Project Two Worksheets (INDIVIDUAL)

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MILESTONE ONE (INDIVIDUAL): OBJECTIVES, MORPH CHART, & INITIAL DESIGN

MILESTONE 1 (STAGE 1) – LIST OF OBJECTIVES, CONSTRAINTS, AND FUNCTIONS

Please complete this worksheet in your corresponding team document.

MILESTONE 1 (STAGE 2) – MORPHOLOGICAL ANALYSIS

Please complete this worksheet in your corresponding team document.

MILESTONE 1 (STAGE 3) – PRELIMINARY CONCEPT SKETCHES (MODELLING SUB-TEAM)

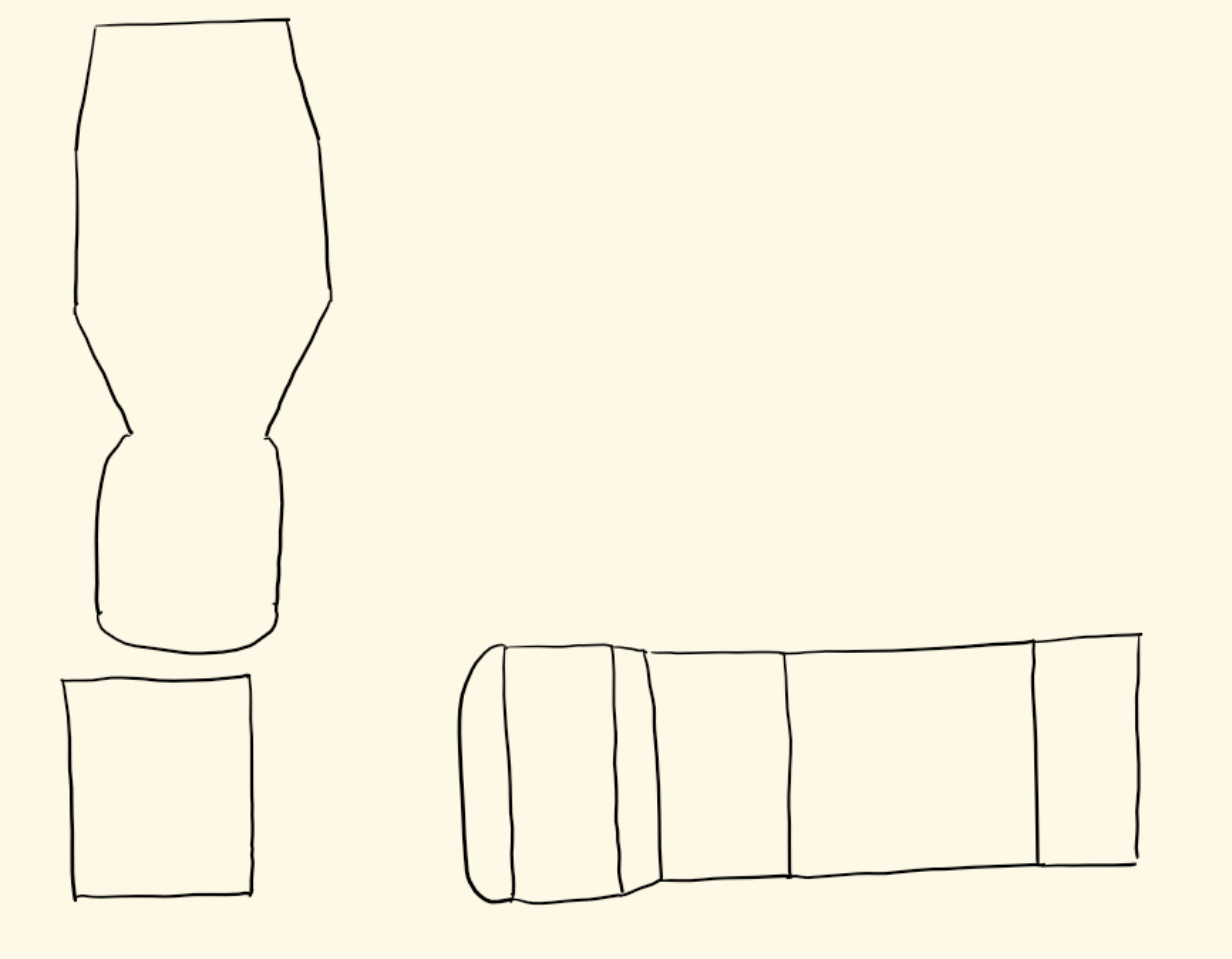
Team ID: Thurs-50

1. Complete your sketch on a separate sheet of paper
   → Be sure to clearly write your Team ID, Name and MacID
2. Take a photo of your sketch
3. Insert your photo as a Picture (Insert > Picture > This Device)

Team ID: Thurs-50

Name: Shadi El-Fares	MacID: elfaress

Insert screenshot(s) of your preliminary sketch below:



*For multiple sketches, please copy and paste the above on a new page

MILESTONE 1 (STAGE 3) – COMPUTER PROGRAM PSEUDOCODE (COMPUTATION SUB-TEAM)

Team ID: Thurs-50

Name:	MacID:
Write your pseudocode in the space below	

MILESTONE TWO (INDIVIDUAL): SUBTEAMS, SKETCHES, & WORKFLOW

MILESTONE 2 (STAGE 1) – LOW-FIDELITY PROTOTYPE (MODELLING SUB-TEAM)

Team ID: Thurs-50

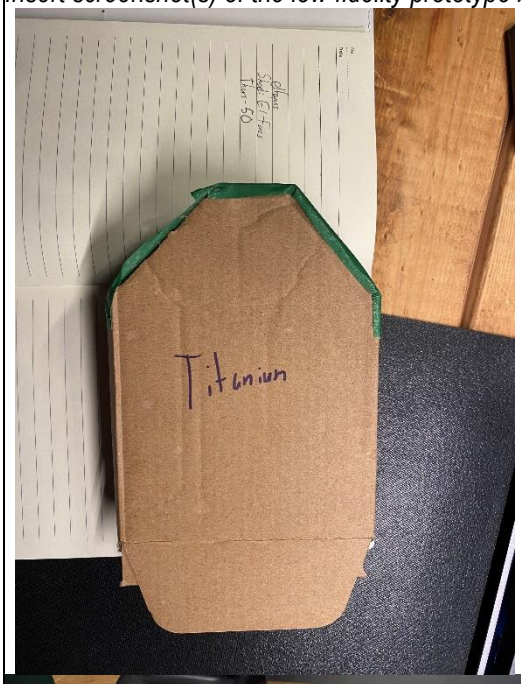
Complete this worksheet before design studio 8 while creating the low-fidelity prototype based on your group members preliminary concept sketch.

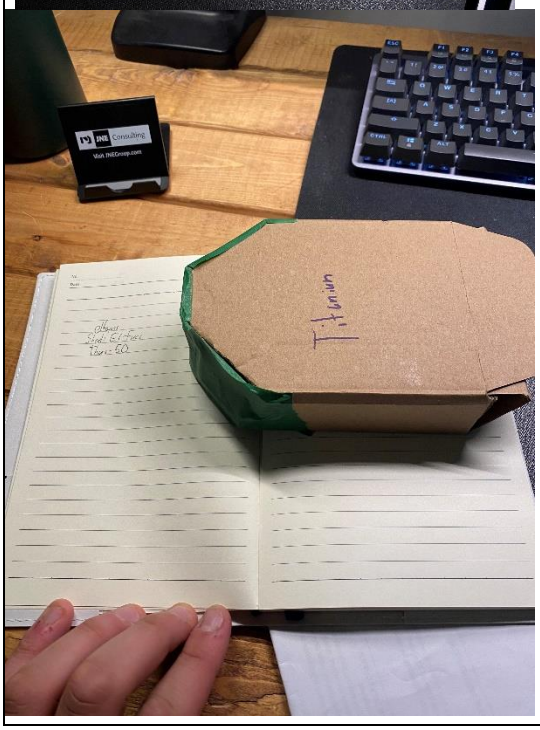
1. Take multiple photos of the low-fidelity prototype
    - Include an index card (or similar) next to the prototype, clearly indicating your Team Number, Name and MacID on *each* picture
2. Insert your photo(s) as a Picture (Insert > Picture > This Device)
3. **Do not include more than *two* prototype photo's per page**

Team ID: Thurs-50

Name: Shadi El-Fares	MacID: elfaress

Insert screenshot(s) of the low-fidelity prototype below





MILESTONE 2 (STAGE 1) – COMPUTER PROGRAM WORKFLOW (COMPUTATION SUB-TEAM)

Team ID: Thurs-50

Complete this worksheet individually before coming to Design Studio 8.

1. Complete your storyboard or flowchart sketches on a separate sheet of paper
   → Be sure to clearly write your Team ID, Name and MacID on *each* workflow
2. Take a photo of your sketch
3. Insert your photo as a Picture (Insert > Picture > This Device)

Team ID: Thurs-50

Name: Shadi El-Fares	MacID: elfaress
Insert screenshot(s) of your workflow below	

MILESTONE 2 (STAGE 2) – LOW-FIDELITY PROTOTYPE OBSERVATIONS (MODELLING SUB-TEAM)

Please complete this worksheet in your corresponding team document.

MILESTONE 2 (STAGE 2) – COMPUTER PROGRAM PSEUDOCODE COMPILATION & OBSERVATIONS (COMPUTATION SUB-TEAM)

Please complete this worksheet in your corresponding team document.

MILESTONE 2 (STAGE 3) – PRELIMINARY SOLID MODEL (MODELLING SUB-TEAM)

Team ID: Thurs-50

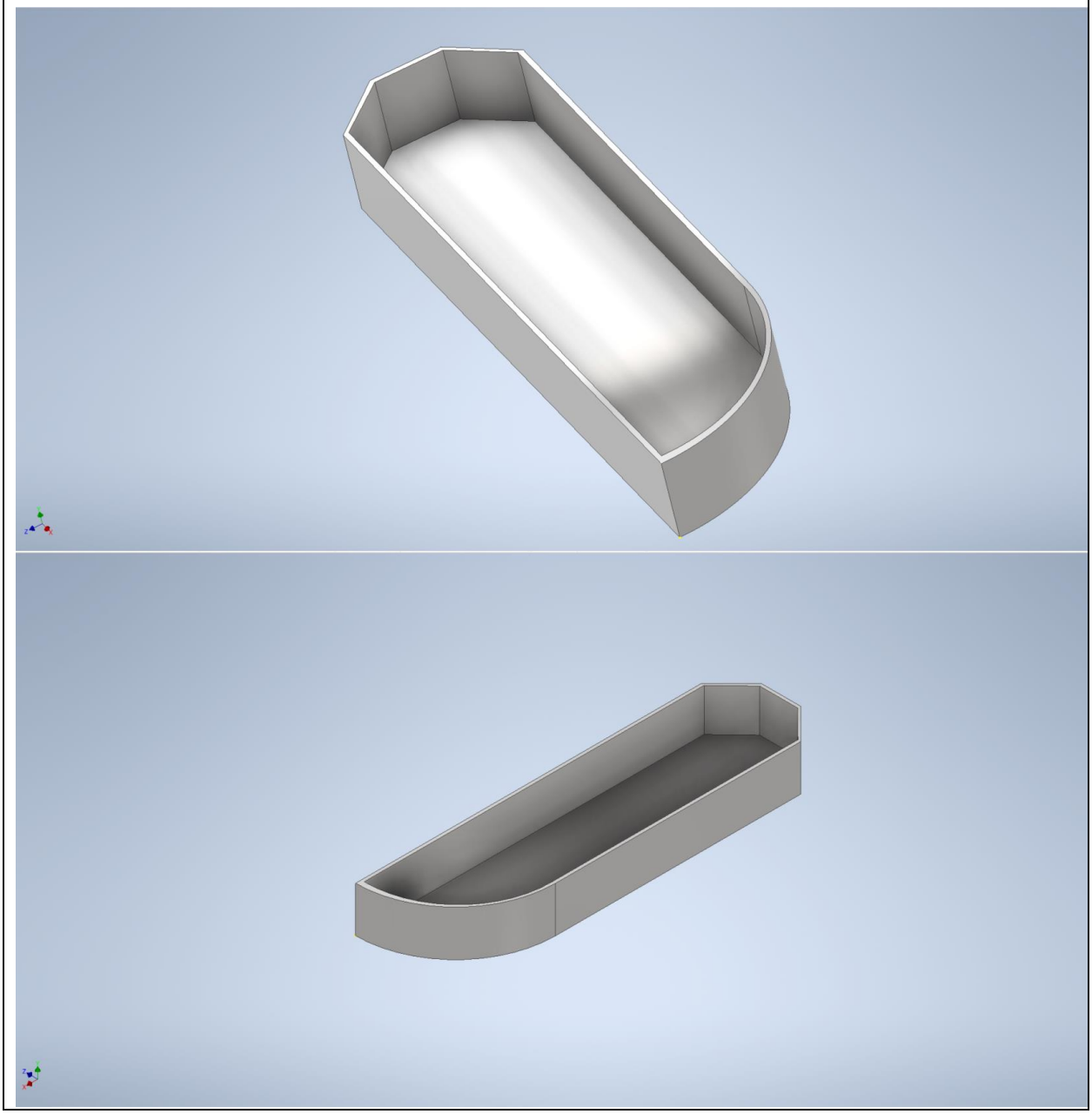
Complete this worksheet individually during Design Studio 8.

1. Take multiple screenshots of your preliminary solid model
   → You are also required to submit an IPT file of each solid model (see Submission Details section above)
   → Be sure to label model with your Name and MacID
2. Insert your photo(s) as a Picture (Insert > Picture > This Device)
3. **Do not include more than *two* solid modelling screenshots per page**

Team ID: Thurs-50

Name: Shadi El-Fares	MacID: elfaress

Insert screenshot(s) of your model below



*Limit screenshots to no more than 2 per page. For additional screenshots, please copy and paste the above on a new page

MILESTONE 2 (STAGE 3) – PRELIMINARY PROGRAM TASKS (COMPUTATION SUB-TEAM)

Team ID: [ ]

Complete this worksheet individually during Design Studio 8.

1. Take multiple screenshots of your code
   → You are also required to submit a Python (*.PY) file of your code (see Submission Details section above)
   → Be sure to label your tasks with your Name and MacID
2. Insert your photo(s) as a Picture (Insert > Picture > This Device)
3. **Do not include more than *one* screenshot per page**

Team ID:

Name:	MacID
Insert screenshot(s) of your code below	

*Limit screenshots to no more than 1 per page. For additional screenshots, please copy and paste the above on a new page

MILESTONE THREE (INDIVIDUAL): PRELIMINARY MODEL & CODE

MILESTONE 3 (STAGE 1) – INITIAL DESIGN OF FINALIZED STERILIZATION CONTAINER (MODELING SUB-TEAM)

Please complete this worksheet in your corresponding team document.

MILESTONE 3 (STAGE 1) – PROGRAM TASK PSEUDOCODE (COMPUTATION SUB-TEAM)

Please complete this worksheet in your corresponding team document.

MILESTONE 3 (STAGE 2) – STERLIZATION CONTAINER DESIGN EVALUATION (MODELING SUB-TEAM)

Please complete this worksheet in your corresponding team document.

MILESTONE 3 (STAGE 2) – CODE PEER REVIEW (COMPUTATION SUB-TEAM)

Please complete this worksheet in your corresponding team document.

INDEPENDENT MATERIALS RESEARCH ASSIGNMENT

MATERIAL SELECTION (STAGE 1) - PROBLEM DEFINITION

Use the following information to help you in your assignment:

- Function: The containers must securely contain a surgical tool during the tool's sterilization period.
- Fixed Variable: Radius, melting temperature (100^{O}C, steam)
- Free Variable: Wall thickness
- Objective: Must minimize cost and mass (material density and CAD)

Use the following MPI's to select your final material:

- Stiffness Design: $\frac{E}{\rho C_m}$
- Strength Design: $\frac{\sigma}{\rho C_m}$

Chosen Design	Chosen MPI	Objective
Stiffness Design	$\frac{E}{\rho C_m}$	Minimize cost and mass (density) while also minimizing any material deformation by through using the container.

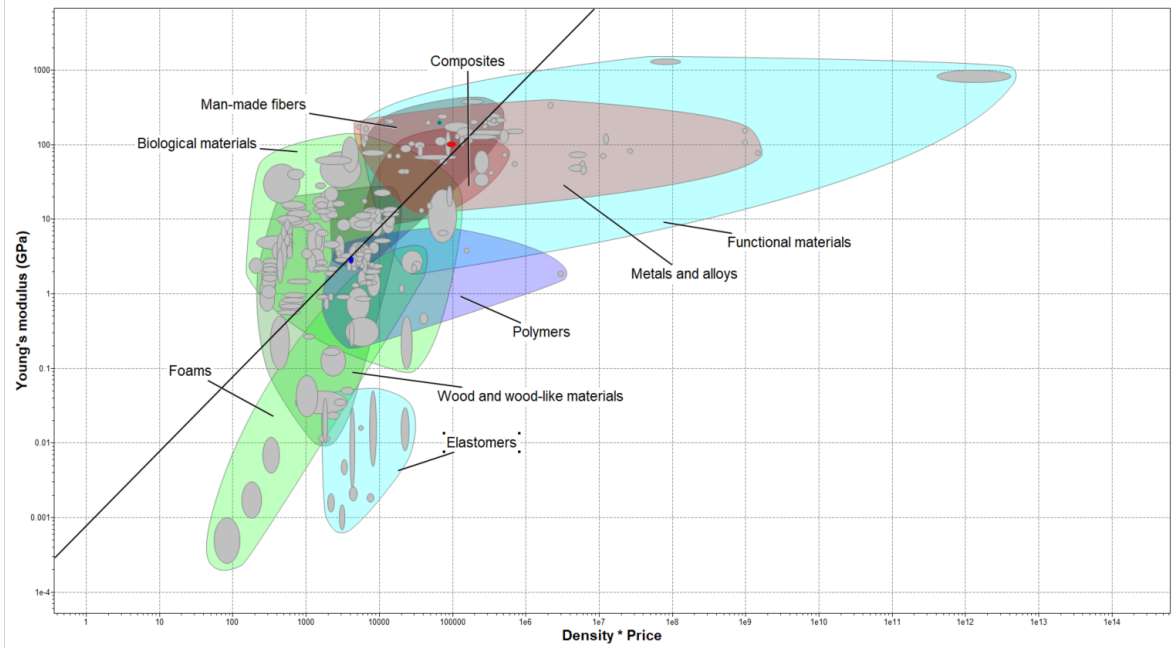
Please provide a short justification for your chosen design and MPI.

I believe optimizing the stiffness of the model should be a focus for the material chosen due to the significant count of openings located at the bottom of the container, that allow for proper sterilization. The large number of holes must be able to retain the added load of the surgical tool and reduce deformation in the container (i.e maximizing the strength).

MATERIAL SELECTION (STAGE 2) - MPI AND MATERIAL RANKING

Include a screenshot of your GRANTA graph in the text box below. The following should be included and clearly visible in your graph:

- X and Y axis
- MPI slope
- Material titles
    - The materials that you may choose from are those that are able to be 3D-printed (i.e., materials such as ceramics and glasses should be excluded from your database)
- Material family bubbles



Material Ranking			
	Rank 1	Rank 2	Rank 3
Assigned MPI:	Stainless Steel (Bio)	Titanium (Bio)	Polyoxymethylene(Acetal, POM)

MATERIAL SELECTION (STAGE 3) - FINAL SELECTION

State your chosen material and justify your final selection

Chosen Material:	Stainless Steel

Discuss and justify your final selection in the space below (based on the MPI results and any other relevant considerations).

Stainless Steel emerges as the optimal choice for our model, perfectly aligning with our twin objectives of augmenting stiffness whilst simultaneously reducing the density and cost of the material. These considerations take on paramount importance when viewed in light of the specific use case of our model, along with its stringent medical-grade requirements and high melting point constraints. The properties of Stainless Steel facilitate the creation of top-notch, medical-grade containers that surgeons can rely on. These containers maintain the sterility and cleanliness of their tools, serving as an indispensable asset in any surgical setting. The basis of properties in GRANTA, utilized medical grade and a minimum melting point of 140 degrees Celsius. In addition to the added properties above, Stainless steel will also add to sterility of the container, as blood and other external liquids will not stick to the container.

References (If any):

[1] Ansys GRANTA EduPack software, ANSYS, Inc., Cambridge, UK, 2023 (www.ansys.com/materials)

[2] B. Industries, “6 benefits to choosing stainless steel for Healthcare Applications,” Blickman, https://www.blickman.com/blog/6-benefits-to-choosing-stainless-steel-in-healthcare (accessed Nov. 25, 2023).