# 2016 Hacking Course Ideas

## Course Names

* Coding the physical world.
* Computing with junk
* Tangible/digital bits

## Overview

This course will introduce students to the process of product development afforded by the new generation of single-board computers and prototyping boards that have become available. Students will design a smart hardware device using Raspberry Pi computers, Arduino microcontrollers, sensors, and servos as the computing core of their designs. They will create prototypes of their devices in maker-space style labs, where they will rapidly sketch in hardware using upcycled cardboard and other scavenged materials. Their designs will bring computing power to bear on everyday problems like fitness, health, home-automation, and emphasise the power of the maker to create new forms of artistic expression and entertainment.

*Maybe make more of the "junk" aspect?*

## Educational Outcomes

* Produce designs for physical computing devices including sensors, actuators, and internet connectivity.
* Produce software for microcontrollers and single-board Linux computers to control their device and connect to web-based services.
* Produce basic circuits to connect sensors and actuators to microcontrollers using breadboards or prototyping hardware.
* Produce physical prototypes of devices using upcycled materials.
* Iteratively evaluate and refine prototype devices through a user-centred design process.

## ACM/IEEE Bodies of Knowledge

### Core

* Systems (integrating hardware, software, network connectivity)
* Software Engineering (requirements gathering, stakeholder engagement, continuous evaluation & delivery)

### Electives

* HCI/New Interactive Technologies
* HCI/Design-oriented HCI
* HCI/Mixed, Augmented & Virtual Reality
* PBD/Mobile Platforms
* PBD/Cloud (maybe spin up an AWS EC2 instance to talk to)

## Course Outline

## Inspirational Project Ideas

* Controllers and Computing
  + [OneHand 20% Chording Keyboard](http://deskthority.net/workshop-f7/onehand-20-keyboard-t6617-120.html)
  + [Arduino Controlled Apple 1 Replica Computer](http://dave.cheney.net/2014/12/26/make-your-own-apple-1-replica)
* Health
  + [Multi-sensor data recorder](https://hackaday.io/project/1395-open-source-science-tricorder)
* Fitness
  + [Jacket/backpack-mounted LED display for cyclists/runners](http://www.wired.com/2010/09/cyclists-backpack-shows-led-turn-signals/)
* Art
  + [Button Grid Music Controller](http://flipmu.com/work/arduinome/)
  + [Programmable Effects Pedal](http://hackaday.com/2012/11/30/guitar-foot-controller-uses-dsp-for-audio-effects/)
  + [Hackable Digital Synthesiser](https://ccrma.stanford.edu/~eberdahl/Papers/NIME2014EmbeddedAcousticInstruments.pdf)
  + [Sound and Light Trail Makers](https://hackaday.io/project/157-center-flee)
* Bikes
* Environment
  + [Raspberry Pi night-vision camera](http://www.mcmelectronics.com/product/RASPBERRY-PI-/28-18030)
  + [Raspberry Pi baby monitor](https://www.raspberrypi.org/products/camera-module/)
* Fun
  + [Portable Games Console](https://youtu.be/zrEj1aQRbpw)
  + [Cuddly Companion Robot](http://www.nickstedman.com/art/adb.html)
* Home Automation
  + Home RGB Lighting System

## Hardware kits

Each student should have a kit available for experiments in labs and product designs.

### Raspberry Pi

Test budget for one student:

* Raspberry Pi A+ 256MB - 27.78
* PSU - 15.65
* Adafruit GPIO breakout 9.89
* WiFi module - 14.57
* Servo - 12.14
* Stepper/DC motor HAT - 22.50