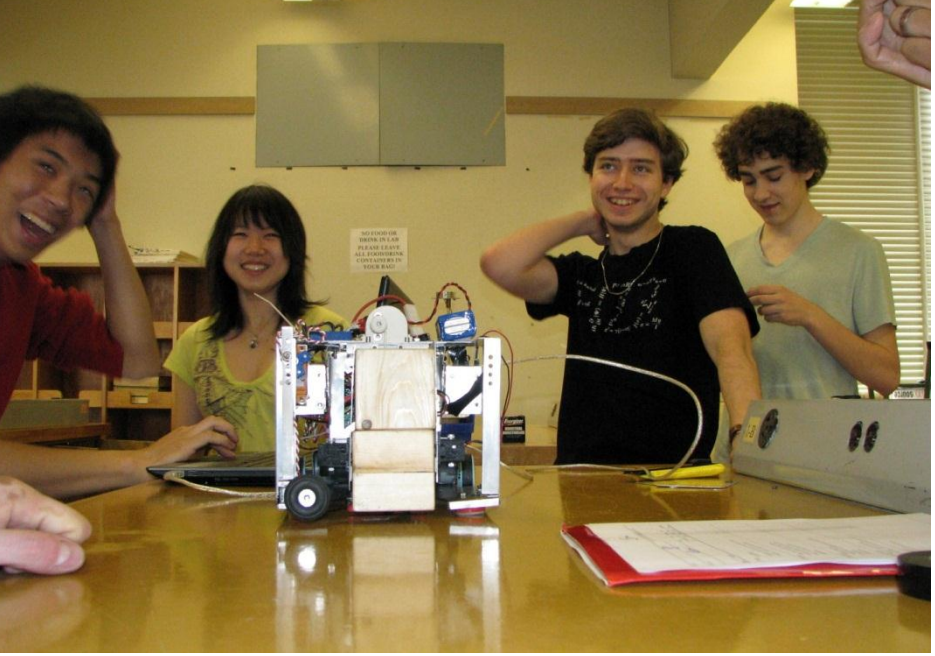
**summer term on campus**

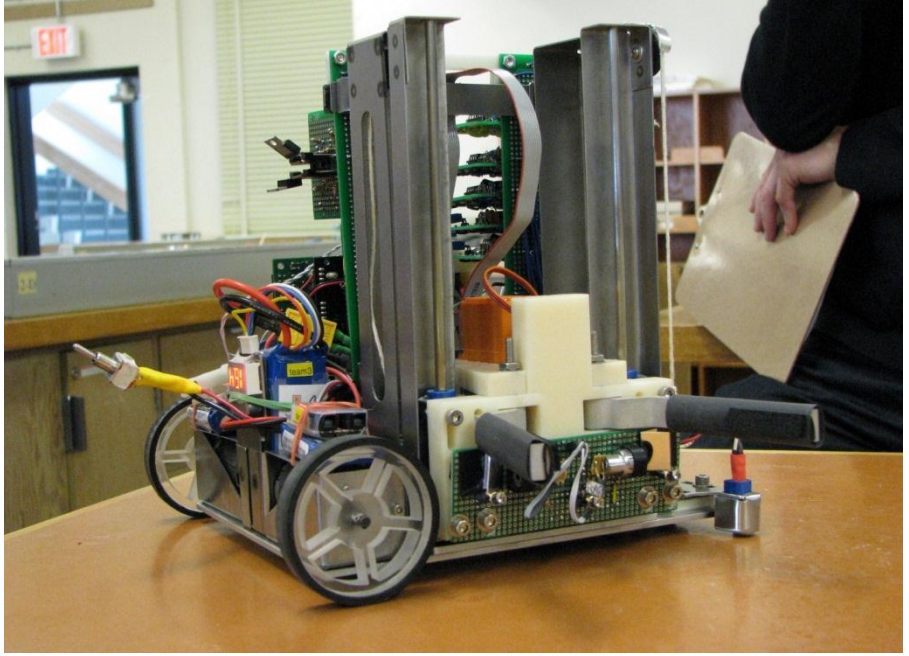
**4 academic classes + Intro to Prototyping**

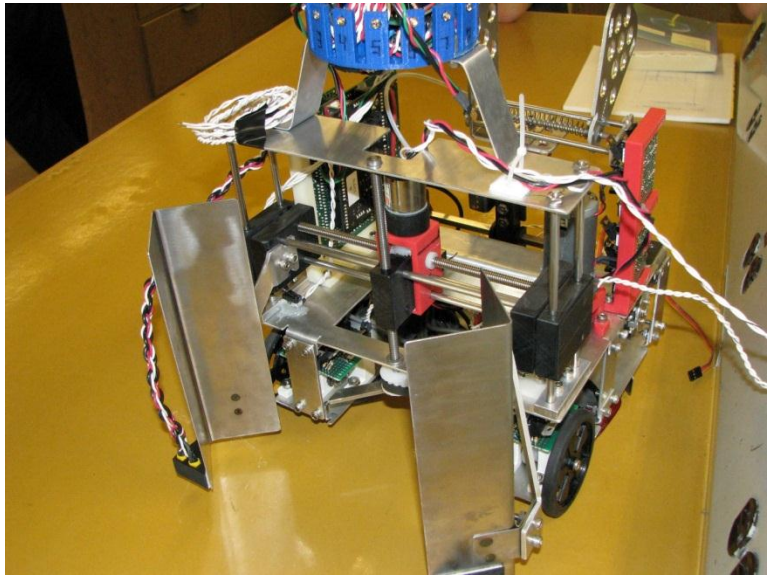
# EngPhys schedule

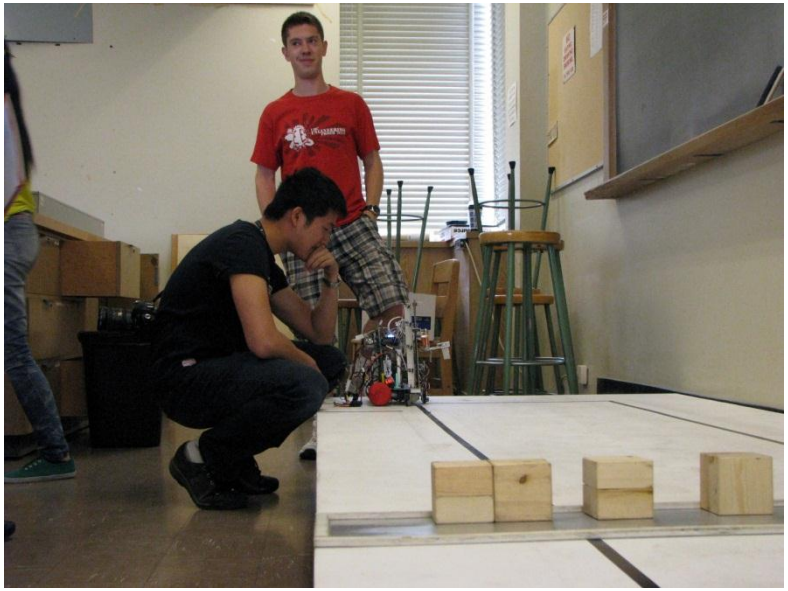


# ENPH 253 Intro to Prototyping





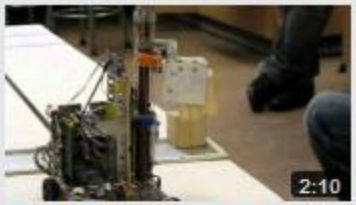





# Summer 2012 – block-stacking robots

# Block-stacking competition - video


**Hand Tool Bootcamp - our highest-rated activity.**




Block Stacking Robots
455 views | 1 month ago


assembly of the tape follower
103 views | 3 months ago


snapper to hold the TINAH b...
83 views | 3 months ago


caster - assembly with smal...
55 views | 3 months ago


caster
68 views | 3 months ago


QRD sensor holder part B
55 views | 3 months ago


QRD sensor holder part A
97 views | 3 months ago


disassembly of the tape foll...
26 views | 3 months ago


hinge A - making the right ha...
55 views | 3 months ago


making a spring
116 views | 3 months ago


how to use a battery drill
38 views | 3 months ago


knurling
109 views | 3 months ago


hinge B - making the left han...
47 views | 3 months ago

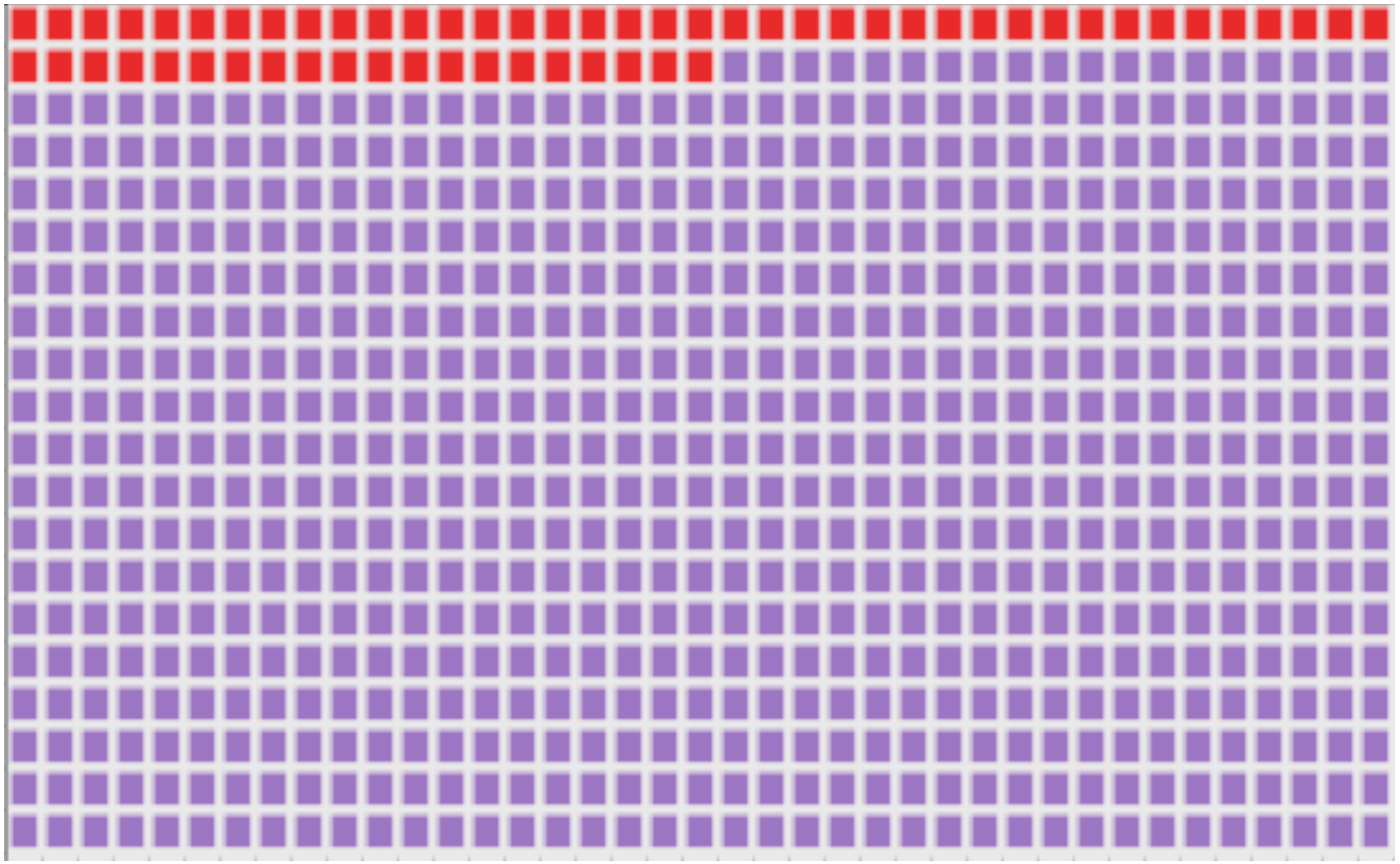

wheels - making wheels fro...
130 views | 3 months ago


wheel - drilling and assembl...
74 views | 3 months ago

# Hand Tool Bootcamp – we made lots of videos

# EngPhys = 60 students/year

## EngPhys = 60 students/year



**Can we give some of this kind of training to all 800 first-year APSC students?  Do you want it?**

**3.**

**Can we deliver this kind of training to first year students?**

**You can help us answer this question.**

1. **Find out more info about prototyping**
2. Complete the Class Survey
3. Drop by and Say Hi.

# Please google "apsc 150 prototyping"

UBC Engineering Physics Project Lab

IGEN 230 - mini-bootcamp
ENPH 253
TINAH
solidworks
Prototyping Tools
Lab Resources

Guides
ENPH 479
ENPH 459
FAQ for 459/479
ENPH 480/481
Available Projects
Project Sponsors
Awards

PHYS 350 - projects
Events and Talks
Prototyping and Electronics - (Pro-D Day 2012 Oct 19)
Prototyping - APSC 150 - 2012 Sept 20
Prototyping and Electronics - (Shad Valley, 2012 July 19)
ENPH 459 - kickoff session (2012 March 29)
2012 Engineering

Home » Events and Talks » **Prototyping – APSC 150 – 2012 Sept 20**

Welcome to UBC! Here is info about the "Prototpying" talk given to APSC 150 students in September 2012.

Download the talk here (link to come)

## 0. Examples:

Student Undergrad Projects and Sponsors

- Kirk Madison and his research in Cold Atoms
- Light Integra
- Remote Control Kite in action.
- Titanoboa vs. Mondo Spider (also see the full-length Titanoboa)

Prototyping tools

- ENPH 253 - intro to prototyping course for 2nd year Engineering Physics students.
- Videos of the Engineering Physics prototyping equipment in action – waterjet cutter, laser cutter, and 3D printer.
- Want to manufacture your drawing? You can draw up items in any CAD drawing software (like Google Sketchup or SolidWorks or Autocad ) and submit to a 3D company like Shapeways or Ponoko - get your pa
  week.

1. Find out more info about prototyping
2. **Complete the Class Survey**
3. Drop by and Say Hi.

## Sample Questions…. May lead to some test workshops this fall, next year.

**Have you ever had any experience before with electronics? mechanical making? software?** *
answer with anything remotely relevant - this can include classes, hobbies, things taught by parents and friends, etc.

**Please indicate your interest in having these workshops as part of a first-year experience.** *
Please try to rank no more than 3 or 4 as "highly interested", to help see which activities are most highly regarded by most people..

| | 1 - highly interested | 2 | 3 - neutral | 4 | 5 - low interest |
|---|---|---|---|---|---|
| Mech - using hand tools | ○ | ○ | ○ | ○ | ○ |
| Mech - using automated tools (waterjet/laser/3D printer) | ○ | ○ | ○ | ○ | ○ |
| Mech - product tear-downs (examining existing products) | ○ | ○ | ○ | ○ | ○ |
| Elec - basic electronics (transistors, motors) | ○ | ○ | ○ | ○ | ○ |
| Elec - microcontroller programming (i.e. arduinos) | ○ | ○ | ○ | ○ | ○ |
| Elec - soldering and circuit board assembly | ○ | ○ | ○ | ○ | ○ |
| Software - software for android/iphone apps | ○ | ○ | ○ | ○ | ○ |
| Software - visual and graphing tools (opencv, opengl, processing) | ○ | ○ | ○ | ○ | ○ |
| Software - engineering tools (matlab, python, labview) | ○ | ○ | ○ | ○ | ○ |
| Software - CAD tools (solidworks) | ○ | ○ | ○ | ○ | ○ |

1. Find out more info about prototyping
2. Complete the Class Survey
3. **Drop by and Say Hi.**

**Hennings Building**
**Room 115**

**EngPhys Project Lab**

**Door is usually open.**

**Say hi to anyone there.**

You can always ask me anything.

—

Jon Nakane
Lab Director, UBC Engineering Physics Project Lab
jnakane@physics.ubc.ca

End.