



# Education Resources for 3D Printing

A GUIDE FOR EDUCATORS



stratasys®

# INTRODUCTION

3D printing can inspire students to imagine, build, test their ideas, and engage in meaningful learning. With the help of many of our customers' schools and our Education Advisory Board, Stratasys put together this printer-agnostic guide to teaching and learning resources to help you kick-start meaningful projects and lessons in your learning community.

This guide is organized into 3 sections:



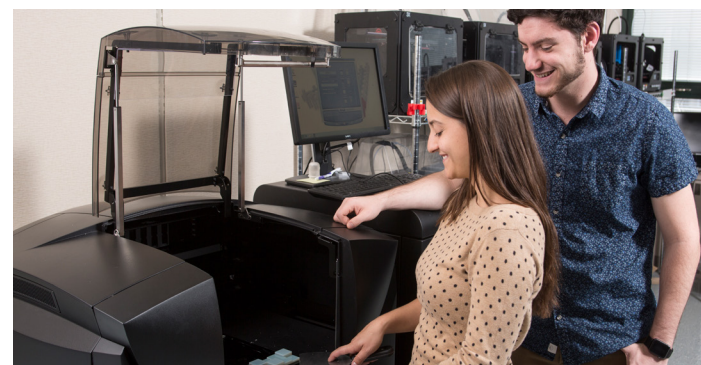
## GRADES K-8 ▶

This section includes resources to engage and inspire younger students with 3D printing. Many of the lessons go beyond STEM and have cross-curricular connections. Lessons can be adapted to group or individual activities to meet your student's abilities and interest levels.



## GRADES 9-12 ▶

The high school projects focus on individual or small group hands-on activities that teach higher-order skills like critical thinking, problem solving, advanced computation and innovation. This section provides links to numerous, more advanced projects.



## HIGHER EDUCATION ▶

This section contains learning resources on design thinking, problem solving and the ability to innovate. Designed for adult learners, this content is provided by higher education institutions and software vendors. Included here is the Stratasys 15-week curriculum — Make Something That Moves Something.

# GRADES K-8

Lessons appropriate for elementary and middle school students



## HIGHLIGHTS:

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The City X Project ▶

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Enabling the Future ▶

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SketchUp ▶

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Make Your Own Moby ▶

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Thingiverse Project  
Collection ▶

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MakerBot in the Classroom ▶

- Digital Sculpting
  - How to Use a 3D Printer
  - Solid Modeling
  - Parametric Modeling
-



## 1.1 3D LESSON PLANS

Browse 40+ lesson plans covering a broad range of subjects.

### Resources

Tutorials, training manual, web links, databases and software files

SPO Learning Labs

[Link](#)



## 1.2 SEEMEEDUCATE

Get started using Orion or Rostock Max 3D printers.

### Resources

Presentations, activities and projects in PDFs and video format

SeeMeCNC

[Link](#)



## 1.3 THINGIVERSE PROJECT COLLECTION

Search 200+ projects that students can download and print.

### Resources

Downloadable STL files

Thingiverse

[Link](#)



## 1.4 THE CITY X PROJECT DESIGN THINKING WORKSHOP

Includes resources for literacy, problem-solving, critical thinking, and STEM.

### Resources

Step-by-step guide, materials and equipment list, presentation, character cards, workbooks, resource handouts, tips and tricks

IDEAco

[Link](#)



## 1.5 ENABLING THE FUTURE

Design and print a prosthetic arm.

### Resources

Video tutorials

e-NABLE

[Link](#)



## 1.6 SKETCHUP TUTORIALS

This includes numerous tutorials on using SketchUp.

### Resources

Online tutorials

Sketchup

[Link](#)



## 1.7 INTRODUCTION TO 3D PRINTING (MAKER'S EMPIRE)

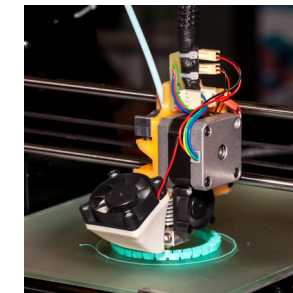
Read about the history, function, applications, process and design.

### Resources

Video tutorials

Maker's Empire

[Link](#)



## 1.8 INTRODUCTION TO 3D PRINTING (MERLOT.ORG)

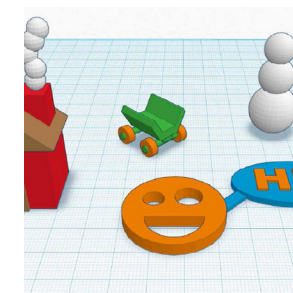
Browse 3D printing concepts, design and production.

### Resources

Lesson plan

Merlot.org

[Link](#)



## 1.9 MAKE YOUR OWN MOBY

Explore 3D printing by sketching and printing objects.

### Resources

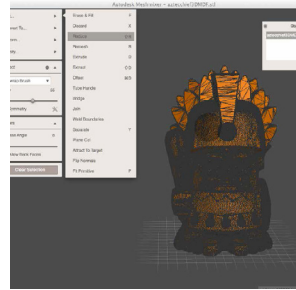
Graphic organizer, movie, software file, activity handout, quiz

BrainPOP Educators

[Link](#)

## Lessons

[Download all Lessons](#)



### 1.10 ADVANCED 3D PRINTING TECHNIQUES AND TROUBLESHOOTING

Learn to use advanced tools such as Autodesk Meshmixer.

**Resources**

PDF teacher guides, thing files, and web links

MakerBot in the Classroom



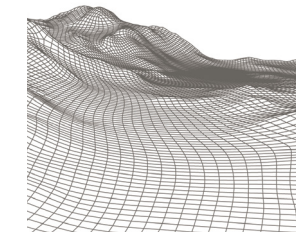
### 1.13 DIGITAL SCULPTING WITH SCULPTRIS

Learn how to digitally sculpt fossils using Sculpttris and 3D print your work.

**Resources**

PDF teacher guides, thing files, and web links

MakerBot in the Classroom



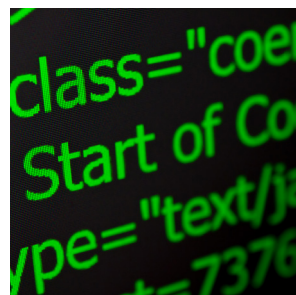
### 1.16 PRIMITIVE MODELING: GEOGRAPHY

Make a topographic map of your own country using TinkerCad.

**Resources**

PDF teacher guides, thing files, and web links

MakerBot in the Classroom



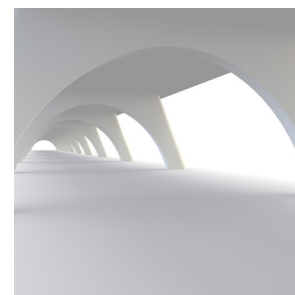
### 1.11 BEGINNER PARAMETRIC MODELING: NAMETAG

Learn how to go from coding to designing models using OpenSCAD.

**Resources**

PDF teacher guides, thing files, and web links

MakerBot in the Classroom



### 1.14 SOLID MODELING: EXPERIMENTAL ENGINEERING

Learn how to model using 123D by Autodesk to build bridges and more.

**Resources**

PDF teacher guides, thing files, and web links

MakerBot in the Classroom



### 1.12 HOW TO USE A 3D PRINTER

Learn how to make, scan, design and print projects.

**Resources**

PDF teacher guides, thing files, and web links

MakerBot in the Classroom



### 1.15 INTRODUCTION TO 3D PRINTING IN THE CLASSROOM (MAKERBOT)

Explore the basics of 3D printing (design, print and post-process) and business applications for it in medical, product development and manufacturing.

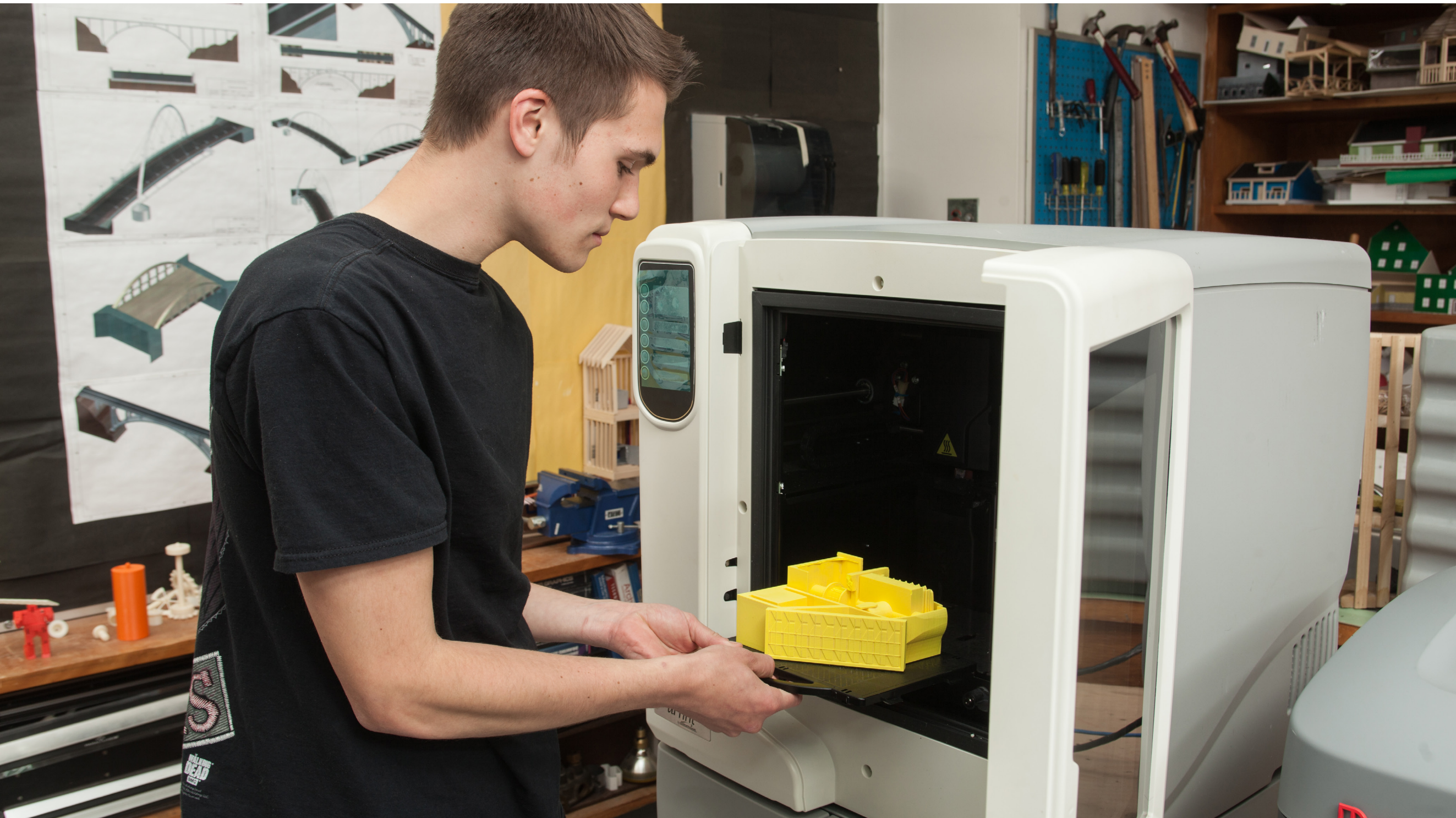
**Resources**

PDF teacher guides, thing files, and web links

MakerBot in the Classroom

# GRADES 9-12

Projects designed specifically for high school students



## HIGHLIGHTS:

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3DP Entrepreneur ▶

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Crystal Growth ▶

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Density ▶

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Filtration ▶

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Friction ▶

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Material Properties ▶

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Optics ▶

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Rapid Prototyping ▶

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Topography ▶

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Volume and Surface Area ▶

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**stratasys**<sup>®</sup>



## 2.1 3DP ENTREPRENEUR: CUSTOMIZATION

Modify and print a 3D model as an end product for sale.

### Resources

Lesson plan, instructions, worksheet, STL files

TinkerineU

[Link](#)



## 2.5 PHYSICAL CHANGE AND FILTRATION

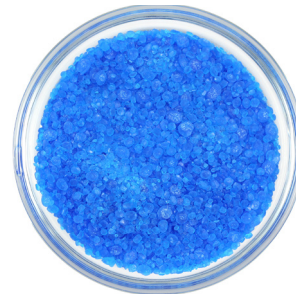
Design and print a filter to learn filtration.

### Resources

Lesson plan, instructions, worksheet, STL files

TinkerineU

[Link](#)



## 2.2 ADDITIVE MANUFACTURING: 3D PRINTING TECHNOLOGY

Study structure and design applications.

### Resources

Recorded video lecture

Merlot.org

[Link](#)



## 2.6 CRYSTAL GROWTH

Grow crystals to analyze 3D shapes.

### Resources

Lesson plan, instructions, worksheet, STL files

TinkerineU

[Link](#)



## 2.3 AUTODESK DESIGN ACADEMY MAKER CURRICULUM

Explore design concepts, principles and best practices.

### Resources

Datasets, software tutorials, videos, starter files, instructor manuals

Autodesk

[Link](#)



## 2.7 DENSITY

Test density using 3D printing.

### Resources

Lesson plan, instructions, worksheet, STL files

TinkerineU

[Link](#)



## 2.4 PRODUCT DESIGN: COMPUTER MOUSE PROJECT

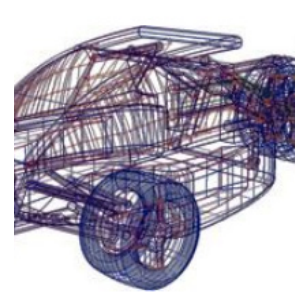
Learn about design planning, prototyping and ergonomics.

### Resources

PDF teaching guide, project plan, rubrics, STL files

Stratasys

[Link](#)



## 2.8 THE DESIGNER'S TOOLKIT

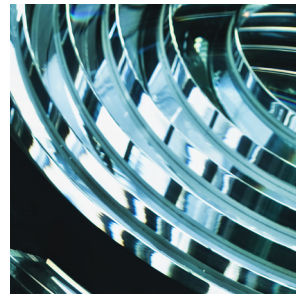
Review the design process and tools for 3D printing.

### Resources

PDF teaching guide, project plan, rubrics, STL files

Stratasys

[Link](#)



## 2.9 MIRRORS

Learn the effect of focal distance and curvature on mirrors.

### Resources

Lesson plan, instructions, worksheet, STL files

TinkerineU

[Link](#)



## 2.13 EAR BUD HOLDER

Use design thinking and processes to build an ear bud holder.

### Resources

PDF teaching guide, project plan, rubrics, STL files

Stratasys

[Link](#)



## 2.10 OPTICS

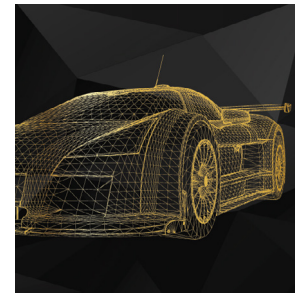
Design and cast lenses to learn the effect of shape and material.

### Resources

Lesson plan, instructions, worksheet, STL files

TinkerineU

[Link](#)



## 2.14 VOLUME AND SURFACE AREA

Design a race car to learn about shape, volume, and area.

### Resources

Lesson plan, instructions, worksheet, STL files

TinkerineU

[Link](#)



## 2.11 PRODUCT DESIGN: CHESS SET PROJECT

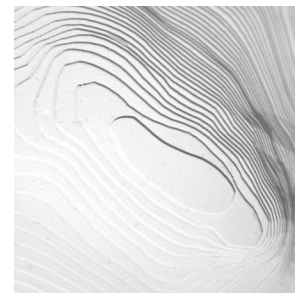
Use mathematical thinking and design to adjust size.

### Resources

PDF teaching guide, project plan, rubrics, STL files

Stratasys

[Link](#)



## 2.15 TOPOGRAPHY

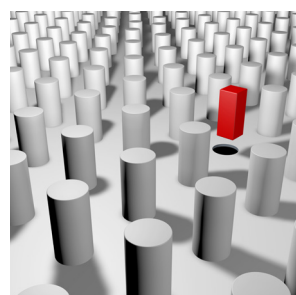
Design, build and use a 3D topographic map.

### Resources

Lesson plan, instructions, worksheet, STL files

TinkerineU

[Link](#)



## 2.12 UNCERTAINTY IN MEASUREMENT

Learn the effect of uncertainty on object manufacturing.

### Resources

Lesson plan, instructions, worksheet, STL files

Print Your Mind 3D

[Link](#)



## Lesson Videos

[VIEW ALL LESSONS](#)



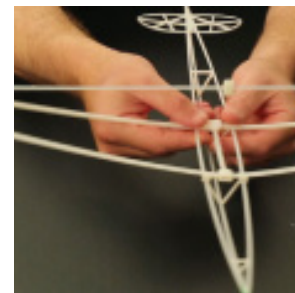
### 2.17 INTRO TO COMPLEX STRUCTURES: PRINT A MULTIPLIER

Create mechanisms that multiply movement in one build.

**Resources**

Video, lesson guide, sample design files

Stratasys



### 2.20 PRINT A GLIDER

Explore aspect ratio, strength and weight in a 3D printed model.

**Resources**

Video, lesson guide, sample design files

Stratasys



### 2.18 COMPLEX STRUCTURES: MULTI-MATERIAL RIDDLES

Design a structure for minimal friction.

**Resources**

Video, lesson guide, sample design files

Stratasys



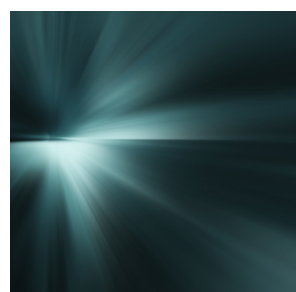
### 2.21 MATERIAL PROPERTIES: DESIGNING A CATAPULT

Learn how material properties affect the design-to-print process.

**Resources**

Video, lesson guide, sample design files

Stratasys



### 2.19 COMPLEX STRUCTURES: CREATING SPECIAL EFFECTS

Create a structure to influence light without assembly.

**Resources**

Video, lesson guide, sample design files

Stratasys



### 2.22 WEIGHT-SUPPORTING STRUCTURES

Learn about structural design, strength and failure, and optimization.

**Resources**

Video, lesson guide, sample design files

Stratasys

# HIGHER EDUCATION

A range of offerings from well-known higher education institutions and companies



## HIGHLIGHTS:

- 4D Printing ▶
- Bioprinting ▶
- Dynamic Surfaces ▶
- Gear Systems ▶
- Factory of Tomorrow ▶
- Fluid Dynamics ▶
- History ▶
- Parametric Design ▶
- Regulations ▶
- Sound Printing ▶



### 3.1 3D PRINTING APPLICATIONS

Learn how 3D printing and design thinking are used.

#### Resources

Pre-recorded videos, quizzes, projects

Cloudera/University of Illinois at Urbana-Champaign

[Link](#)



### 3.5 THE 3D PRINTING REVOLUTION

Explore how printing and customizing 3D designs is changing the world.

#### Resources

Pre-recorded videos, quizzes, projects

Cloudera/University of Illinois at Urbana-Champaign

[Link](#)



### 3.9 BIOPRINTING: 3D PRINTING BODY PARTS

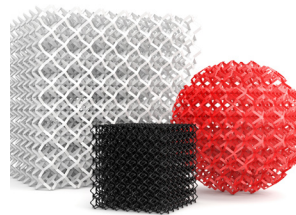
Design and print parts using bioprinting techniques.

#### Resources

Videos, audio, quizzes, articles

Futurelearn/University of Wolongong, Australia

[Link](#)



### 3.2 3D PRINTING CAPSTONE

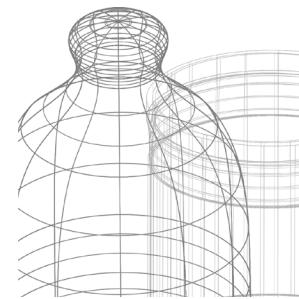
Design, make, and share a 3D printed object.

#### Resources

Pre-recorded videos, quizzes, projects

Cloudera/University of Illinois at Urbana-Champaign

[Link](#)



### 3.6 3D PRINTING SOFTWARE

Use Tinkercad and Fusion 360 to design a variety of objects.

#### Resources

Pre-recorded videos, quizzes, projects

Cloudera/University of Illinois at Urbana-Champaign

[Link](#)



### 3.10 ADVANCED SOUND PRINTING

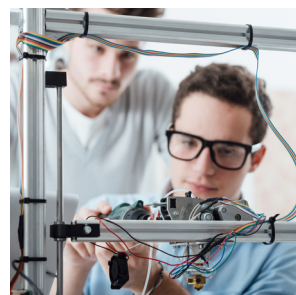
Design and print a sound tunnel for your mobile phone.

#### Resources

Lecture guides, lessons, PPTs, STL files, videos

Stratasys

[Link](#)



### 3.3 3D PRINTING HARDWARE

Learn about the use and repair of desktop 3D printers.

#### Resources

Pre-recorded videos, quizzes, projects

Cloudera/University of Illinois at Urbana-Champaign

[Link](#)



### 3.7 4D PRINTING

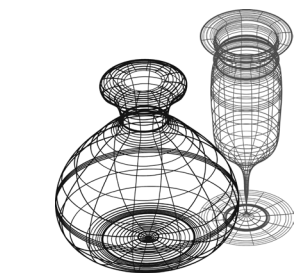
Learn how 4D printing impacts the design process.

#### Resources

Lecture guides, lessons, PPTs, STL files, videos

Stratasys

[Link](#)



### 3.11 CTRL+P

Use CAM software to prepare files for 3D printing.

#### Resources

Lecture guides, lessons, PPTs, STL files, videos

Stratasys

[Link](#)



### 3.4 3D PRINTING REGULATION & CARBON FOOTPRINT

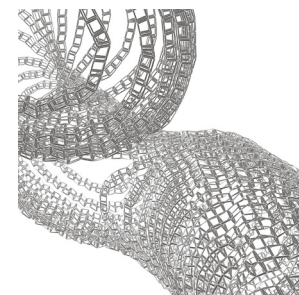
Learn about legal, ethical and environmental issues.

#### Resources

Lecture guides, lessons, PPTs, STL files, videos

Stratasys

[Link](#)



### 3.8 ADVANCED PARAMETRIC DESIGN

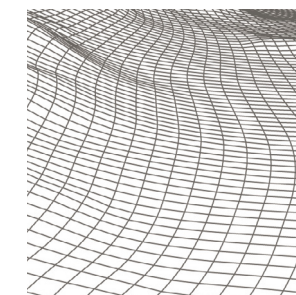
Learn about the impact of parametric design.

#### Resources

Lecture guides, lessons, PPTs, STL files, videos

Stratasys

[Link](#)



### 3.12 WHAT IS A MESH?

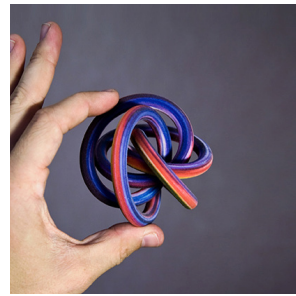
Design 3D mesh structures and prepare files for printing.

#### Resources

Lecture guides, lessons, PPTs, STL files, videos

Stratasys

[Link](#)



### 3.13 DYNAMIC SURFACES AND CHAINS

Learn dynamic surfaces concepts.

#### Resources

Lecture guides, lessons, PPTs, STL files, videos

Stratasys

[Link](#)



### 3.16 GEAR SYSTEMS PART II

Print and present kinematic gear models.

#### Resources

Lecture guides, lessons, PPTs, STL files, videos

Stratasys

[Link](#)



### 3.19 POST-PROCESSING

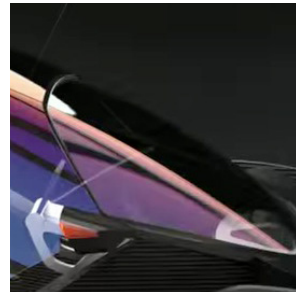
Explore FDM post-processing techniques for 3D printed models.

#### Resources

Lecture guides, lessons, PPTs, STL files, videos

Stratasys

[Link](#)



### 3.14 THE FUTURE OF FABRICATION

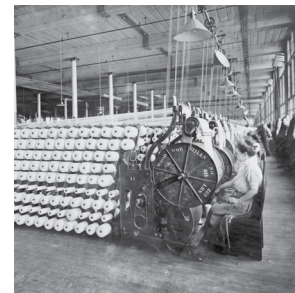
Learn innovative uses of 3D printing technology.

#### Resources

Lecture guides, lessons, PPTs, STL files, videos

Stratasys

[Link](#)



### 3.17 HISTORY OF 3D PRINTING

Review the history, design and programs from CAD to CAM.

#### Resources

Lecture guides, lessons, PPTs, STL files, videos

Stratasys

[Link](#)



### 3.20 FACTORY OF TOMORROW

Learn how 3D printing will change the way things are made.

#### Resources

Lecture guides, lessons, PPTs, STL files, videos

Stratasys

[Link](#)



### 3.15 GEAR SYSTEMS PART I

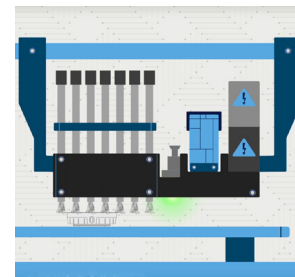
Build a 3D gear system model using appropriate tolerance and thickness.

#### Resources

Lecture guides, lessons, PPTs, STL files, videos

Stratasys

[Link](#)



### 3.18 INTRODUCTION TO 3D PRINTING TECHNOLOGY

Learn the unique advantages of additive manufacturing.

#### Resources

Lecture guides, lessons, PPTs, STL files, videos

Stratasys

[Link](#)



### 3.21 SOLIDWORKS ONLINE TRAINING

Learn how to use SolidWorks 3D CAD software.

#### Resources

Lesson plan, instructions, worksheet, STL files

SolidWorks

[Link](#)

# TELL US WHAT YOU THINK

We would love to hear how you are using these resources with your students, and any ideas you have for additional teaching and learning tools.

Doing an amazing project? Let us know and perhaps we will feature it here!

Contact us at [edu.info@stratasys.com](mailto:edu.info@stratasys.com)

The links provided are the latest available URLs as of the publication date of this guide.

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