

# Box Project

## Overview

---

For this project, each student will demonstrate competency in basic wood and/or metal working, shop protocol, safety, & tool use, and documentation of the Engineering Design Algorithm. Each student must design and create a decorative box, the end use of which is determined by the student. The deliverable is expected to be a “finished” product - meaning that it is neat, aesthetically pleasing, and devoid of flaws, blemishes, or unfinished faces/edges.

The intricacy and creativity of the box is entirely determined by the student, as long as it meets the basic requirements and constraints. However, students may earn bonus points by successfully achieving various levels of complexity in their deliverable. If awarded bonus points results in a final deliverable grade higher than 100%, excess points may be applied to future projects at student’s discretion. Up to 10% bonus points may be awarded for the following features:

- Puzzle locks, or intricate clasp/locking mechanisms
- Hidden or otherwise “clever” hinge mechanisms
- Hidden compartments or other secret features

## Constraints

---

- Internal volume of the box must be between 36 in<sup>3</sup> and 216 in<sup>3</sup>
- Overall cost of materials in the finished deliverable must not exceed \$10 (fair market value) of shop-supplied materials
- Box must have a lid, and be able to shut completely. Lid should fit snugly.

## Timetable & Design Process

---

- Conceptual Plan & Interview with Ms. Earnhart
  - Hand-drawn sketch (full-page, 3 views, dimensions, labels)
  - General materials list (not an official BOM)
  - Calculations of internal volume
  - Statement of Purpose & Function (What is it meant to hold? Who will use it? How will it work?)
  - Explanation of any special functions (hinges, puzzle locks, hidden compartments, etc.)
- Prototyping Phase
  - Create full-scale prototype using foam board, tape, etc.
  - Render all individual parts & whole assembly in SolidWorks (include drawings with dimensions in inches)
  - Create formal Bill of Materials (BOM) covering all parts including fastening, hinges, decorations, paint, etc.
  - Present & get approval from Ms. Earnhart
- Final Deliverable Phase
  - Get in the shop and build the thing!
  - **Finished deliverable is due on or before last class day of 1<sup>st</sup> six weeks (A: Sept. 30<sup>th</sup>, B: Oct. 1<sup>st</sup>)**
  - When deliverable is presented, student must prove that it meets all constraints.

## Evaluation

- Completion of Conceptual Plan & Interview with Ms. Earnhart: 1 homework grade (automatic 100% when approved)
- Completion of Prototyping Phase: 0.5 weighted Project grade (automatic 100% when approved)
- Completion of Final Deliverable: 1 weighted Project grade
  - Functionality: 33%
  - Aesthetics: 33%
  - Meets all Constraints: 34%
  - Up to 10% bonus points

### Evaluation Rubric

Category	1-20 Points	21-29 Points	30-33 Points
<b>Functionality</b>	Deliverable fails to function as a box. Structural integrity is questionable. Lid fails to fit, hinges don't work, etc. People might not know it's meant to be a box...	Deliverable functions, but has flaws such as: lid doesn't fit just right, hinges or other mechanisms stick. Box is sloppy and not fit for public sale/use.	Deliverable functions exactly as intended. Lid fits snugly, all mechanisms work without fuss. Box is completely "finished" and ready to present to the user.
<b>Aesthetics</b>	That's an ugly box. Rough edges, uneven surfaces, awkward corners and angles. No/little attempt at decoration.	Edges and corners are neat, flat, and smooth. Most surfaces are finished (painted, sealed, lacquered, etc.) and box is reasonably "decorative".	That's a beautiful box! Box goes beyond functional and is a work of art. There is a definite theme, and all parts of the box (inside & out) are finished (painted, sealed, lacquered, upholstered, etc.)
<b>Constraints</b>	Internal volumetric footprint nowhere near target. Total cost of box is nowhere near target. Box fails to have a lid, or lid fits very poorly.	Internal volumetric footprint is within 4 in <sup>3</sup> Total cost of box is no more than \$2.00 over target budget. Box has a lid, but doesn't fit snugly.	Internal volumetric footprint is within acceptable range. Total cost of box is \$10 or less (shop provided) Box has a lid, and fits as intended. (34 points if all are completed)