Using 3D Printing within my Physics Education through Free Computer-Aided Design Resources

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Outline

What is Computer-Aided Design (CAD)?

CAD Learning Resources

Overview of 3D Printing Process

Example Projects in Physics Education

What is Computer-Aided Design? (CAD)

- Software designed for object creation.
- Graphic visualization.
- Greater accuracy than hand-drawn diagramming.
- 2D Diagramming
  - Floor plans, construction blueprints, electrical layouts, ect.
- 3D Modeling
  - Object modeling, may lead to 3D printing.

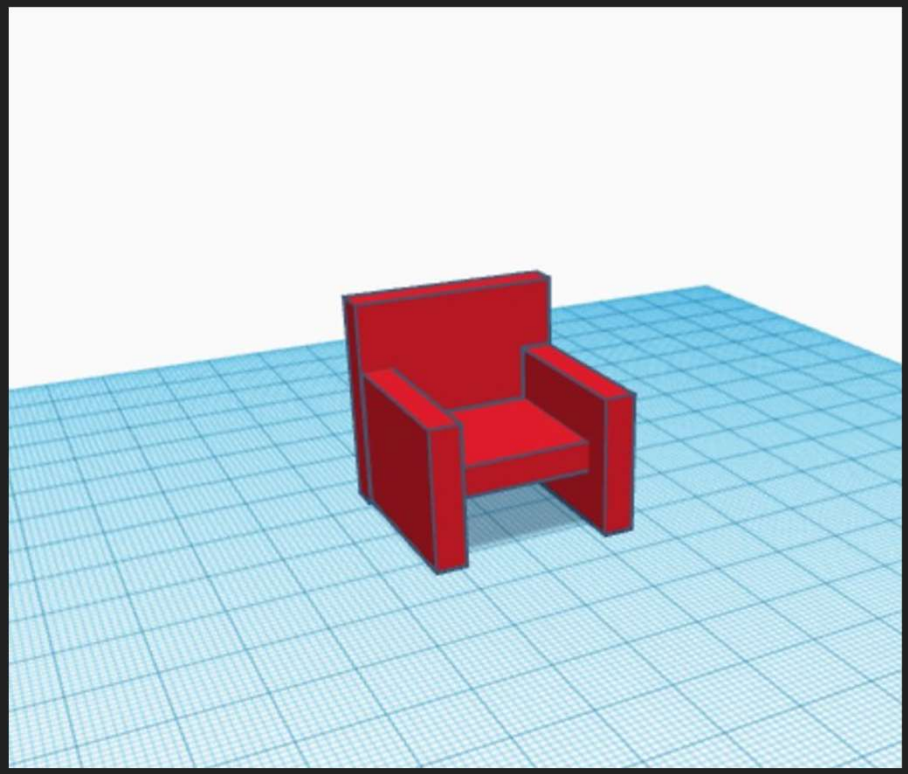
TinkerCAD

Beginner level.

Create a free account at Tinkercad.com!

Class Friendly!

Similar conceptual functionality to AutoCAD.

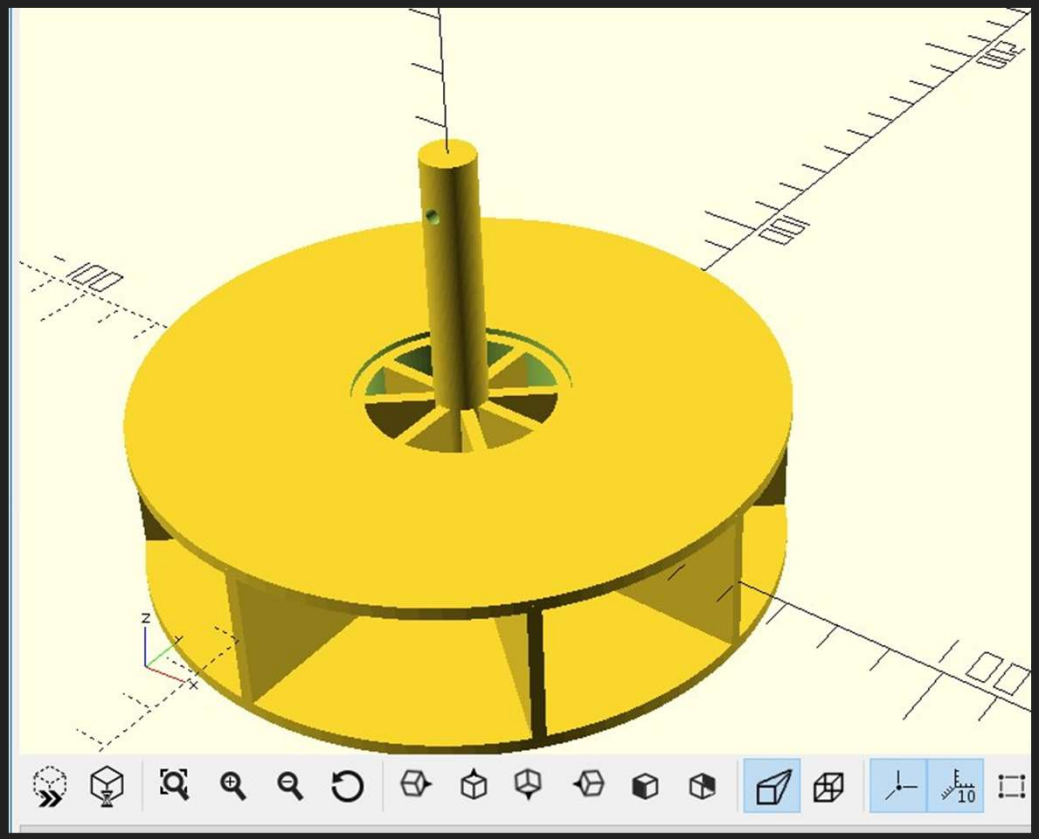


OpenSCAD

Intermediate level

Encouraged for programming inclined students.

Free download to Windows, Mac, or Linux.



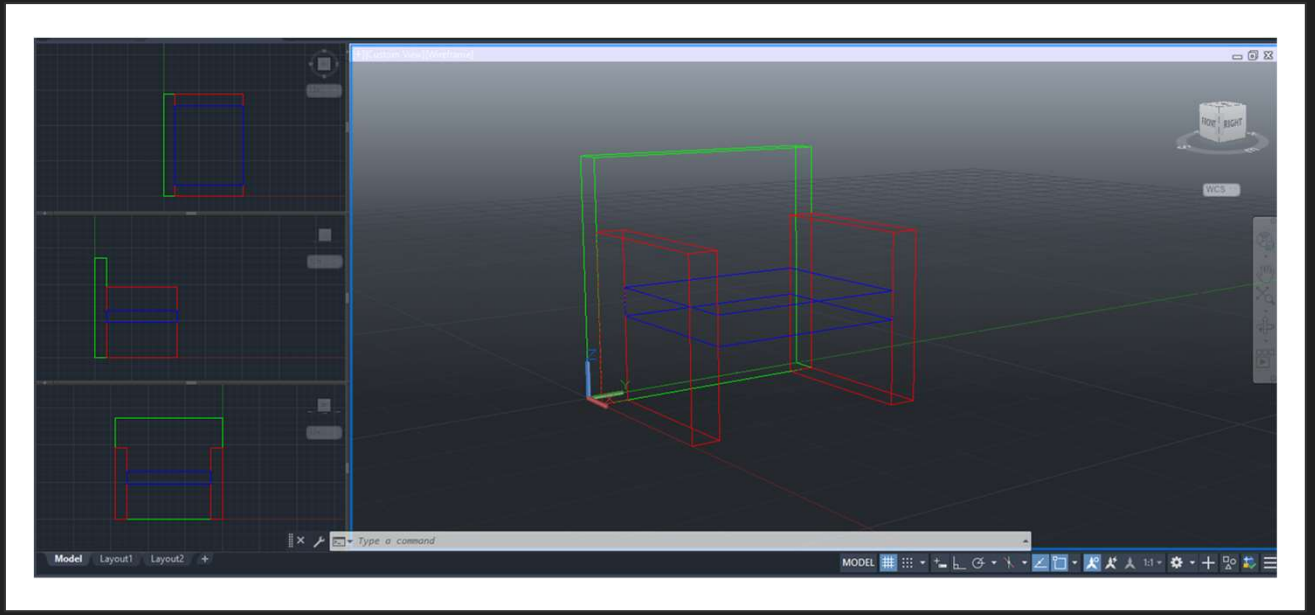
AutoCAD

Commercial-level Engineering software.

2D and 3D modeling capabilities.

Free 1 year student trial.

Available for Windows and Mac.



How does CAD help Students?

- Abstract problem solving:
  - How can I create a given object using these shapes?
- Familiarity with software commonly used in Engineering careers.
- Easy to use functionality for visualization of objects.

Learning Resources

TinkerCAD

- TinkerCAD offers free tutorials for trial projects on their website!

OpenSCAD

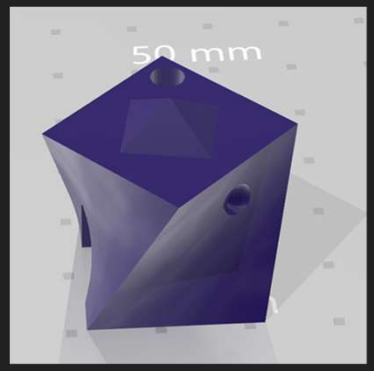
- *“mathcodeprint”* on youtube.com offers a beginner series of tutorials to create using OpenSCAD software. https://youtu.be/oTCu2hCuqfg

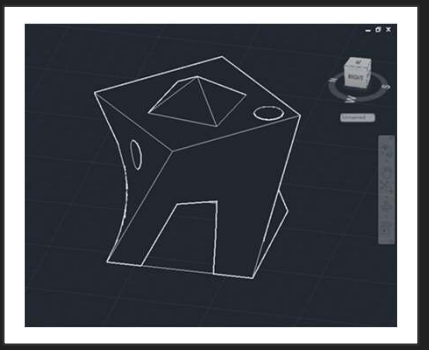
AutoCAD

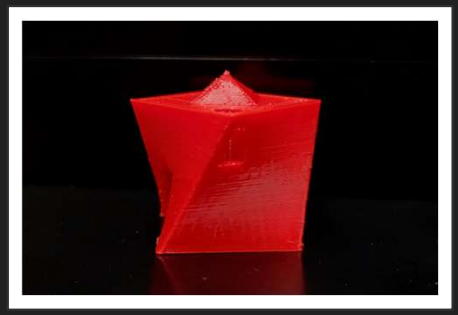
- https://www.mycadsite.com/tutorials.html. Free tutorials, as well as check-in quizzes and sample files, for using AutoCAD in both 2D and 3D design.

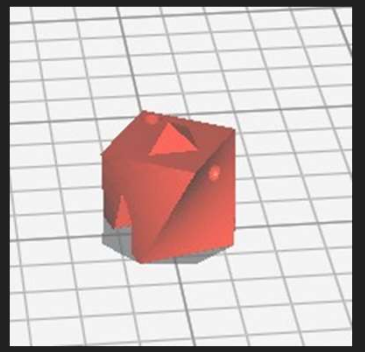
From CAD to 3D Printing: How does it Work?

1. Create object in preferred CAD environment.
2. Export object to .stl file.
3. Splice into gCode.
    a. This splicer is specific to *your* printer.
4. Print!





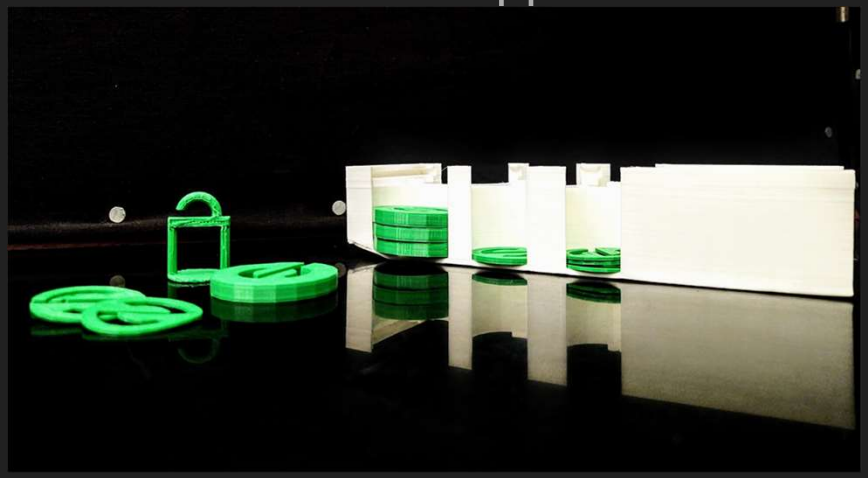




Projects within a Physics Education

Token Masses

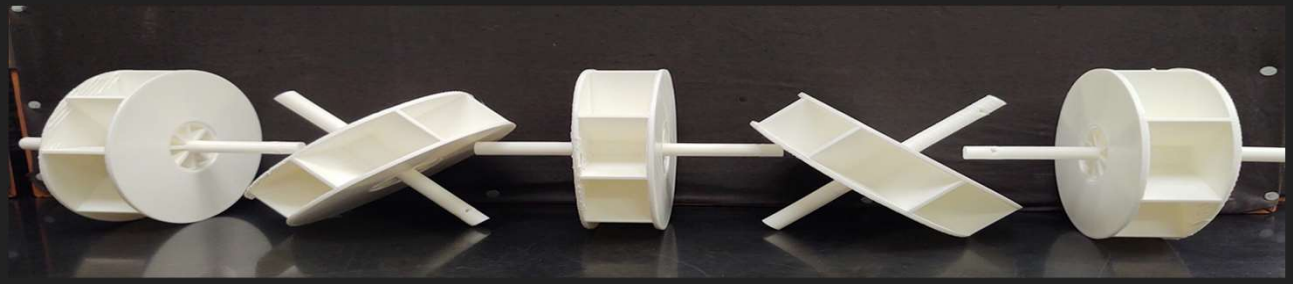
- Student independently designs objects of various masses.
  - 1g “hanger”, 2g, 5g.
- Accurate masses may then be used in lab for extra application.



Projects within a Physics Education

Waterwheels

- Students design waterwheel objects using CAD software.
- Objects are printed and tested for functionality in lab.
- Water-wheels should be designed to lift masses when in use.
  - Creating a “wheel stand” that students must fit their wheels into for testing adds an extra challenge in that designs must be restricted to specific dimensions.



Thank You