IEEE’s
Hands on Practical Electronics (HOPE)

Lesson 1: Safety, Soldering, Terminology
Course Information

• This is the IEEE Hands on Practical Electronics (HOPE) decal
• EE98/198
• Day/Time: Wed 8-10P
• Website: ieee.berkeley.edu/hope
  – Lectures and labs will be posted each week
This Week

• The goal of today’s lesson is to become familiar with some basic EE components and tools

• We will talk about circuits and learn to solder
Tools

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<tr>
<th>Soldering Iron</th>
<th>Digital Multimeters</th>
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<tbody>
<tr>
<td>Hot, hot, hot!</td>
<td>Measures various values – voltage, current, resistance, etc.</td>
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<tr>
<td>Forms “permanent” connections in a circuit</td>
<td>Easy to read display and accurate reading measurements</td>
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Soldering Iron

• Cold heat soldering iron
  – Used for instructional and safety purposes
  – They are safe but clumsy.
  – Batteries die quickly so you may need to change them before you start.

• Regular soldering iron
  – Used by professionals (like us!)
  – Seriously, these things get hot. Be careful not to burn yourself.
Soldering

• Repairing damaged circuits requires soldering the broken leads together

ESG Soldering Tutorial
Soldering

• To solder, we need:
  – Soldering iron
  – Solder
• An alloy made of lead and tin. It is used to provide a path for the current to flow between two components.
• Recently, solder was required to be lead-free and other replacement soldering alloys are being researched.
• See: http://en.wikipedia.org/wiki/Solder#Lead-free_solder

• Before soldering
  – First lay out the circuit on the board
  – Twist tie the components together to make sure it works
Soldering

• To use the soldering irons
  – Touch the hot iron to the joint
  – Touch the solder to the heated joint (not to the actual iron!)

• Tip: Solder under the breadboard to avoid messy connections
More Soldering
Soldering Usage

• Soldering is used to assemble circuits
• It is an alternative to welding. Plumbing pipes can also be soldered together
• Solder provides a nearly permanent, but reversible connection
Soldering Usage

• Soldering is also used for small things such as:
  – Jewelry
  – Stained Glass
Digital Multimeter (DMM)

- Combination of
  - Ammeter: measures current
  - Voltmeter: measures voltage
  - Ohmmeter: measures resistance

- We will go into more detail on how to use multimeters next week
DMM Usage

• A Digital Multimeter is a measurement device commonly used as a diagnostic tool.
• Fancier multimeters can measure more quantities such as frequency, temperature, conductance, inductance, capacitance and so on.
LED Introduction

• LED = Light Emitting Diode
• Lights up when current flows through it
• LED’s only allow current to go through it in one direction

Current Flows

LED’s have 1 lead that is longer than the other. The longer lead is the positive side. Current flows from the longer lead to the shorter lead.
LED Usage

- Will be discussed further in a future lecture
- Used to generate light (hence the light emitting part)
  - More efficient than incandescent bulbs!
  - Difficult to break by dropping. (try that with a light bulb)
- Used anywhere where they need to generate light
  - Bike lights
  - Car brake lights