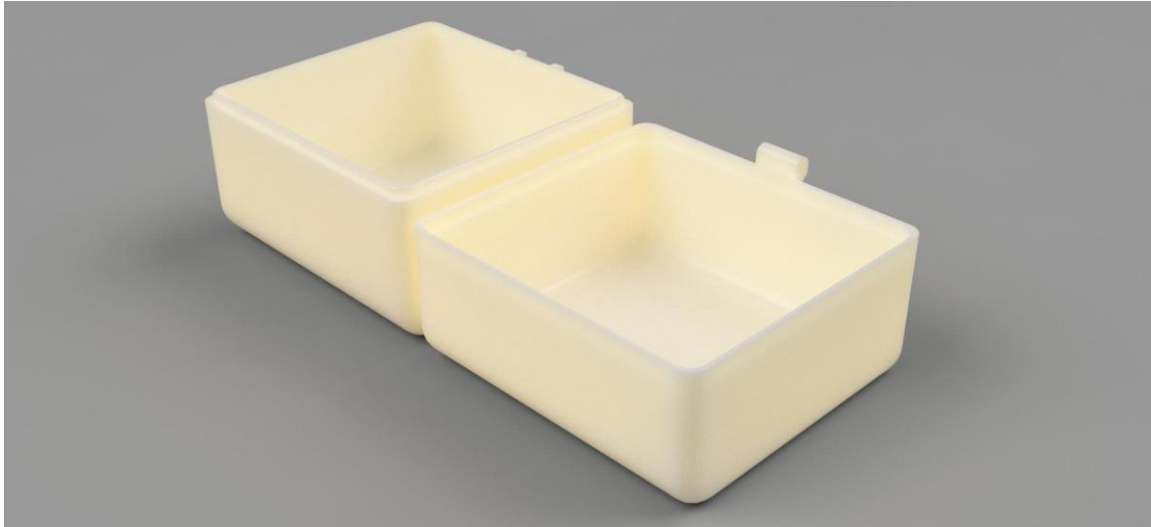
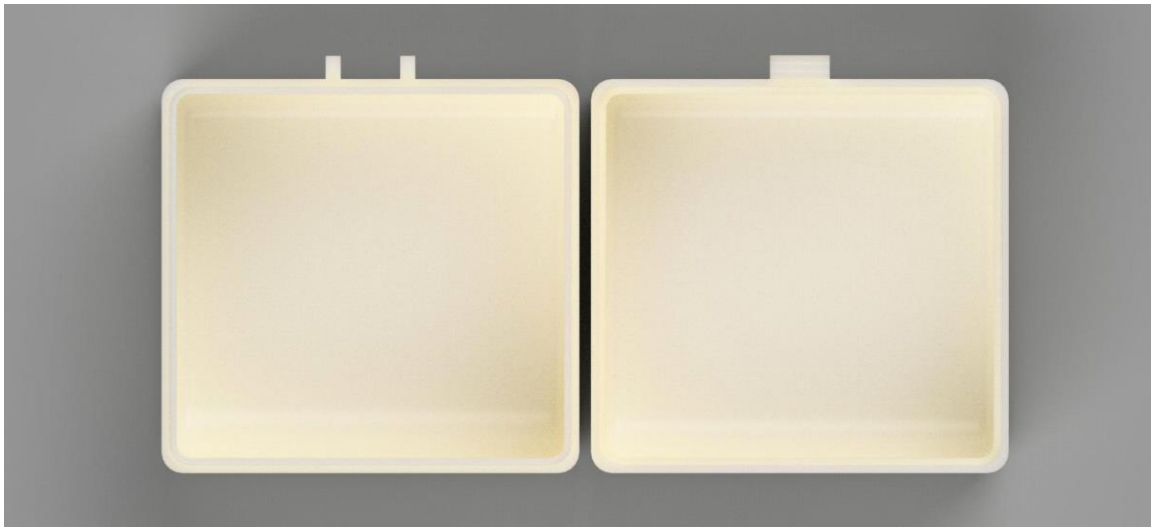


Medical Device Box



1 - Perspective View



2 - Top View

Student Name: Jordan Concepcion

Course Name: Additive Manufacturing

Course Completion Date: 1/14/21

Additive Manufacturing Course

Course Overview

Learn how to design and produce tangible 3D printed parts while confidently operating FDM (Fused Deposition Modeling) 3D printing equipment.

Prerequisites

Designing in CAD Basics, Additive Manufacturing Overview

Badge 1 – Design for 3D printing

- CAD programs to use for designing 3-D printed parts
- Unique properties of 3-D printing versus subtractive manufacturing techniques
- 3-D Printing considerations to CAD design

Badge 2 – Computer Aided Manufacturing for FDM

- Slicing software
- Controllable parameters that “slicers” allow for FDM printing
- Layout and orientation and affect a print
- Support creation and usage
- G-code basics
- Host software

Badge 3 – Fundamentals of FDM

- Components of FDM printer
- Operation of an FDM printer
- Safety considerations
- Common materials for FDM and the differences between them
- Calibrate of an FDM printer
- Advantages and limitations of FDM compared to other manufacturing technologies

Badge 4 – Post Processing FDM parts

- Support types and how to remove them
- Part smoothing
- Heat set-inserts usage

Badge 5 – Maintenance and Troubleshooting

- Regular maintenance of an FDM machine
- Troubleshoot and solve issues for FDM printing

Project Overview

Name:

Medical Device Box

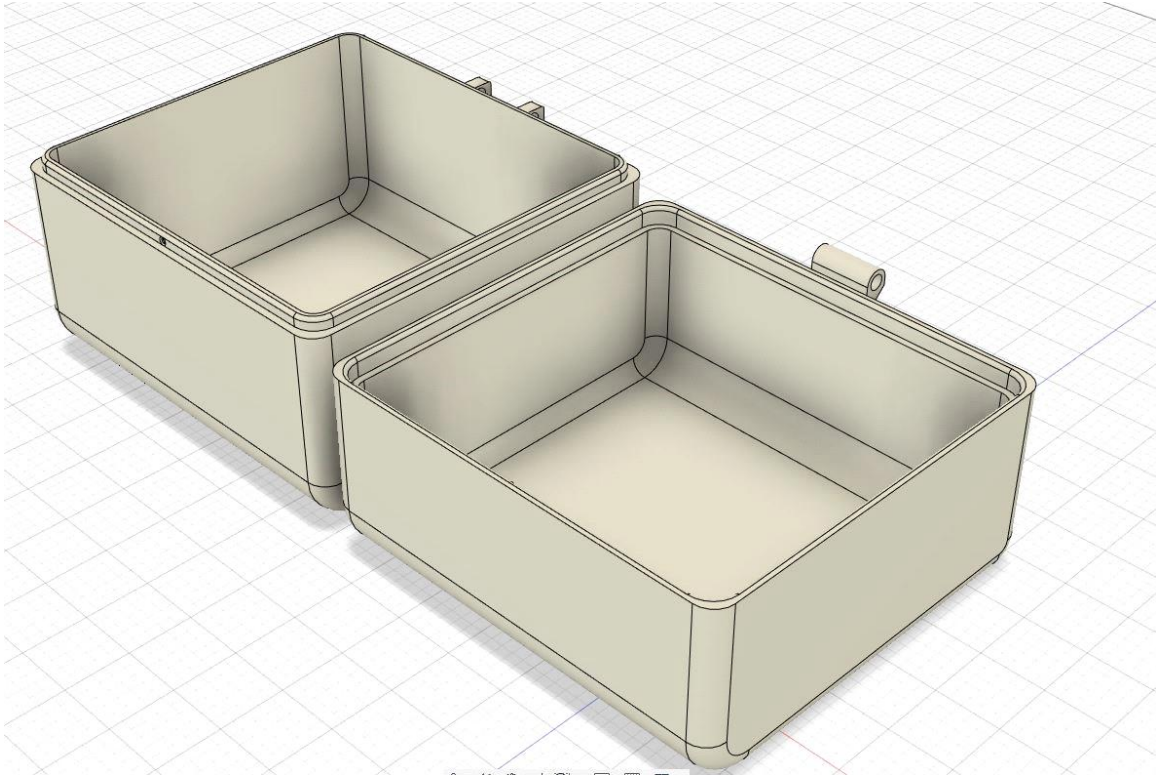
End use case:

At the very beginning of this course, my sister asked me if i could 3d print a box for a blood pressure monitor she uses at work.

The original box had a flap hinge to hold the box together when it was opened. This was one of the major design challenges of this project, as I had to completely redesign a hinge mechanism to replicate the opening and closing action of the original.

After printing a single prototype, I found there were some changes that needed to be made to the model so that it would fit and function properly. some design considerations i made were to print the box with supports to make the bottom radius as well as the hinges print nicely with minimal deformation. I also had to make sure that the thickness of the thinnest wall were evenly divisible by .4mm as that was my nozzle size.

Design for 3D printing



2 - Picture of CAD design

CAD software used:

Autodesk Fusion 360

Why CAD software was chosen for project:

This box was a reverse engineered design. Utilizing Sketch Based Modeling allowed for quick design iteration based on the dimensions that were measured using calipers and a micrometer. The Cad software allowed for accurate visualization and editing of the design.

Considerations taken while designing to ensure that 3D print would be successful:

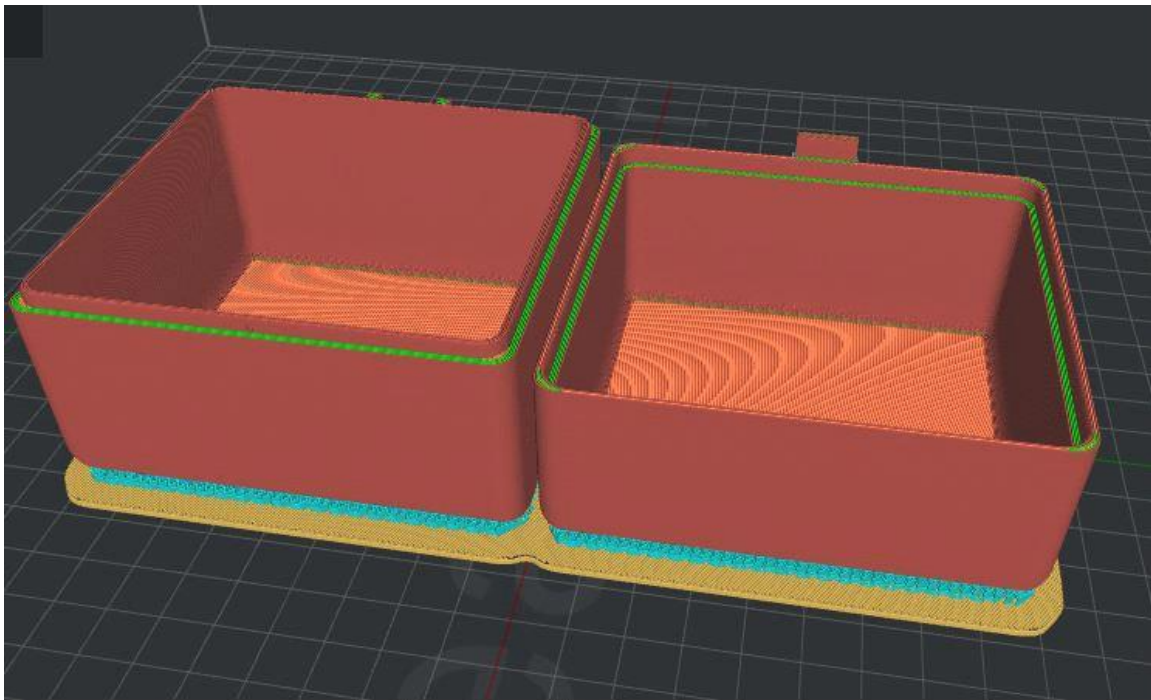
Orientation:

The part was printed with the holes in the hinge left out so that I could drill the desired hole size after the print was finished. The radius on the bottom of the box required support so as not to have a bad surface finish. The thinnest parts of the box needed to be evenly divisible by the size of the nozzle, in this case .4mm. There was no requirement for datums, however I wanted the surface finish to look nice and professional so I opted for .1mm layer height.

Surface finish:

There was no requirement for datums, however I wanted the surface finish to look nice and professional so I opted for .1mm layer height.

Computer Aided Manufacturing for FDM



3 - Picture of Slice

Slicing software used:

Idea Maker

Why Slicing software was chosen for project:

Functionality and printers default

Slicing parameters used and why:

Shells:

4 shells for surface finish and to ensure enough material around insert diameters.

Infill:

35% gy – provides adequate strength for end use while using less material. This reduces print time as well as material needed.

Support:

45 degree or greater - Touch build plate only to ensure smooth radius on bottom as well as no hinge deformation.

Rafts/brim/skirt:

Raft used to ensure dimensional accuracy and good first layer adhesion

Fundamentals of FDM



4 - Printer used

Machine used:

Raise3D Pro2

Machine info:

Type:

FDM

Style:

Cartesian

Build volume:

12 * 12 * 24 IN

Extruder type:

Direct drive

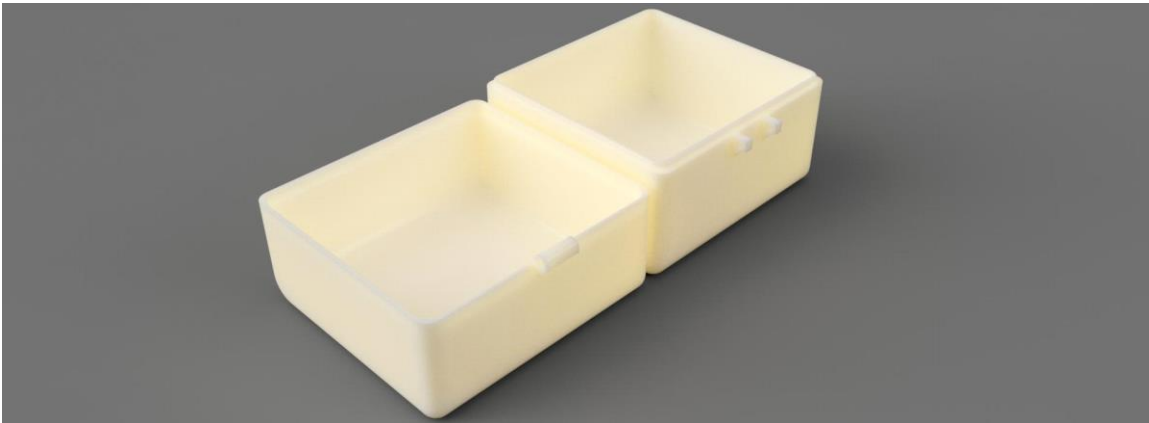
Nozzle type/ size:

Brass - .4mm

Firmware:

Marlin

Post Processing FDM parts



Post processing needed:

Smoothing:

Smooth on XTC

Support Removal:

Break away support were used to support the radius along the bottom as well as the hinges.