**Midterm Project**

**Introduction to Fabrication**

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**Basic Design and Assembly Project**

The midterm project for Intro to Manufacturing will require students to construct a wooden box. The details of this box are given below along with a grading rubric and other items that need to be delivered with this box. Goals are also listed. Please refer to the ‘Design Basics’ Presentation on the class website for further instruction, tips and ideas!

**Goals:**

1. Students to put new knowledge gained in first four modules to practice by experiencing actual power and hand tool usage, metrology skills and fastener handling.
2. Students will design a project from start to finish including: Designing for basic assembly, minimizing waste and picking proper fasteners for the intended function.
3. Hands on experience in the shop area
4. Gain new knowledge of actual design and manufacturing processes

**Deliverables:**

1. Design Drawing: a complete CAD drawing (preferably done in solidworks) properly dimensioned and clearly explained. (30 points)
2. Assembly Instructions: A list of instructions for manufacturing. (20 points)
3. Box: the physical wooden box should be turned in for grading. You will get it back. (20 points)
4. Memo: A one page memo, properly formatted, describing the project, what was learned, challenges and what would be done differently in the future. (30 points)

**Detailed requirements:**

 **Design Drawing and Assembly Instructions:**

The design drawing is vitally important to this project, and must be done before any construction can take place. Your design drawing should be completed in SolidWorks and should be two to three pages of drawings, including one page of assembly. Within the drawing, there should be an assembled picture of the box (as in how it will look when finished, with the lid) and also drawings of the various sizes of walls and cuts you will be making.

**Dimensions** should be clear and concise. Fastener holes should be accounted for, and properly sized. You do not need to draw and place actual fasteners in the drawing, just the holes and hole sizes you will be drilling.

**Tolerances** should also be included in the drawing and should be clearly labeled.

A **Bill of Materials (BOM)** should be included in the drawing. **This will serve as your assembly instructions.** For examples, please refer to the following link, or refer to the links on the website. You can also ask for instruction on this section from Paige. This is also briefly covered in the presentation.

 **Box requirements are listed below:**

1. Required dimensions of the cube:
	1. All outside dimensions will be between 3.75in and 4.25 in
	2. The walls of the cube will be at a thickness of ½”
	3. The bottom and top of the cube will be at a thickness of 3/8”
2. Fasteners:
	1. Fastener holes must all be predrilled
	2. Fasteners must be properly installed
	3. Fasteners should be appropriate for the part and project, and should not jut out of the wood at any location
	4. TRY to avoid splitting any wood (this means to crack the wood from forcefully applying pressure with a fastener or using a fastener that is too large and splits the material)
3. Minimization of waste:
	1. Each cut should be carefully calculated.
4. Lid/top of box:
	1. The top of the box will be removable. It should fit tightly on the top of the cube.
	2. All parts of the lid should be constructed out of 3/8” thick plywood
	3. A drawing of the lid type is shown



Figure 1: Box lid type. Should fit snuggly on top of your cube

1. Aesthetics:
	1. Box should be sanded lightly to remove splinters or rough edges
	2. Box should not have fasteners sticking out at odd angles

This table includes all requirements and grading rubric for the project.

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| --- | --- | --- | --- |
| # | Criteria | Description | Priority |
| 1 | Raw material | The plywood is standard 4X8 foot sheets. Only fasteners available in the Shiley shop shall be used. | Essential |
| 2 | Dimensions | All outside dimensions of the cube shall be between 3.75 and 4.25 inches | Essential |
| 3 | material thickness | The four sides of the cube shall be made from ½ inch thick plywood.The top and bottom of the cube shall be made from 3/8 inch plywood. | Essential |
| 4 | maximize material use (minimize waste) | The dimensions and tolerances shall be selected to maximize the use of material (minimize waste) assuming many identical boxes will be produced.\* | Essential |
| 5 | no wasted cuts | The dimensions and tolerances shall be selected to minimize the number of saw cuts required to produce multiple boxes.\* | Essential |
| 6 | Lid of Box  | The lid should be completely flush with the cube size at the top, and should secure in place with a small insert centered on the lid that fits within the inner dimensions of the box. The same thickness for the lid should be used for this inset.  | Essential |
| 7 | Fastening | Properly sized fasteners should be used for this project (nothing too long or too short) and they should be installed securely and properly.  | Important |
| 8 | Finishing | The box should be sanded and smoothed as to eliminate splintering issues or jagged edges.  | Important |
| 9 | Design for assembly | The dimensions shall be selected to minimize the chance of assembly errors\*\* | Important |

**Memo:**

The memo should be written in engineering memo format. It should be no longer than one page and should be addressed to the instructor. It should include a brief description of the project, describe the design and assembly process briefly, and should touch on any challenges faced during design or manufacturing. Keep it brief and professional.

**Due dates will be assigned later.**