99-353 SolidWorks and Laser Cutting

Instructor: Dave Touretzky

TAs: Chelsea Chen Penelope Ackerman

1.0 Units / 4 days (Micro course)

http://www.cs.cmu.edu/afs/cs/academic/class/99353-f16
Goals For This Course

At the conclusion of this course, you will know:

1. How to design objects using SolidWorks.
2. How to safely operate a laser cutter.
3. How to work with a variety of materials (wood, acrylic, paper, cardboard).
4. How to incorporate mechanical elements into your design (screws, nuts, standoffs, etc.)
Communication

• The syllabus and all assignments are posted on the course web page.

• We will use Piazza for announcements, question answering, and discussions.

• If you have questions about an assignment, SolidWorks, etc., use Piazza instead of email.
  – Other students may have the same question.
  – Fellow students may be able to answer your question more quickly than the instructor or TA.
Hand-Ins

• Each assignment specifies what to hand in and when it is due.

• We will use AutoLab to:
  – Accept hand-ins
  – Provide feedback on assignments
  – Record grades
Rapid Prototyping Fabrication Technologies

- Computer-controlled
- Requires little skill to operate the machinery
- Generally safe to use
- May have limitations as to materials or production capacity.
- But may also offer new capabilities not previously available.
Laser cutter / Water jet

- Fast
- Precise
- Cheap
- Wide choice of materials

X Parts are only 2D (but assemblies can be 3D)
Cheap 3D Printing

- Slow
- Less precise
- More expensive
- Limited materials
- Support material may be required

✓ Complex 3D structures!
High End 3D Printing

✓ Precise
✓ Multicolor
✓ Complex materials
X Slow
X Expensive
What Is Maker Culture?

• “Do it yourself” meets high technology and open source movements.

• The high tech part:
  – CAD software
  – Laser cutters, 3D printing, Arduinos, etc.

• Why is this good?
  – Rapid prototyping: hold your ideas in your hand!
  – Extreme customization / personalization
  – New modes of artistic expression
Maker Culture Around Us

- Make Magazine
  - Makezine.com
- Hacker spaces; TechShop
- LaserSaur: open source laser cutter
- Reprap and open source 3D printers
- Thingiverse & similar sites: marketplaces for 3D models (many are free)
CAD Tools

- The big two:
  - AutoCad from AutoDesk
  - SolidWorks from Dassault Systemes
- Alibre/Invent
- Sketchup
- Blender
- CorelDraw, Inkscape, Rhino
- Sketch It Make It (developed at CMU)
- Many more…
A Quick Look at SolidWorks

Assembly

Part...

Feature...

Sketch

Sketch Entity
(line, arc, etc.)

(SLDASM file)

(SLDPRT file)
A Little More Detail

Assembly (SLDASM file)
- Mates
- Reference Geometry
- Subassembly...

Part... (SLDPRT file)
- Reference Geometry
- Feature...
- Sketch
  - Entities
  - Dimensions
  - Relations

Sketch Entity Parameters...
How To Learn SolidWorks

1. We'll teach you, starting now. The scripts are linked from the class syllabus.

2. SolidWorks has good built-in tutorials; click on the little “house” icon (Resources) on the right side of the screen, and select Tutorials (mortar board icon).

3. Lynda.com offers excellent quality video tutorials; see the link from our course home page.

4. Thousands of random YouTube videos, including specialized topics such as how to make involute gears.