Gateway To Space

ASEN 1400 / ASTR 2500

Class #06

Colorado Space Grant Consortium
Today:

- Announcements

- Next Time

- Soldering 101

- HW 03 DUE

- HW 04 Assigned
Announcements:

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

- Bring everything built and done in HW 4 to class FEB 05
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- Before you leave class today, each team will take one of the following:

<table>
<thead>
<tr>
<th>Item</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 Strippers</td>
<td>1</td>
</tr>
<tr>
<td>Wire Cutters</td>
<td>1</td>
</tr>
<tr>
<td>Pliers</td>
<td>1</td>
</tr>
<tr>
<td>Screw driver</td>
<td>1</td>
</tr>
<tr>
<td>Solder Wick</td>
<td>1</td>
</tr>
<tr>
<td>Solder</td>
<td></td>
</tr>
</tbody>
</table>
Announcements:

- Before you leave class today, each team will take one of the following:
Announcements:

- Before you leave class today, each team will take **two** of the following:
Announcements:

- Before you leave class today, each team will take one of the following:
Next Tuesday...

Conceptual Design Reviews
“Elevator Pitch”

Presentations due 7:00 AM
02-03-15

Template on the website

Colorado Space Grant Consortium
Next Thursday...

**Arduinos**
Please be early to help setup

**DLC 1B70**
Bring HW #4 hardware and Laptops (2 per team)
HW #03 and #04 DUE

Colorado Space Grant Consortium
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:
Soldering

Solder Pads

Top View

Side View

Circuit Board

Resistor

PCB – printed circuit boards
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.

Iron is only there for heat – to heat the board and part.
Hold until solder melts on tip by wire

Iron is only there for heat – to heat the board and part
Move solder back to touch wire only

Iron is only there for heat – to heat the board and part
Move solder in to form a small pocket

Iron is only there for heat – to heat the board and part
Move soldering iron tip up. This will drag solder up with it.

Iron is only there for heat – to heat the board and part.
Look for shinny fillets
TIPS:

- Use caution when clipping leads to avoid flinging metal across the room.

- All soldering must achieve a good solder filet on the pad as shown for circuit reliability.

- Also clip the leads in this fashion.

- Bend resistors and diodes using your plastic tool as shown.
Soldering:

- How much solder?

- Cold Solder Joints (CSJs)
Tinned Copper Traces
Soldered bridge shorting two traces - bad, bad, bad

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

Other Soldering Tips:
- Easy to add solder or re-melt vs. remove it
Soldering Tips

1. Make sure tip is hot
2. Clean & tin tip
3. Keep tip clean by using wet sponge and cloth
4. Heat until the parts are hot enough to melt solder
5. Hold until solder flashes around pad
6. Do not put too much solder on
7. LEAD – Wash Hands
Caution:

- Soldering is dangerous if not respected

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

- Eyes and liquid solder

- Everyone is expected to solder

- If you get burned…

- Stay together, don’t work ahead
Prep Step 4: Tinning the iron (close-up)

- 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.

- Now place the iron back into the holder. Tinning your soldering iron in this manner will aid in future soldering.
Prep Step 4: Tinning the iron (close-up)
Prep Step 1: Tool Layout

- Prepare tools for the construction process.
- Put on your safety glasses.
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
Hands-on: Soldering

**Step 5:** Flip board over and solder 8 pin socket
Step 6: Flip board over and bend chip leads out
DO NOT SOLDER AT THIS TIME
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)
Hands-on: Soldering

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
Hands-on: Soldering

Step 12: Inspect solder joints and trim leads
**Hands-on: Soldering**

**Step 13:** Flip board over and install capacitor.

Gray strip indicates “negative” lead.

“-” Lead
Step 14: Verify capacitor is installed correctly

“-” Lead
Hands-on: Soldering

Step 15: Flip over board and solder capacitor
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
**Hands-on: Soldering**

**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
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