Gateway To Space

ASEN 1400 / ASTR 2500

Class #08

Colorado Space Grant Consortium
Today:

- Announcements
- Next Time
- Soldering 101
- HW 04 Assigned
Announcements:

- Snow day messed a lot up with our class schedule

- New Syllabus

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Type</th>
<th>Week</th>
<th>Event</th>
<th>Team/Assignments</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>02-02-16</td>
<td>T</td>
<td>67</td>
<td>SNOW DAY</td>
<td></td>
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</tr>
<tr>
<td>x1</td>
<td>02-03-16</td>
<td>W</td>
<td>66</td>
<td>REVIEWS: Conceptual Design Review (CoDR) via YouTube</td>
<td>Presentations DUE 4:00 PM</td>
<td>All Teams</td>
</tr>
<tr>
<td>8</td>
<td>02-04-16</td>
<td>R</td>
<td>65</td>
<td>HANDS-ON: Soldering 101 (Build and Blink)</td>
<td>HW 04 Assigned</td>
<td>All Teams DLC 1870</td>
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<tr>
<td>x2</td>
<td>02-08-16</td>
<td>M</td>
<td>61</td>
<td>PROPOSALS DUE 8:00 AM</td>
<td></td>
<td>All Teams</td>
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<tr>
<td>9</td>
<td>02-09-16</td>
<td>T</td>
<td>60</td>
<td>HANDS-ON: Arduino – Part I (Type and Blink): &lt;Arduino’s distributed to teams today for HW 04&gt;</td>
<td>HW 04 DUE HW 05 &amp; 06 Assigned</td>
<td>All Teams</td>
</tr>
<tr>
<td>10</td>
<td>02-11-16</td>
<td>R</td>
<td>58</td>
<td>HANDS-ON: Arduino – Part II (Analog Sensors): All team members report for beginning of class</td>
<td>HW 05 DUE HW 08 Assigned</td>
<td>All Teams DLC 1870</td>
</tr>
<tr>
<td>x3</td>
<td>02-11-16</td>
<td></td>
<td>58</td>
<td>HANDS-ON: Arduino – Part III and IV (More Sensors &amp; Memory): Team representatives required to attend</td>
<td></td>
<td>All Teams DLC 1870</td>
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<tr>
<td>x4</td>
<td>02-12-16</td>
<td>F</td>
<td>57</td>
<td>&gt;&gt;&gt; Authority To Proceed (ATP) by appointment with Chris &lt;&lt;&lt;</td>
<td>9 AM – 3 PM + HW 06 DUE</td>
<td>Team Representatives</td>
</tr>
<tr>
<td>16</td>
<td>[WEB] 03-03-16</td>
<td>R</td>
<td>37</td>
<td>Guest Lecture – “Spacecraft Propulsion”</td>
<td>DD Rev A/B DUE 4:00 PM</td>
<td>Steve Hayett (Lockheed Martin)</td>
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<tr>
<td>17</td>
<td>03-08-16</td>
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<td>Rocket History</td>
<td>MID-Semester Team Evaluations Assigned</td>
<td>Chris Koehler</td>
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<tr>
<td>18</td>
<td>03-10-16</td>
<td>R</td>
<td>30</td>
<td>Launch Vehicles</td>
<td>Mid Semester Team Eval DUE</td>
<td>Chris Koehler</td>
</tr>
<tr>
<td>20</td>
<td>03-17-16</td>
<td>R</td>
<td>23</td>
<td>HANDS-ON: In-Class Team Time – Bring hardware and questions. Chris will be walking the room and inspecting payloads</td>
<td>RFP Cards Assigned</td>
<td>All Teams</td>
</tr>
<tr>
<td>21</td>
<td>03-19-16</td>
<td>R</td>
<td>21</td>
<td>HANDS-ON: Using the FEMM software to design and analyze electric motors</td>
<td></td>
<td>All Teams</td>
</tr>
<tr>
<td>22</td>
<td>03-21-16</td>
<td>T</td>
<td>22</td>
<td>SERVICE APPROVALS DUE</td>
<td></td>
<td>All Teams</td>
</tr>
<tr>
<td>23</td>
<td>03-22-16</td>
<td>R</td>
<td>22</td>
<td>HANDS-ON: Continue working with the FEMM software to design and analyze electric motors</td>
<td></td>
<td>All Teams</td>
</tr>
</tbody>
</table>

**Note:** All assignments are due at the end of the class period unless otherwise specified.
Announcements:

- CoDR Presentations and Feedback

https://www.youtube.com/watch?v=SrDMrxJDJhM
Announcements:

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

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

- Success of class on FEB 9th depends on teams doing HW4
Announcements:

- Bring everything built and done in HW 4 to class FEB 09
Announcements:

- Bring everything built and done in HW 4 to class FEB 05
Announcements:

- Bring everything built and done in HW 4 to class FEB 09
Announcements:

- Bring everything built and done in HW 4 to class FEB 09
Announcements:

- Bring everything built and done in HW 4 to class FEB 09
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:
Announcements:

- Before you leave today, each team will take:
Next Tuesday...

**Arduinos – Part 1  ITLL 1B50**

Please be early to help setup

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

**Arduinos – Part 2  ITLL 1B50**
Please be early to help setup

**Bring HW #4 and #5 hardware and Laptops (2 per team)**
Next Thursday Night...

**Arduinos – Part 3 AND 4**  DLC 1B70
Please be early to help setup

Bring HW #4 and #5 hardware and Laptops (2 per team)
5:30 – 9:00 PM
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

Soldering

Top View

Side View

Circuit Board

Solder Pads

Resistor
Soldering Iron

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 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:

- 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

Top View

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…
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
**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
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
**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)
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
Hands-on: Soldering

Step 14: Verify capacitor is installed correctly

“-” Lead
Step 15: Flip over board and solder capacitor

“-” Lead
Hands-on: Soldering

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
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