OCN 479-001

3D Design

Today's plan

Rest of semester plan

Interactive lecture

Build sensors!

Rest of semester plan/check-in

Check in/plan

- How are we feeling with writing, compiling, and flashing code? Common challenges?
- How are we feeling with wiring/breadboarding/soldering?
- 6 more classes (including today!).
- Final class dedicated to final presentations, so 5 classes for development
- Ideally we'll deploy in penultimate class, so 4 classes for development
- Your first deployment might not work, so 3 classes for development and deployment test ;)
- Progress—everyone is doing well, but going to be extremely tight. Make sure if you are not your group's coding leader that you find other work to stay busy. No one should be sitting on their hands at this point in the semester; plenty of jobs for all.
- Final reports need some data—doesn't have to be final, successful instrument, but has to have something. Talk with your team about how you will ensure inclusion of data in your final presentation and continuity report.

Today's topic

3D Design

3D Design

- Many options: some free, some extremely expensive
- Some good for hobby design, some for professional
- Some meant for engineering, some for art/professional design

3D Design Process

Measure	Sketch 2D	Sketch 3D	Consider
Measure what you have. What are you building around? E.g., sensor components, off-the-shelf PVC tubes, etc.	Sketch out what you think you want, starting with 2D	Sketch out 3D	Consider how it will be made: • 3D printer? • CNC mill? • Manual lathe? • Hacksaw & hot glue?

3D Design Process

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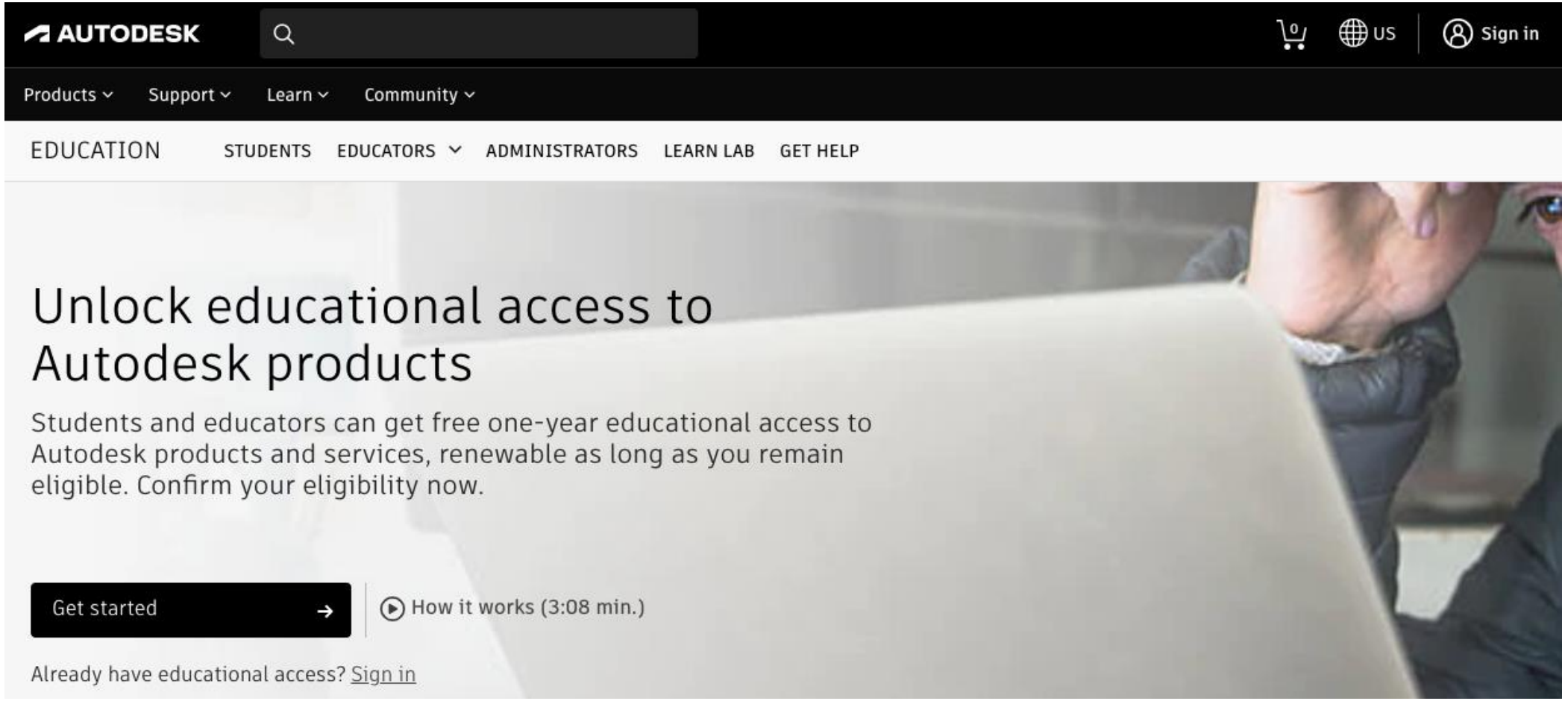
Even better—many manufacturers supply part drawings in datasheets, or even supply CAD models for you to use!

CAD (Computer-Aided Design) should be preceded by PAD (Pencil-Aided Design)

- Let's draw an end cap for a single housing with a few individual sensors that need to contact the water (i.e., protrude through the end cap)
- Known requirements:
  - Must have outer diameter that nearly matches inner diameter of housing it is going into (leave some wiggle room AKA tolerance)
  - Must have thru holes with diameters that match diameters of sensors that will protrude (again, with some tolerance)
  - Should have features to help put it into housing, e.g., softened edges that will slide in more easily
  - Can't have features smaller than smallest printable/machinable feature
  - Can't have footprint larger than working area of printer/machine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Platform

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Tinkercad

Simple 3D design and 3D printing app

Platform:

Get started

Fusion 360

Software or Browser Access

Cloud-based CAD, CAM, CAE, and PCB software. Continue for access, then install Fusion 360 (multiple languages available) or run Fusion 360 from fusion.online.autodesk.com

Platform:

Get started

Revit

Plan, design, construct, and manage buildings with powerful tools for Building Information Modeling.

Platform:

Get started

Revit

Revit Generative Design

Note: this product requires Autodesk Revit 2021.

Quickly generate design alternatives based on your goals, constraints, and inputs to give you higher-performing options for data-driven decision making.

Platform:

Get started

AutoCAD

Software for 2D and 3D CAD.

Includes access to AutoCAD Architecture, Electrical, Mechanical, Map3D, MEP, Plant 3D and AutoCAD Raster Design

Platform:

Get started

AutoCAD for Mac

Software for 2D and 3D CAD

Platform:

Get started

Inventor Professional

Professional-grade product design and engineering tools for 3D mechanical design, simulation, visualization and documentation

Platform:

Get started

3ds Max

3D modeling, animation, and rendering software for games and design visualization

Platform:

Get started

Maya

3D animation, modeling, simulation, and rendering software for film, games, and TV

Platform:

Get started

Advance Steel

3D modeling software for steel detailing

Platform:

Get started

Alias AutoStudio

Automotive conceptual design, technical surfacing, and visualization.

Platform:

Get started

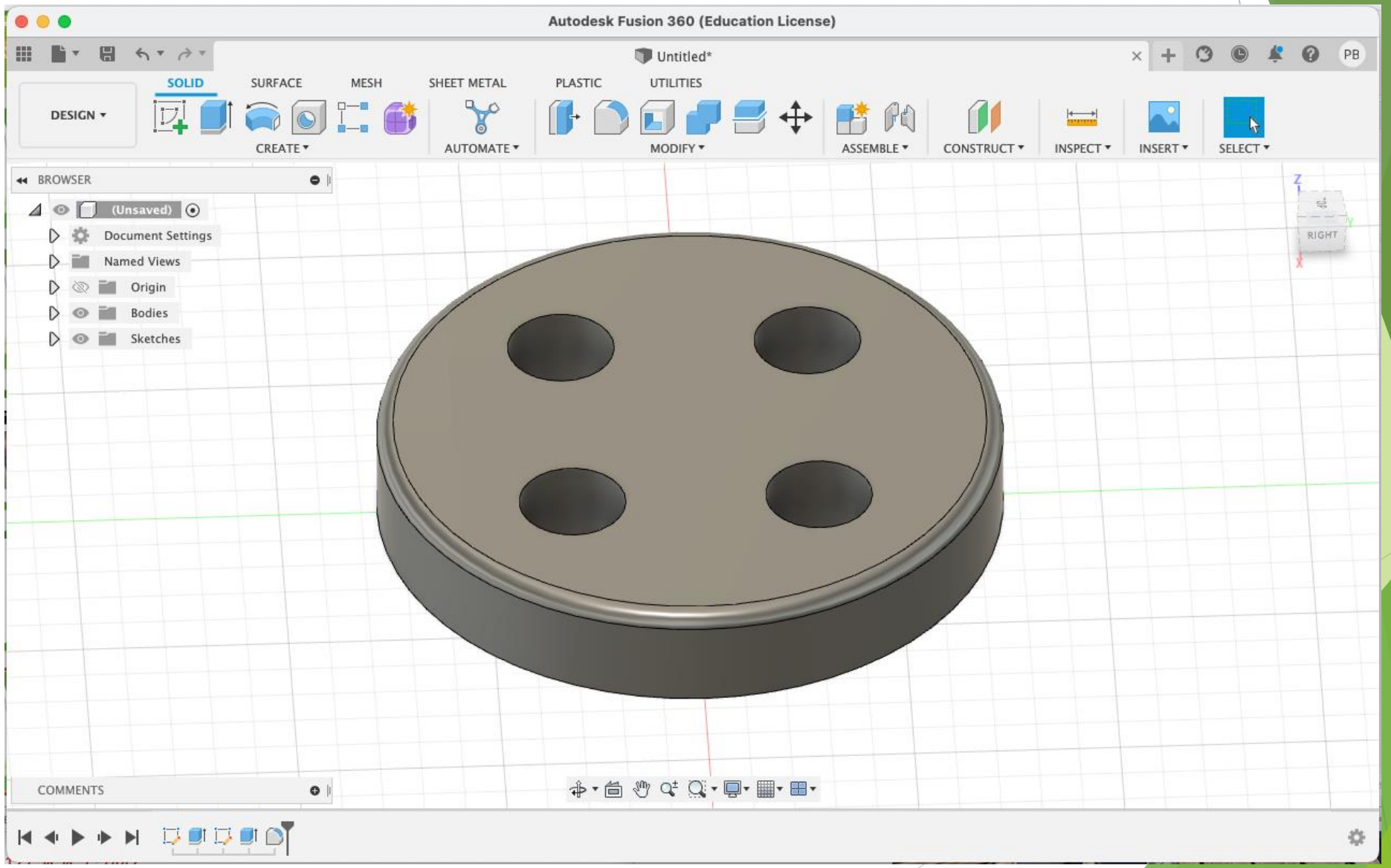
Arnold

Global illumination rendering software

Platform:

Get started

Fusion 360


Autodesk Fusion 360 (Education License)
Untitled*
PB
DESIGN
SOLID
SURFACE
MESH
SHEET METAL
PLASTIC
UTILITIES
CREATE
AUTOMATE
MODIFY
ASSEMBLE
CONSTRUCT
INSPECT
INSERT
SELECT
BROWSER
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Document Settings
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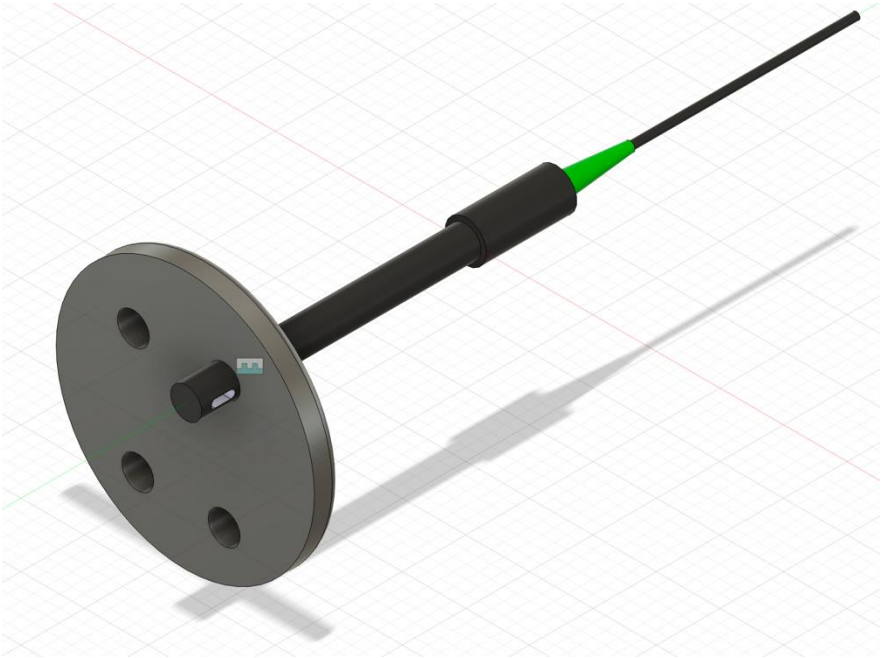
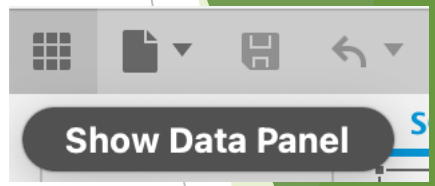
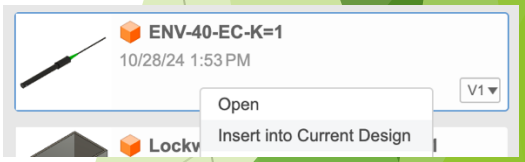
Origin
Bodies
Sketches
RIGHT
COMMENTS

Fusion 360 Assembly



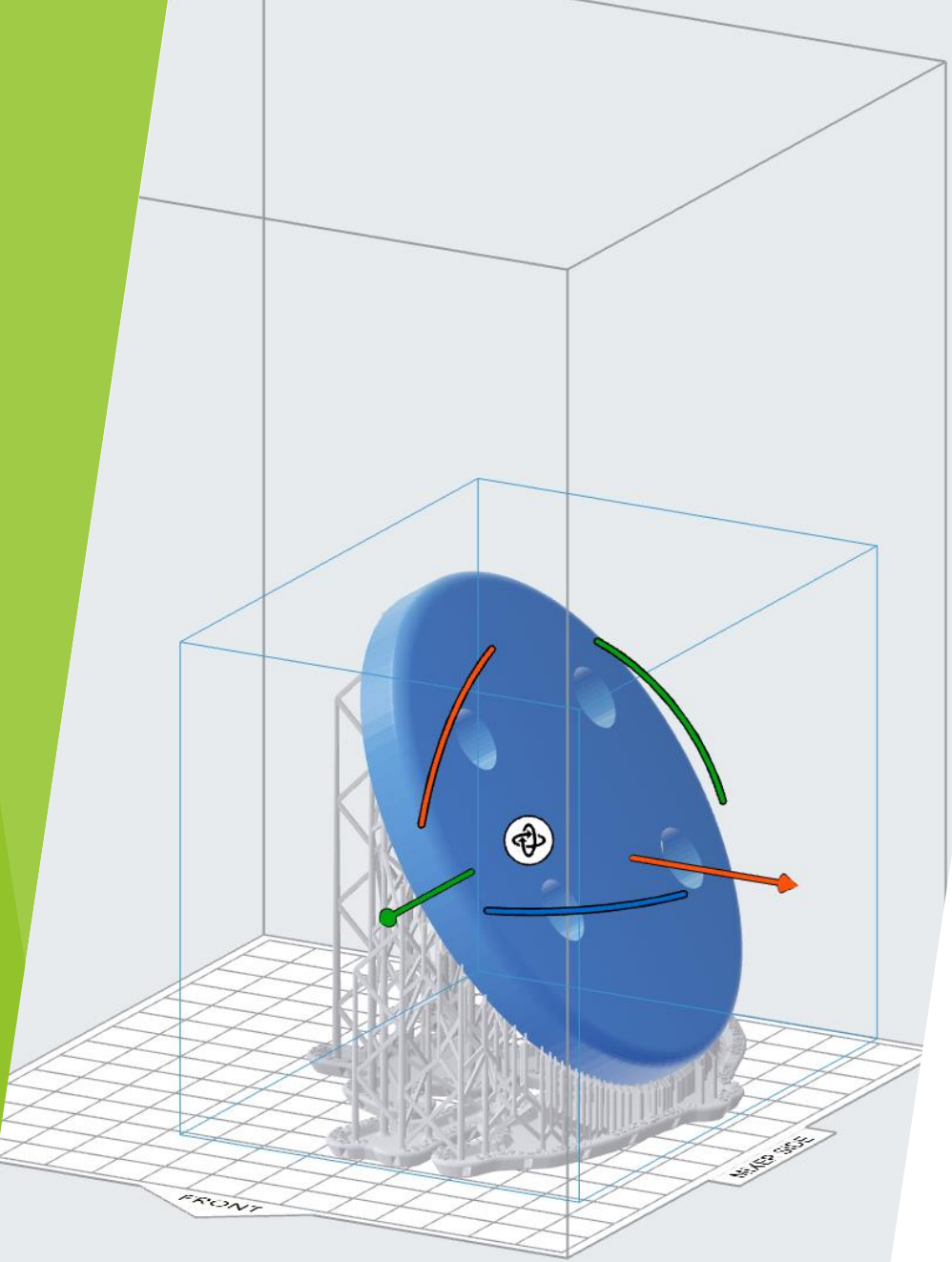


- Open Panel on top left of Fusion
- Download .STEP file of Atlas K1 Conductivity probe from Atlas website
- Open .STEP file in Fusion, save to current cloud project
- Create new design file in Fusion
- Right click on assembly parts in Panel and select “Insert into Current Design”
- Select “Joint” option under “Assemble toolbar and define relationships



What to do with 2D or 3D models

- Subtractive manufacturing:
  - Start with piece of stock material (solid brick/sheet/rod of material)
  - Drill, cut, lathe, sand, file, etc.
- Additive manufacturing:
  - 3D printing: start with nothing but an empty panel
  - Add filament or cure resin



Export as .stl, open in FormLabs' PreForm software