

# **CST8227**

# **INTERFACING**

**Introduction**

## Instructor Contact Info.

- Instructor: Gerry Hurdle
- Office: T building, Room 316 (T316)
- Email: [hurdleg@algonquincollege.com](mailto:hurdleg@algonquincollege.com)
- Phone: 727-4723, ext. 5942
- Office Hours: See “Course Section Information” in Brightspace. By appointment.

## Course Schedule

### Lecture / Lab:

Mondays, 5:30PM – 8:50PM room B185

Tuesdays, 6:30PM – 8:30PM, room B185



# Agenda: Introduction

- Administrative Details:
  - Course Outline.
  - Lab #1 – finish this week
  - Lab #2 – start demonstrating this week.
- Course Hardware:
  - Teensy 3.2 USB development board + electronic parts .
  - A multimeter is not provided but having one would be extremely useful.
  - Wire cutters are not provided but are extremely useful.
  - Pre-cut jumper wires (available from Active ~\$20) are also not provided [or necessary], but have proven to be convenient.
- Course Software:
  - Arduino
    - Arduino IDE (free download).
    - Teensyduino add-on (free download)
  - Android
    - Android SDK (free download)
  - Circuit design
    - Fritzing (free download – used for breadboard layout, PCB design)



# Important Dates

- **Holidays:**
  - Thanksgiving (Oct. 8<sup>th</sup>)
- **Tests & Final Exam:**
  - Midterm Test, Week 8 – in the regular theory class period.
  - Lab Test: Week 14 in the ***theory*** class.
  - Final Exam, Week 15.



# Course Learning Objectives

- To provide a solid understanding of fundamental interfacing concepts
- To increase your knowledge and skill of actual interface devices, using discrete components, modular (sub-)assemblies (i.e. Teensy board), and complete systems (i.e. smart phone)
- To do some fun lab work, putting together the knowledge you've acquired during the previous semesters in the program.



# Motivation for experimenting with microcontrollers?

- Basically every electronic gadget has one – game consoles, cell phones, car electronics, etc.....
- They are fun....you can do cool stuff like the laser harp:  
<http://www.youtube.com/watch?v=sLVXmsbVwUs>
- Smartphones have a lot of useful sensors for microcontroller projects.
  - light sensor
  - Temperature sensor
  - proximity sensor
  - aGPS (assisted gps)
  - compass/magnetometer
  - Accelerometer
  - orientation sensor
- There are a ton of websites with tutorials and projects supported by a huge group of very motivated and willing to teach people.

# Hardware, Weeks 1 - 10:

- Teensyduino microcontroller.
- We will be “interfacing” to a variety of sensors and actuators.
- Write code using the Arduino programming language (if you know java, you know Arduino programming language).
- This is an excellent prelude to weeks 11-13 where we will be learning how to program an Android device.



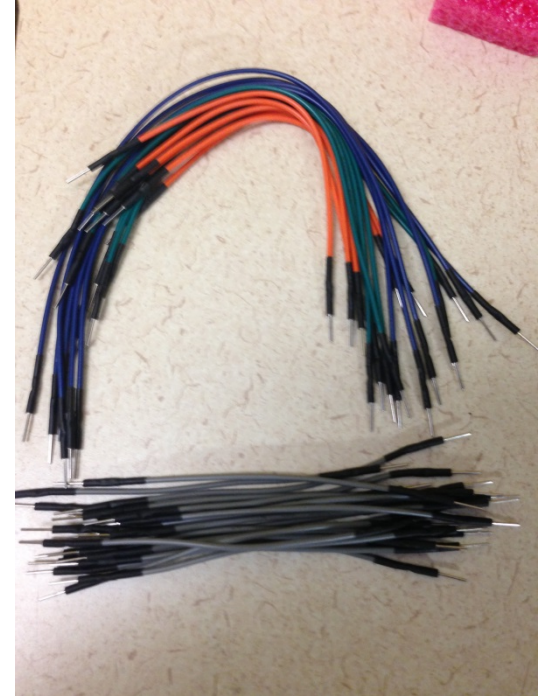
# Other useful Tools



Wire cutters



Multimeter



Pre-cut jumper wires





# Android Weeks 11-13:

- Learn to program the Android phone.
- Don't need an actual Android to do this – a phone can be emulated using a variety of software (Android SDK, Virtual Box, (possibly) Eclipse).
- <https://developer.android.com/training/basics/firstapp/>



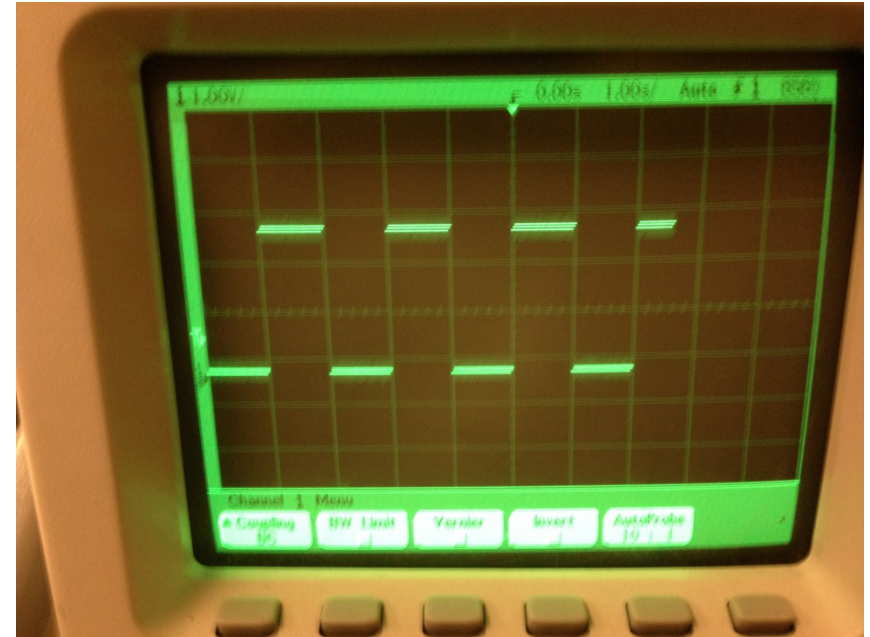
# Teensyduino (Arduino) Basics

- Arduino programs are called ***sketches***. The concept is that they are a quick implementation of an idea, in order to make is easy to test and refine new ideas.



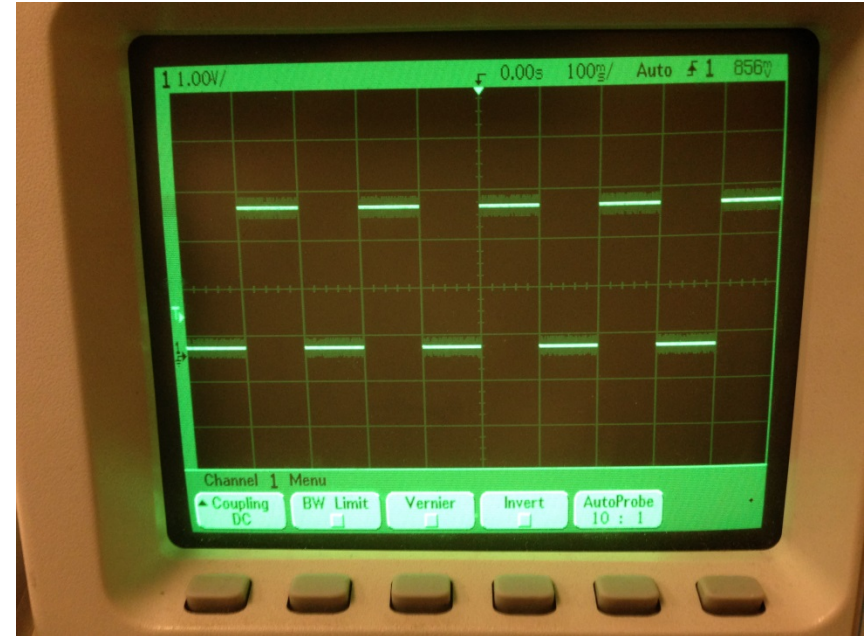
# Oscilloscope, Blink, delay = 1000 ms

- See videos in Brighspace

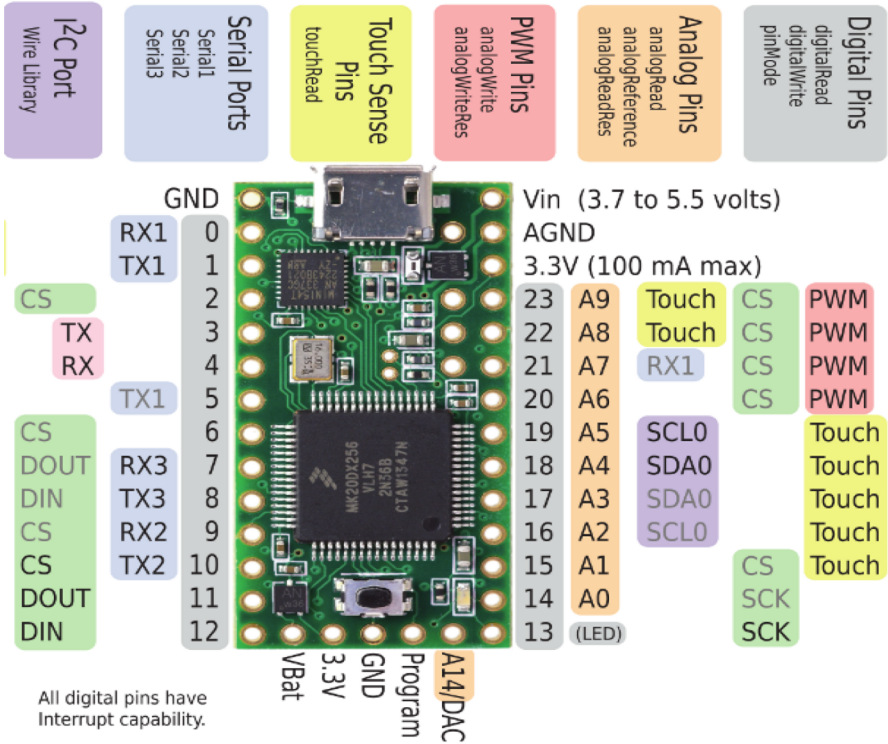
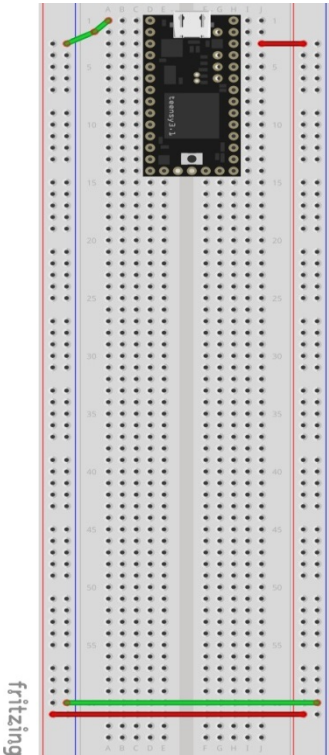


# Oscilloscope Blink, delay = 100 ms

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# Prelab #2 Schematic



# How to destroy the Teensy (or other microcontroller)

1. Shorting I/O Pins to Ground
2. Shorting I/O Pins to Each Other
3. Apply Overvoltage to I/O Pins
4. Apply External Vin Power Backwards
5. Apply >5V to the 5V Connector Pin
6. Apply >3.3V to the 3.3V Connector Pin
7. Short Vin to GND
8. Apply 5V External Power with Vin Load
9. Apply >13V to Reset Pin
10. Exceed Total Microcontroller Current