Gateway To Space

ASEN 1400

Class #05

Colorado Space Grant Consortium
Today:

- Announcements
- Next Time
- Soldering 101
- HW 4 Assigned
Announcements:

- Spatial Visualization workshops begin this week

- Tuesday or Thursday from 5 to 7 PM in ITLL

- Next 4 weeks

- Retake test at end

- Jacob Segil = jacob.segil@colorado.edu
Announcements:

- Lego Drop Winners…
  - 2nd Place = Revenge of the 6th
    404 grams
  - 1st Place = Team 7 – The Biebers
    267 grams
Announcements:

- Everyone submits HW 4 via email but it is a team HW

- Bring everything built and done in HW 4 to next class

- Success of class on FEB 2 depends on teams doing HW4
Announcements:

- Bring everything built and done in HW 4 to class FEB 2
Announcements:

- Bring everything built and done in HW 4 to class FEB 2
- DO NOT TRIM LEADS OF HEADERS
Announcements:

- Bring everything built and done in HW 4 to class FEB 2
Announcements:

- Bring everything built and done in HW 4 to class FEB 9
Announcements:

- Bring everything built and done in HW 4 to class FEB 9
Announcements:

- Before you leave today, each team will take: 

1

1

<table>
<thead>
<tr>
<th>Soldering Kit Contents</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soldering Iron</td>
<td>1</td>
</tr>
<tr>
<td>Soldering Stand</td>
<td>1</td>
</tr>
<tr>
<td>Wire Stripper</td>
<td>1</td>
</tr>
<tr>
<td>Wire Cutters</td>
<td>1</td>
</tr>
<tr>
<td>Pliers</td>
<td>1</td>
</tr>
<tr>
<td>Screwdriver</td>
<td>1</td>
</tr>
<tr>
<td>Solder Wick</td>
<td>1</td>
</tr>
<tr>
<td>Solder</td>
<td>1</td>
</tr>
</tbody>
</table>
Announcements:

- Before you leave *today*, each team will take:
Announcements:

- Before you leave today, each team will take:
Announcements:

- Before you leave today, each team will take: 2
Thursday...

**Arduinos – Part 1**
Please be early to help setup

**Bring HW #4 hardware and Laptops (2 per team)**
Next Tuesday...

Conceptual Design Review

Presentations due at 7 AM

Class starts at 9:20 AM
Next Thursday...

**Arduinos – Part 2**
Please be early to help setup

**Bring HW #4 and #5 hardware and Laptops (2 per team)**

Colorado Space Grant Consortium
Hands-on: Soldering

This is a difficult class to conduct with the number of students

Be quiet and patient with me and your team and yourself

Not everyone will enjoy this experience (95% will)

Not all these kits will work so don’t be discouraged

This is the Dean’s prized conference room so...
Hands-on: Soldering

When completed…

- Help other team members
- Start cleaning up
- Complete 1 minute reports
- Push chairs in
Soldering:
Soldering

PCB – Printed Circuit Boards

Top View

Side View

Circuit Board

Resistor

Solder Pads
Iron is only there for heat – to heat the board and part
Move soldering iron until tip is touching wire & solder pad

Iron is only there for heat – to heat the board and part
Move solder to touch edge of tip

Solder

Solder will go where the heat is
Hold until solder melts on tip by resistor lead

Iron is on the board/pad
Move solder back to touch resistor lead only
Move solder to form a small pocket/blob

Solder
Move soldering iron tip up dragging the solder with it
Remove solder and then iron leaving nice shiny fillets (Hershey kisses)
Soldering:
Soldering:

- How much solder?

- Cold Solder Joints (CSJs)
TIPS:

- Use caution when clipping leads to avoid flinging metal across the room
- Please put clipped leads in the trash not the floor
Soldered

Solder bridge shorting two traces or pads

But, can be fixed by reheating or using solder sucker
Soldering:

- Easy to add solder or re-melt vs. remove it
- Tin the tip of the soldering iron by melting an inch or so of solder on the tip
- The iron will now look shiny on the tip
- Then wipe any excess solder on the golden sponge.
Safety:

- Soldering is dangerous if not respected

- Be mindful of where you are and where the soldering iron is

- Eyes and liquid solder – everyone shall wear safety glasses

- Everyone is expected to solder

- If you get burned…

- LEAD – Wash Hands
Hands-on: Soldering

- Get into your teams

- Each person on the team will solder their own circuit but will have to share resources

- I will guide you and the rest of the class through the 24 steps

- Turn your soldering irons on

- Don’t work ahead…
**Hands-on: Soldering**

**Step 1:** Distribute solder kits among team

You will have to share the soldering stations

Help each other learn the techniques

Throw out instructions
Hands-on: Soldering

Step 2: Layout kit
Hands-on: Soldering

Step 3: Look at board, find reference point

Install Side
Hands-on: Soldering

Step 4: Look at board, find reference point

Solder Side
Step 5: Flip board over and solder 8 pin socket
Hands-on: Soldering

Step 6: Flip board over and bend chip leads out
DO NOT SOLDER AT THIS TIME
Hands-on: Soldering

Resistors...

What is a resistor?

In the event that your resistors get mixed, please refer to the chart at the left to classify your resistors, or use your multimeter.

If you are unsure, don’t hesitate to raise your hand and ask for assistance.
Hands-on: Soldering

Step 7: Install 120 kΩ resistor (Brown, Red, Yellow)
Hands-on: Soldering

Step 8: Install 33 kΩ resistor (Orange, Orange, Orange)
Step 9: Verify resistors

120 kΩ Brown, Red, Yellow

33 kΩ Orange, Orange, Orange
Hands-on: Soldering

Step 10: Flip board over

Step 11: Solder Resistors

- 33 kΩ
  Orange, Orange, Orange

- 120 kΩ
  Brown, Red, Yellow
Step 12: Inspect solder joints and trim leads
Step 13: Flip board over and install capacitor

Gray strip indicates “negative” lead

“-” Lead
Hands-on: Soldering

Step 14: Verify capacitor is installed correctly

“-” Lead
Hands-on: Soldering

Step 15: Flip over board and solder capacitor

“-” Lead
Step 16: Verify solder joint and clip leads
Hands-on: Soldering

Step 17: Install YELLOW LED

Negative Lead
Hands-on: Soldering

Step 18: Install GREEN or RED LED
Step 19: Flip board over and solder LED leads
Hands-on: Soldering

Step 20: Solder socket to board. Go slow

Verify solder joints and check for solder bridges
Step 21: Install the chip

Hands-on: Soldering

Small circle placed over pin hole "1"
Hands-on: Soldering

Step 21: Install the chip

Small circle placed over pin hole “1”
Hands-on: Soldering

Step 22: Install 9V battery clip to board
Hands-on: Soldering

Step 23: Flip board over and solder battery leads
Hands-on: Soldering

Step 24: Attach test battery and watch what you made.

NOTE: If it doesn’t work, detach battery immediately and have it inspected.
Hands-on: Soldering

When completed…

- Help other team members
- Start cleaning up
- Complete 1 minute reports