

## Electronics – what we'll study/do winter 2019

### 1. Digital Logic Elements/Gates

- a. NOT, OR, AND, XOR, etc

### 2. Memory devices

- a. Latch and Flip-flop
- b. RAM, ROM
- c. Flash

### 3. Computer arithmetic

- a. Shift register, Clock Speed, Edge Triggering
- b. Adders
- c. Counters

### 4. Data protocols

- a. [SPI](#)
- b. [I2C](#)
- c. Serial/[UART](#)

### 5. Sensors/actuators and theory of operation

- a. Servo Motors
- b. Pressure sensors
- c. Accelerometers/IMU
- d. Etc

### 6. Microcontrollers/Integrated Devices

- a. Specs: CPU speed, power consumption, peripherals, ADC, DIO, etc.
- b. Tradeoffs/how to choose a device
  - i. [Arduino](#)
  - ii. [Teensy](#)
  - iii. [Particle](#)
  - iv. [ESP32](#)
  - v. [Raspberry Pi](#)

### 7. Wireless Devices and Protocols

- a. [Bluetooth](#)
- b. Wifi
- c. [XBee](#)
- d. LoRa

### 8. Practical Stuff

- a. Eagle schematic and PCB layout
- b. Mechanical assembly/considerations

**9. Project Ideas (you'll have about 8-10 weeks to work on yours!)**

- a. Geology pressure sensor (w/ Prof. Dave Harbor)
- b. Electrical Impedance Tomography (EIT)
  - i. <https://github.com/OpenEIT>
  - ii. <http://www.chrisharrison.net/index.php/Research/Tomo>
- c. [Water quality sensor](#) for low-resource setting
- d. Engineering World Health: [Projects that Matter](#) and [Research and Development](#)
- e. Particle and SparkFun Blog/Projects:
  - i. [SmartFin](#)
  - ii. [Tiny House/Environmental Monitoring](#)
  - iii. [Hawai'i Island Vog Network](#)
  - iv. [Casper](#)
  - v. [SimpleSense](#)
  - vi. [SafeTransport](#)
  - vii. [Worthwhile](#)
  - viii. [Shifted Energy](#)
- f. Data compression + [Intan GI sensing system](#)
- g. Your ideas?!