## WEEK 1

## BREAKING BEFORE MAKING

### Learning Objectives

- Understand the potential applications of digital fabrication
- Use basic tools to disassemble, inspect, and recognize the basic components of an electronic smart device and understand their function
- Understand the basics principles of Agile Project Management and apply them using GitLab

## WEEK 2

## DESIGNING THINGS FOR FABRICATION

### Learning Objective

- Apply design techniques of screw and nut joints and snap-fit joints within product enclosures for the purpose of manufacturing using Laser Cutting and 3D Printing
- Apply design techniques of product enclosures for manufacturing using mixed fabrication techniques (Laser Cutting AND 3D Printing)
- Apply design techniques for mounts of electrical components in 3D printed and Laser Cut enclosure

## WEEK 3

## MAKING ELECTRONICS USING MACHINES

### Learning Objectives

- Understand the basic structure of a microcontroller board
- Utilize Autodesk Eagle to design through-hole and SMD Printed Circuit Boards
- Understand and apply techniques for soldering through-hole and SMD components
- Prepare PCB design files and fabricate them using PCB Milling Machine

WEEK 4

## MAKING THINGS TALK TO THINGS

### Learning Objectives

- Utilize UART and I2C protocols to send messages between a master microcontroller and a slave microcontroller at a defined address
- Utilize SPI protocol to send messages between at least two microcontrollers interchangeably

WEEK 5

## MAKING I/O HARDWARE

### Learning Objectives

- Understand and use the Op-amp for the purpose of converting analog signals into digital signals
- Understand and use the MOSFET in order to drive high power components
- Understand and use multiplexers and shift registers to expand the inputs and outputs of microcontrollers

WEEK 8

## PHYSICAL COMPUTING USING BIG BRAINS

### Learning Objectives

- Understand and use the Raspberry Pi board GPIO pins physically, including I/O pins and power pins
- Understand how to power the Raspberry pi board
- Understand Linux operating system basics
- Understand and Use GPIO pins from Python as a programming language
- Understand and Use GPIO pins from Processing as an alternative programming tool

WEEK 9

# MAKING THINGS FOR HUMANS

## Learning Objectives

- Experience the design thinking process first hand and understand the basic aspects of human-centered design
- Conduct empathy interviews with users
- Analyze user data using empathy maps
- Write a focused problem statement
- Generate innovative ideas for solutions using ideation techniques
- Prototype and test a Low-fidelity prototype and user experience

WEEK 10

# MAKING ARTIFICIALLY INTELLIGENT THINGS

## Learning Objectives

- Understand and apply basic image processing techniques using Python Programming Language
- Use OpenCV library and Haar Cascade Classifiers for the purpose of performing object detection, localization, and tracking
- Use Raspberry Pi to process images and track objects for the purpose of controlling the action on an actuator