



Make With SOLIDWORKS!

TTU Library Emerging Tech Workshop
Instructor Sean Scully

2025

Who am I?

Sean W Scully



Lead Administrator – TTU Libraries Makerspace

Rhino3D, TinkerCAD, AutoCAD Inventor, Fusion360, Blender, Solidworks
MakeCode, Python, Scratch, C++, C, MATLAB, Arduino, JavaScript, Assembly,
Verilog,
Xilinx

BGS, Math/Engineering/Renewable Energy, TTU

MFA, Studio Art – Metals/Jewelry/Enameling, Kent State Univ

BFA, Studio Art – Metalsmithing/Jewelry Design, TTU

AA, Fine Arts, South Plains College

[linkedin.com/in/seanwscully](https://www.linkedin.com/in/seanwscully)

Find me on the First Friday Art Trail, ffat.org, CASP Work Studio H



MAKER SPACE

RYAN CASSIDY | SEAN SCULLY | JAKE SYMA



Emerging Technology Dept

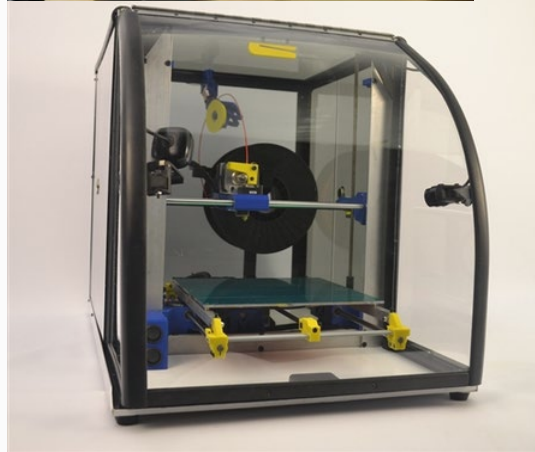
- Makerspace: Main Library, 2nd floor, room 210
- VR Lab: Main Library, 2nd floor, room 201A

make@ttu.edu

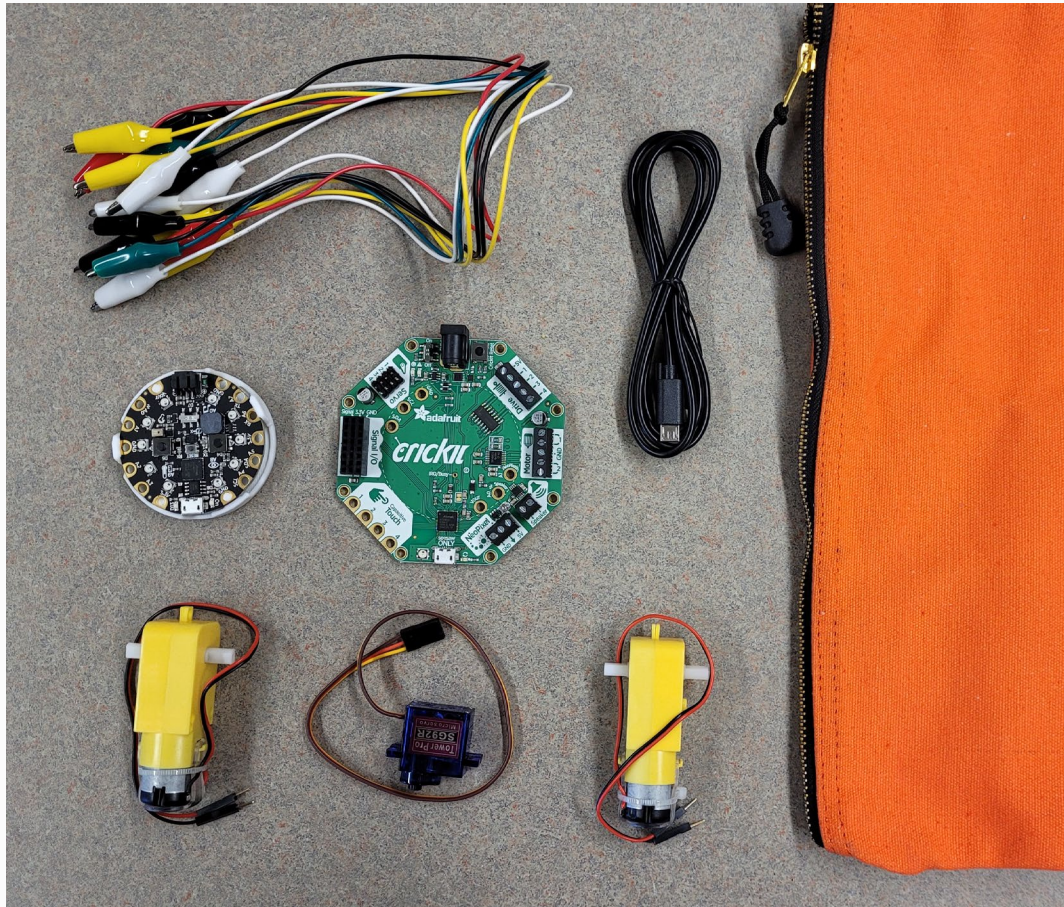
<https://www.depts.ttu.edu/library/make/>

Virtual Walkthroughs - <https://www.youtube.com/playlist?list=PLXiD4wAGiKu7iE0kYENiBLHtM9w-dAvFh>



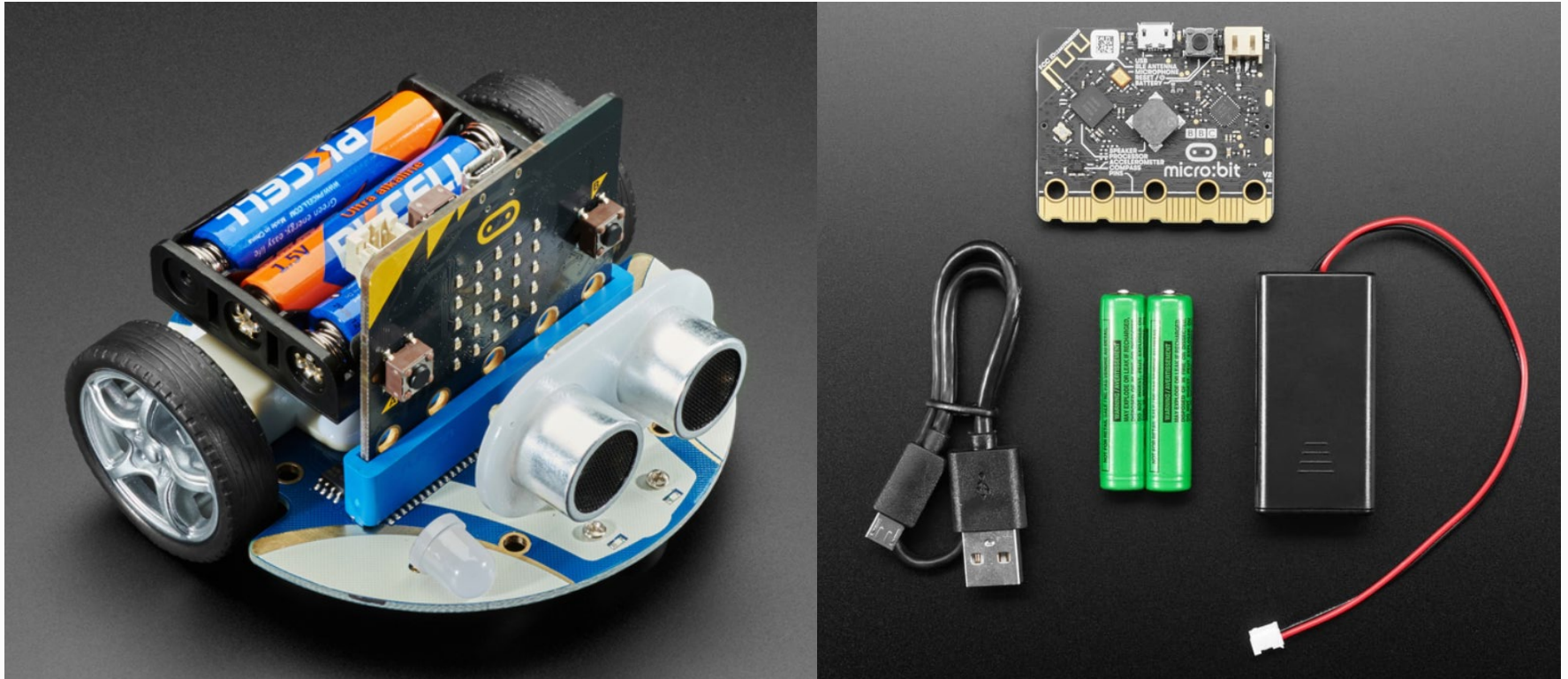


- Cricut Maker/Venture
- Glowforge Lasercutter
- Makyu Formbox
- Matter&Form 3D Scanner
- PolyPrinters 229 & 508
- Ultimaker 3, S7
- Sewing machines



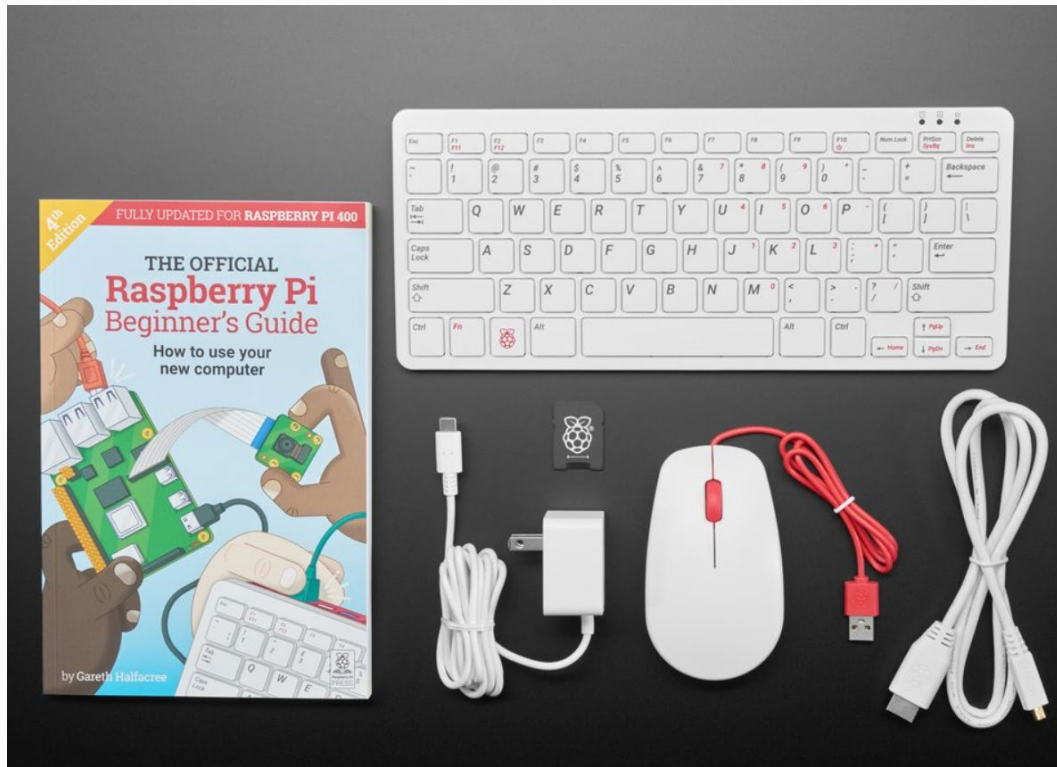
- Robo Kits (15)
 - Adafruit's Circuit Playground Express (CPX)
 - Adafruit's Crickit robotic control board
 - geared motors (2), micro servo
- ElectroSoldering Kits (5)

TTU Library's Makerspace *CuteBot* and *Micro:Bit v2* Kits



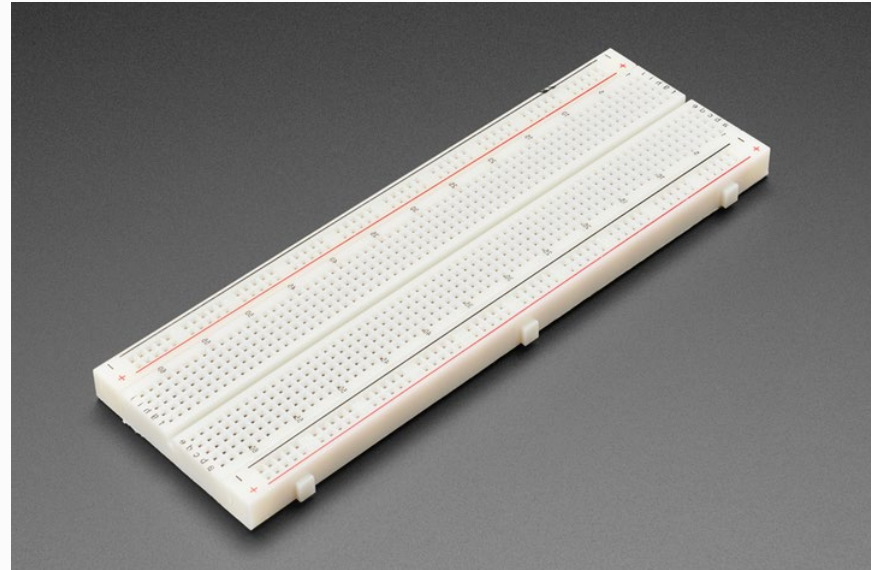
Images of our CuteBot kit and Micro:Bit v2 kit

TTU Library's Makerspace *Pi-400* and *Pi-Zero W* Kits



6 kits of each is available: recommend supplying your own microSD card (minimum size: 8Gb)

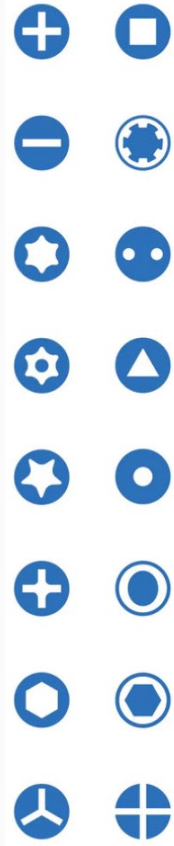
TTU Library's Makerspace *Pi* – *Interface Kits*



6 kits of each is available, one for every Pi-400

- Pi T-Cobbler Plus
 - GPIO Breakout - Pi A+, B+, Pi 2/3/4, Zero
- Full Sized Premium Breadboard
 - 830 Tie Points

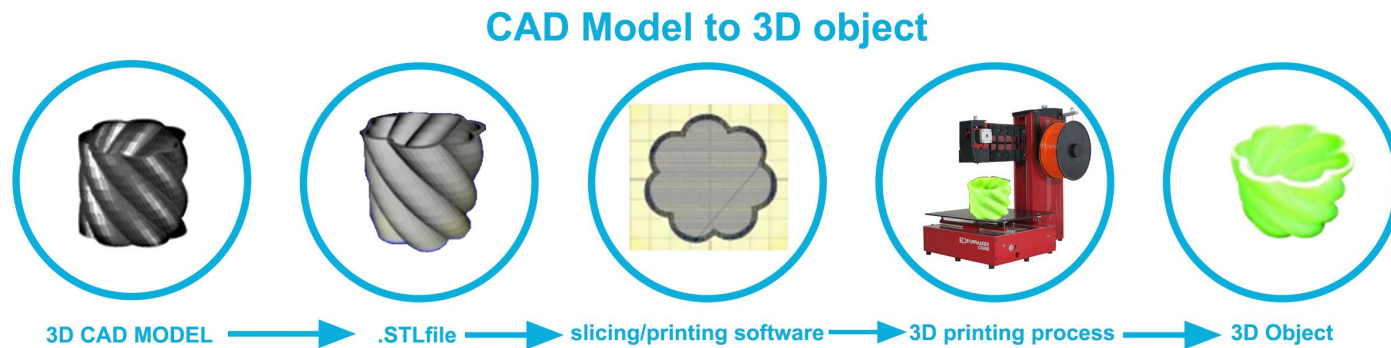
TTU Library's Makerspace *iFixit* Kits



6 kits of each is available, one for every Pi-400

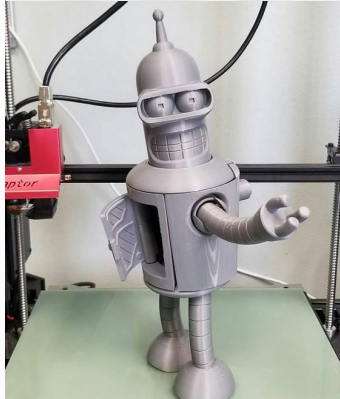
- all kinds of screwdriver tips, 64 total
- larger kit has spudgers and plastic pryers

Overview



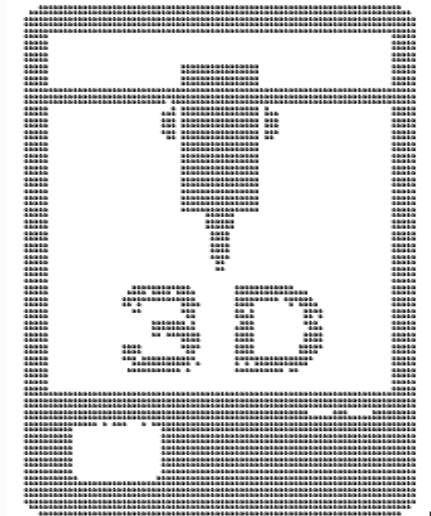
three common styles of 3D printer:

- Powder – layers of thin dust built with a binder
 - ZCorp., powdered cornstarch/gypsum, inkjet binder
 - Titanium/stainless steel powder fused with high power laser/plasma beam
 - Resolution varies widely, but generally the roughest of these processes
- Resin – Light-sensitive resin that hardens in layers as you expose it to images from an LCD, a projector or a laser beam
 - “Form” printers or LCD printers
 - Resolution high, measured in micron layer-heights
- Filament – Fused-Deposition-Modeling (FDM) using a stream of material that hardens/cool that will fuse in layers
 - FFF – Fused Filament Fabrication
 - Resolution varies with the printer extrusion parameters
 - 0.06 mm – 0.4 mm height x 0.4 mm width



3D printing questions

- flat side down
- best to halve and glue
- minimize support material
- durability, temperature, solvents, requirements
- optimize thickness
 - efficiency/strength
 - limits of the printer (min thickness 0.8mm)
- orientation
 - direction for most strength
 - most precise/highest resolution



our PolyPrinters (229/508)

Layer height 0.25mm, width 0.4mm (0.4 mm nozzle)

Print volume maximums

- 229: 220 x 220 x 220 mm
- 508: 220 x 490 x 220 mm
- <https://polyprinter.com/>

Printers use 1.75mm diameter filament

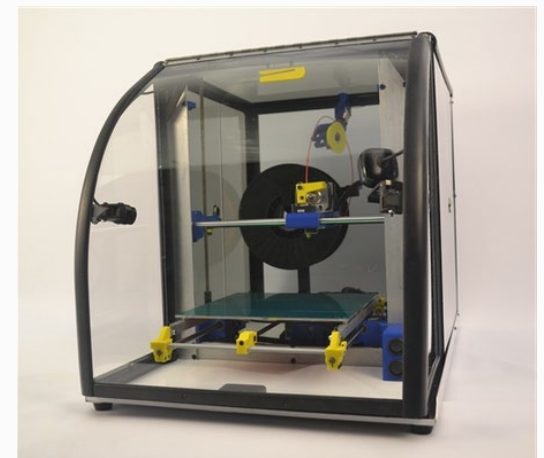
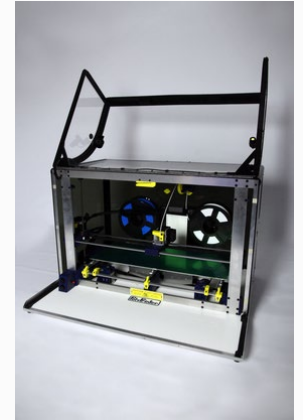
Default material: ABS (Acrylonitrile butadiene styrene – a thermoplastic polymer)

- prints at 260-270C and print bed temperature of 110C
- fee of \$1.00 for each print bed/color used
- 10 cents/gram of filament used

NinjaFlex (a brand of TPU filament – thermoplastic urethane)

- prints at 230-250C with print bed temperature of 60C
- fee of \$1.00 for each print bed/color used
- 30 cents/gram of filament used

For models that only fit on 508, bed fee will be \$2.00



PolyPrinter – Additional Reference

UTA EE Labs – PolyPrinter Walkthrough

- <https://www.youtube.com/watch?v=ElMy8vTiJOM>

PolyPrinter FAQ

- <https://polyprinter.com/content/UserQuestionsAndAnswers/UserQuestionsandAnswers.html>

PolyPrinter Manuals/Documentation

- <https://polyprinter.com/downloads/>
- https://polyprinter.com/content/229_508%20User%20Manual.pdf
- <https://polyprinter.com/content/NozzleChange.pdf>

our Ultimakers 3 + S7

Layer height 0.06-0.3mm

Layer width 0.4mm

0.25mm, 0.4mm, 0.8mm nozzle options

Print volume maximums

- Ultimaker 3:
 - *230 x 190 x 200 mm*
 - <https://ultimaker.com/3d-printers/ultimaker-s3>
- Ultimaker S7:
 - *330 x 240 x 300 mm (13 x 9.4 x 11.8 inches)*
 - <https://ultimaker.com/3d-printers/s-series/ultimaker-s7/>

Printers use 2.85mm/3mm diameter filament

PLA/ToughPLA/Nylon/TPU/PP plastic

- Fee of \$1.00 for each print bed/color/extruder used
- 30 cents/gram of filament used

Breakaway PLA/Dissolvable PVA plastic

- Fee of \$1.00 for each print bed/color/extruder used
- 30 cents/gram of filament used



Samples Samples Samples

- Always print the challenging portions of your project
 - *Saves time and material*
 - *Gain specific knowledge of printer limitations*
 - *Speeds design iteration timetable*
 - *Ensures success*
- Rhino & Blender (formerly used 3D Builder)
 - *Preview and repair STL files*
 - *Chop parts into pieces: “Split”*
 - *“Settle” parts: add gravity to ensure good bed adhesion during printing*
- Practice challenging prints from model repositories (free)
 - *Thingiverse*
 - *Cults3D*
 - *yeggi*



Part



Assembly



Drawing

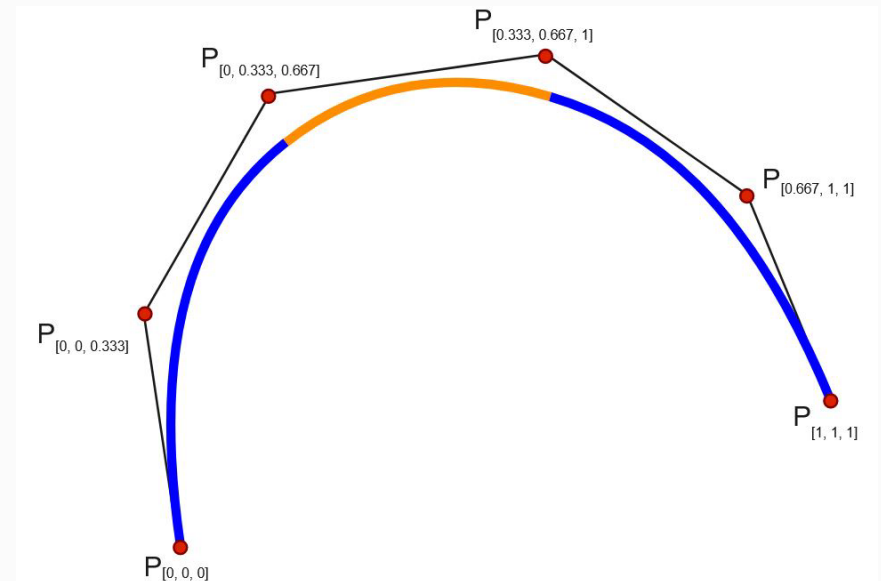
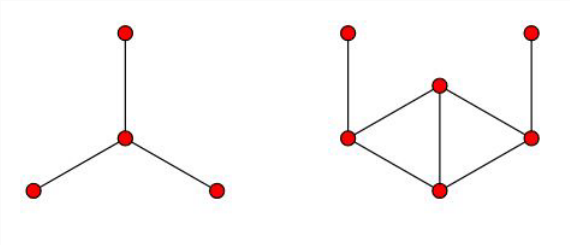
A Brief Intro to SOLIDWORKS

About advanced CAD programs



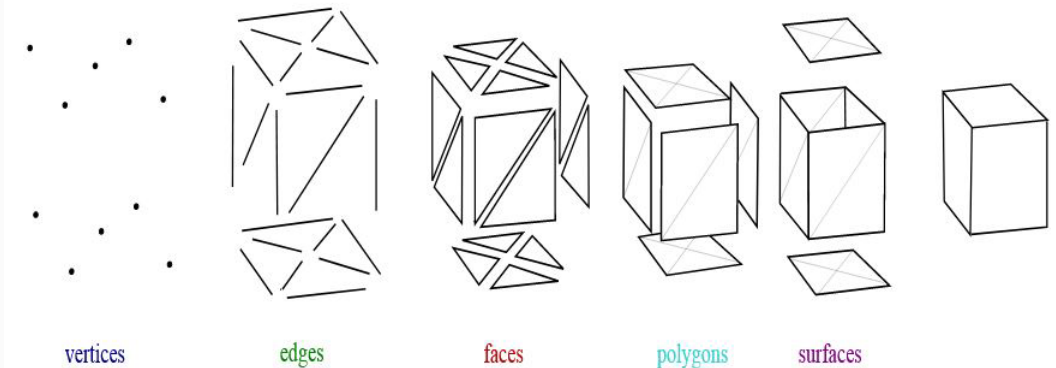
What is CAD made of:

- Points
 - *1D object, coordinates (x,y,z)*
- Lines
 - *two+ points connected*
- Splines
 - *parametric curves*



Polysurface versus Mesh:

- *Points*
- *Surface*
 - 2D area defined by at least two lines
- *Polysurface*
 - 3D vol, two+ surfaces
 - Open – holes in model
 - Closed – “watertight”
- *[Polygon] Mesh*
 - Vertices = Points
 - Edges = Lines
 - Faces ~ Surfaces





getting started – filetypes

- Most common file formats you might deal with are:
 - .IPT, .IAM
 - Part file (.ipt) – each object you build
 - Assembly file (.iam) – file for importing parts and deciding their relationships
 - Autodesk-specific file types
 - .STL (Surface Tessellation Language file)
 - a system of triangles, originally for stereolithography
 - The standard used by slicer programs for 3D printing
 - .DWG, .DWF, .3DM
 - Editable CAD files – more general information about 3d objects/drawings
 - Used by Autodesk Suite and several other programs

<https://fileinfo.com/filetypes/cad>

getting started: SOLIDWORKS

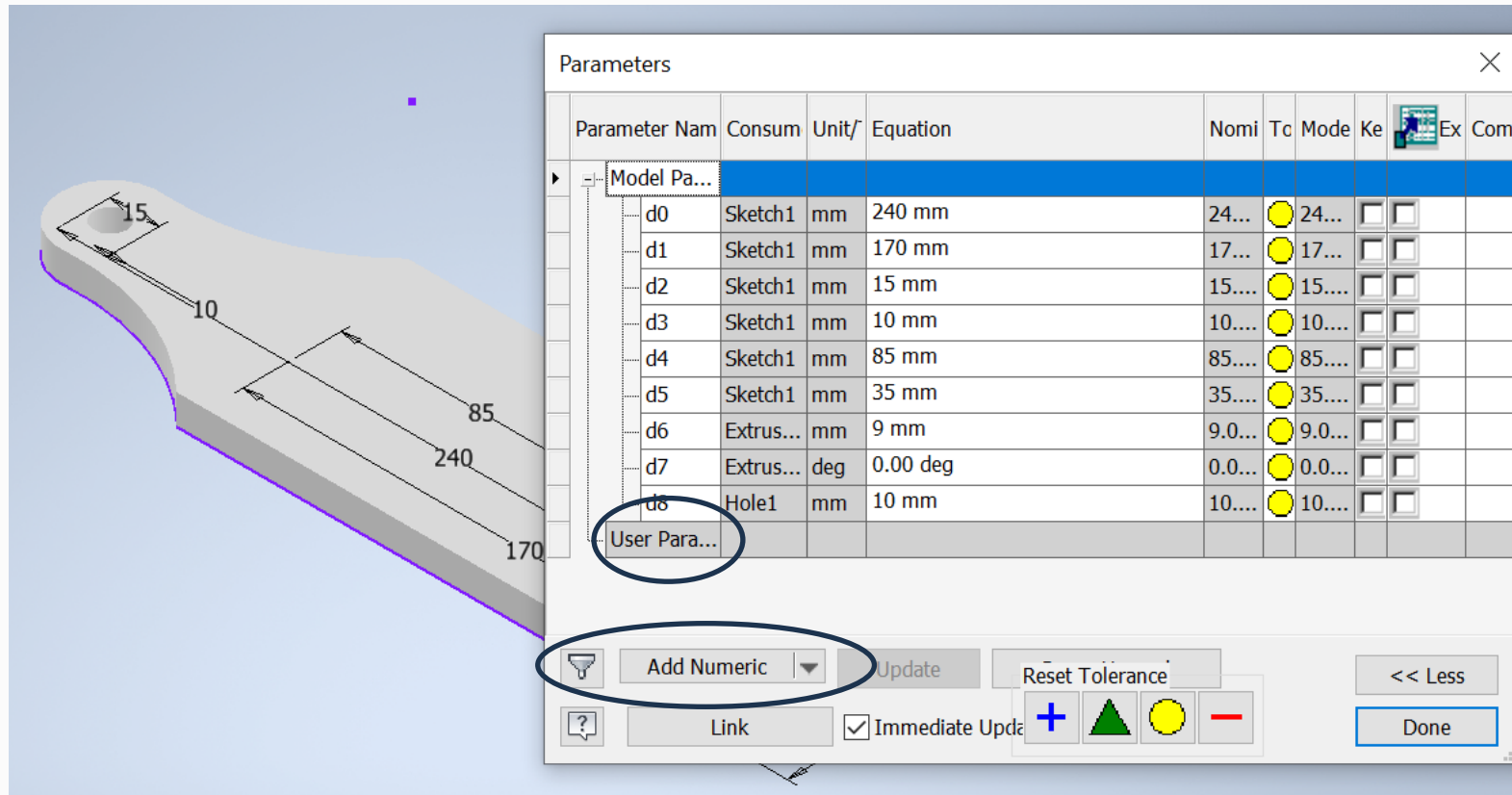
- <http://www.solidworks.com/sw/support/downloads.htm>
- On-campus Computers (already installed, eraider login)
 - Library's 2nd floor: 3D Animation Lab room 205 (only on 2 computers)
 - Engineering Computer Labs
- @Home - Recommended hardware
 - Internet connection (only required for installation)
 - <https://www.solidworks.com/support/system-requirements>
 - Two-button mouse with a scroll that can click
 - A 64-bit Win11 system with a non-integrated graphics card is ideal
 - Mac users require a virtual machine which can significantly change the user experience
- Educational Install
 - <https://www.solidworks.com/community/3dexperience-login>
 - <https://my.solidworks.com/try-solidworks>



sketches – Body / Part – Assembly

- Sketches
 - Best place to start building/modifying your model
 - Drawing aligned normal (perpendicular) to a particular plane X, Y, or Z
- Body
 - Extruded sketch
 - Model object and all of the modifications (chamfer/fillet/extrusion)
- Part
 - A file for each modeling object
- Assembly
 - Separate file for importing/arranging Part files

Parametric Modeling – User Parameters



new features/tutorials

- new for 2025
 - <https://www.solidworks.com/product/whats-new#brick--7869--default--en>
- plier tutorial
 - https://www.youtube.com/watch?v=2mN7m2G5kCI&list=PLiKqXuECiKNK9bUR2xWG40x_AVK-jBbt9
- Solidworks Youtube Channel
 - <https://www.youtube.com/@solidworks/playlists>

onward: assistance is available

- The Staff and Student Assistants in the Makerspace are here to help!
- There are O'Reilly video and text tutorials available to help learn the more advanced software (Solidworks, Inventor, Rhino, Grasshopper, etc.) through Library Databases:
 - *Search for “oreilly” @*
 - <http://texastech-mt.hosted.exlibrisgroup.com/V/?func=find-db-1>

onward: 3D printing near me

- On TTU Campus

- TTU Library Makerspace – make@ttu.edu, Library 210, <https://www.depts.ttu.edu/library/make/index.php>
- ATLC - Library basement, <https://www.depts.ttu.edu/itss/services/3dprint/faqs.php>
- Architecture - <https://www.depts.ttu.edu/architecture/>
- 3D Art Annex - http://www.depts.ttu.edu/art/Programs/graduate/studio_art/sculpture/index.php
- Mechanical/Civil Engineering & IMSE
- Ask your department - there are 3D printers hidden all over campus

- Off-Campus

- ~~ULABS (Ubiquitous Makerspace) – <http://www.ulabstx.org/>~~
- Science Spectrum - <https://www.sciencespectrum.org/fab-lab/>

- Online

- ~~Shapeways – <https://www.shapeways.com/>~~
- UPS - <https://www.theupsstore.com/print/3d-printing>
- iMaterialise - <https://i.materialise.com/en>
- MyMiniFactory - <https://www.myminifactory.com/>

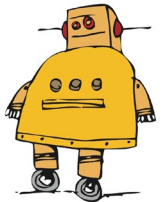
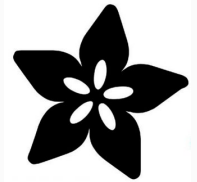
projects galore

project-sharing websites (some require membership)

- <https://learn.adafruit.com/>
- <https://www.hackster.io/>
- <https://www.instructables.com/>
- <https://hackaday.io/>
- <https://make.co/>

Support/Forums/Discord

- Official forums/support
 - <https://my.solidworks.com/forums>
 - <https://my.solidworks.com/support>
- Unofficial discord
 - <https://discord.com/invite/MUYheHd>
 - <https://discord.gg/invite/solidworks-590336164549099520>
- Adafruit
 - <http://adafru.it/discord>





thank you!

please share your projects and progress!

“Make with Solidworks” with Instructor Sean Scully
review this workshop here:

https://ttu.libwizard.com/f/workshop-eval-24-25_emerging_tech

Lead Administrator - sean.scully@ttu.edu

Makerspace - make@ttu.edu

Director/Librarian - ryan.cassidy@ttu.edu

Assoc. Librarian - jake.syma@ttu.edu

Workshop Guides- <https://guides.library.ttu.edu/make>

