

Medical Devices Lab Worksheet

Here you will find the instructions to create your own prosthetic finger using different 3D printing technologies! Follow all the instructions for this worksheet and fill in the blanks as you go.

STEP ONE: INTRODUCTION

What is biomedical engineering?

Biomedical engineering is the application of engineering principles and design concepts to medicine and biology for healthcare purposes.

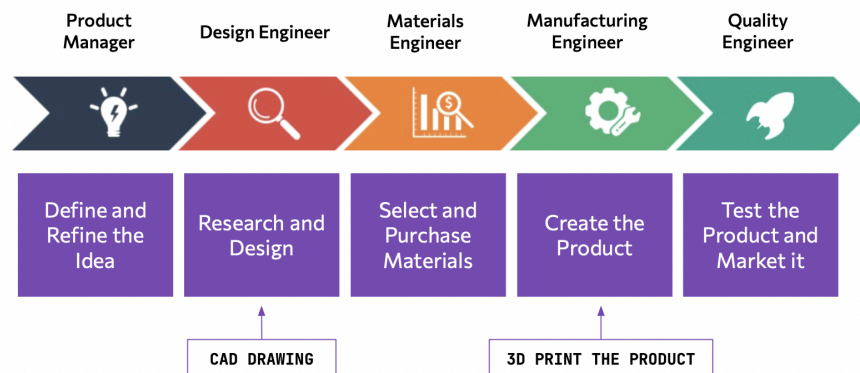
How is 3D printing used in medicine?

3D printing has changed the world of biomedical engineering because it is cheap, products are customizable, and the printing process is fast!

Answer Me! What are some medical devices that you think could be created using 3D printing? Click [HERE](#) to watch a video with some ideas!

STEP TWO: LEARN

What are the steps to 3D print an object? How do they fit into the engineering process?



CAD is important because it allows engineers to visualize a solution and test out different designs before physically creating the object! It is also important for sending designs to the manufacturer.

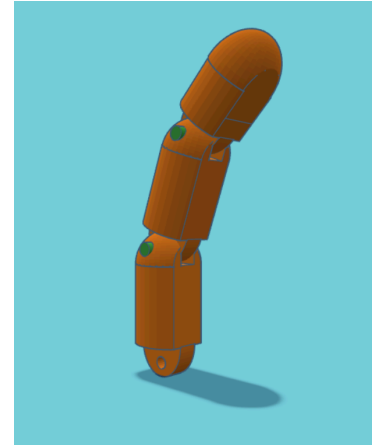
You will be using the TinkerCAD software to create your 3D prosthetic finger. Now that you have a better understanding of how the 3D process works you will be able to start your design!

STEP THREE: THINK

It's time to create your design for a prosthetic finger or hand!



Your group will be utilizing the engineering design process. What action will you take for each step of the process? Don't get discouraged if your first design is not your final design... it is rare that engineers get a perfect product on their first attempt. What matters most is a willingness to try again! Make sure to check in with each other after each step!



Answer Me! Pretend you are a biomedical engineer building a prosthetic finger. How would you use the Engineering Design Process so that the finger meets the needs of your customer?

As an engineer, you also have some design constraints. In the next step, make sure to take these into account while designing your finger!

- The maximum dimensions of your object are 10 cm x 10 cm
- The height of your object should not exceed 2 cm

STEP FOUR: RESEARCH

Now that you have thought about your finger design using the engineering design process, it is time to look a little deeper at your potential clients! Using the descriptions below, decide which client you would like to design a finger for.

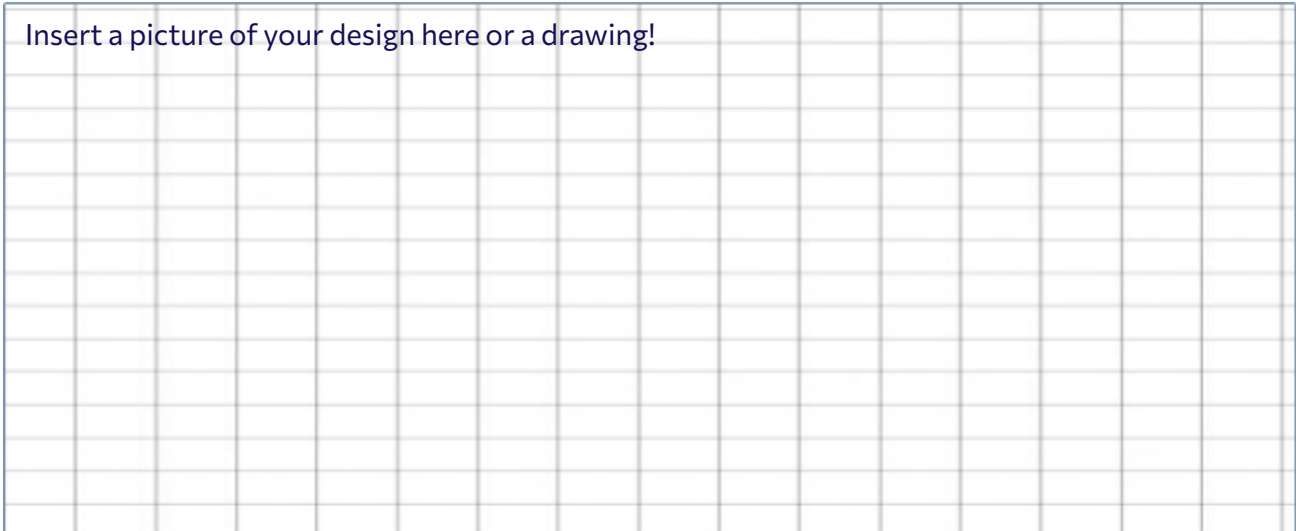
- ▶ **CLIENT #1** has a remaining portion of their finger that is 21 mm long with a circumference of 18 mm. They work in computer science, and need a finger that will have enough dexterity and specificity to type on a computer and not hit the wrong keys.
- ▶ **CLIENT #2** has a remaining portion of their finger that is 23 mm long with a circumference of 20 mm. They work in construction and need a finger that will be strong enough to work with the rest of their hand when carrying heavy objects.
- ▶ **CLIENT #3** has a remaining portion of their finger that is 19 mm long with a circumference of 17 mm. They are an artist and need a finger that will be able to hold a pencil or paintbrush when they are working.

Be sure to consider the following questions: Who are you designing your finger for? Is it a child, teenager, adult, etc...? Which finger are you designing? How will you attach it? What functionality is required? Do they need to button a shirt or play a violin?

Answer Me! How many bones and joints are you going to include? How are you going to attach your finger to the client? What kind of client did you choose? What is the reason why you selected him/her? And which finger(s) is/are required?

STEP FIVE: DESIGN

Insert a picture of your design here or a drawing!



STEP SIX: CREATE

Follow the steps below to create your TinkerCAD account!

1. Go to tinkercad.com
2. Click "Join Now" in the upper right corner of the screen
3. Click on "create a personal account"
4. Sign up with either your personal email or google
5. Enter your credentials and follow any further instructions!

Need a refresher? Click [HERE](#) to access a step by step



TinkerCAD tutorial video building a model prosthetic finger!

Note: When creating pins and holes, make sure the pins are no smaller than 3mm and can fit through the desired holes with room to move!

STEP SEVEN: REFLECT

Answer Me! Would you change anything about your design process? How did your end design turn out! Would you do anything differently? What went well?

Want to print your design and see it in real life? Scan this QR code for step by step instructions, or click [HERE](#).



STEP EIGHT: EXTEND (Optional)

Want to take your 3D Printing knowledge further with an optional extension activity? Click [HERE](#) or scan the QR code below for a tutorial on how to use another 3D printing software to develop different 3D designs!



STEP NINE: STUDENT EXIT SURVEY

Once you've finished the lab, please complete the [student exit survey](#) to share your feedback.