

# WHEAT FROM THE CHAFF

Kick Off Design Challenge

KNW2300: Introduction to Engineering Design, Spring 2015

Updates/clarifications:

- January 21, 2015
  - o Point 2 under challenge – language clarified regarding taking possession of the ball pit balls
  - o Minor language clarifications related to the same point as above.
  - o Details on how a tie with respect to points will be broken has been added under guidelines.

## Challenge:

Your challenge is to build a machine that can:

1. Start outside the black area of the circular inlay in the lobby of Caruth Hall. (See figure.)
2. Take possession as many ball pit balls from the center hula hoop as possible, without taking possession of any ping pong balls.

This will be a head to head, tournament style competition in which teams will compete for a pretty attractive grand prize (see below).

Guidelines:

- Two teams will place their machines directly across from one another at the edge of the black circle (below).
- You can trigger the machine once after the TAs start their timer. Your trigger may not utilize any structure that is independent from the machine or that the machine does not take with it to the center. For example, no ramps or catapults to get the machine into the center. Once you trigger the machine, you may not help/touch/interact with it for the duration of the competition. You may not push, kick, throw or use any other “human power” to propel the machine to the center.
- Your machine should take possession of as many ball pit balls (the larger, colored balls) as possible from inside the hula hoop sitting in the center of the seal. The hula hoop will be lightly affixed to the floor. You may not move the hula hoop from its position at any point during the competition. The team who takes possession of the most ball pit balls will win the round. To be counted, your machine needs to HAVE POSSESSION of the ball pit balls. This means your machine must be “in control” of the ball pit balls. The teaching staff will have the final word in how that gets interpreted, but at the very least that means balls cannot be touching the ground inside the hula hoop. If your machine has removed the balls from the hula hoop area they must not be rolling around. They must be clearly in your possession and under control. You will get one point for every ball pit ball in your possession at the end of the round.
- You may NOT remove any ping pong balls from the hula hoop area. This includes lifting them off the ground or knocking them out of the hoop. For every ping pong ball that your machine takes possession of, you will lose one point from your score for that round.
- In a given round, should there be a tie in the points accrued by the two competing teams, the tie will be broken based on the aesthetic & design qualities of your machine. In this case, “design qualities” relates specifically to the machine, and not the same categories that are part of the Design Prize (discussed later). The determination will be made by the professorial staff and their decision is final.
- The hula hoop will have 100 ping pong balls and 20 ball pit balls inside.
- You may not affix anything to any part of Caruth Hall.
- You will have 3 minutes to complete the task from the time you trigger the machine.
- Your team will have 2 minutes to set up your machine before the timer begins.
- We will run a tournament bracket to determine an overall winner between ALL class sections.
- TA’s will take great care in enforcing adherence to the constraints of this challenge. Any team found to be performing outside of the guidelines (of timing, material usage and other rules) laid out in this document will be disqualified. However, they will still be eligible for the Design Prize.

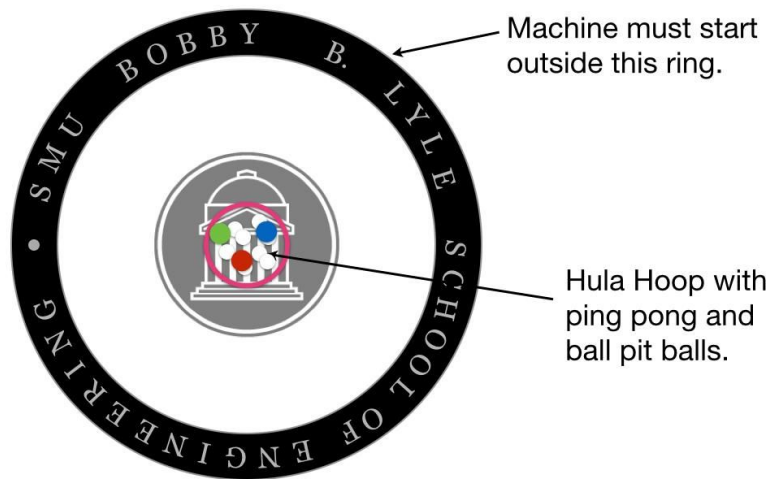


Figure 1: The floor seal in the lobby of Caruth Hall

**Materials:**

You can use ONLY the following materials for your machine:

- Foam core – provided; each team can have 3 sheets total (including those used for prototypes).
- Cardboard – any amount but it must be recycled; you may not purchase cardboard; we will not provide cardboard.
- 24"x24" piece of plywood (or similar material such as MDF), 3mm thickness.
- 3D Printer filament (for 3D printed parts only)
- Rubber bands – any size, any number; a limited variety will be provided.
- Paper clips – any size, any number; a limited variety will be provided.
- Flat washers – any size, any number, a limited variety will be provided.
- Hex nuts – any size, any number, a limited variety will be provided.
- 6 feet of string – a variety of string will be provided.
- 6 feet of dowel – a variety of dowel will be provided.
- Hot glue – unlimited amount; provided.

You may procure alternate rubber bands, paper clips, string or flat washers. If you have any doubt about whether your alternate choices will be permitted, we recommend you consult with one of the professors to have your item approved.

*Note:* Unlike previous semesters, duct tape has been removed from the allowable materials list.

**NOTE:** Your design **MUST** include one (custom-designed) part that has been 3D printed and at least one (custom designed) part that has been laser cut. **DO NOT PUT FOAM CORE INTO THE LASER CUTTER.**

**In the classroom:**

We will provide cutting mats, hot glue, x-acto knives and blades, metal rulers, map pins, a compass, and a hand saw and vise. All tools provided are for communal use among all teams across all sections. Do not remove tools from the classroom for any reason. If your team is known to have taken supplies from the room you will be disqualified.

You will have 24 hour swipe access to Junkins and the classroom. FYI, there happens to be video surveillance in this particular classroom. We just thought you should know that.

**Grand Prize:**

Each person from the winning team will receive a three percentage point bump in their *final* grade.

**Design Prize:**

Members of the teaching team will judge machines on the following:

- **Craftsmanship:** Did the team take care in constructing their machine? Does it look great?
- **Engineering:** Is the function, structure and material usage of the design sound, efficient and effective? Is the design unusual, surprising or clever?
- **Showmanship:** Is the presentation of the design an experience to behold? Are we delighted as an audience?
- **Teamwork:** Does this appear to have been a collaborative effort (this can be based on observation over the course of the project), and are all members involved in the design and presentation?
- **Effort:** Keep in mind effort can be rewarded even for a failed attempt. Fail with flair!

Each person from the highest scoring team across these categories will ALSO receive a three percentage point bump in their final grade. In the event that the Grand Prize winner and the Design Prize winner are the same team, there will only be a three percentage bump, not six. Don't even try to negotiate this.

**Schedule:**

Class 1 (week of 1/19): Intro to project, intro to foam core construction, begin working as a team.

Interim deadline: 1/26 at 11:59pm. We want to see that you have tried a lot of different ideas already one week in. To do this, we ask that you set up a blog that is accessible to the profs and TAs (We recommend tumblr or blogger, but it's up to you.), and photograph and comment on various attempts, failures, prototypes and iterations. For example "Here is a photo of the failed such and such mechanism. We learned that making our own springs out of paper clips isn't going to work." You should have at least **twelve photographs** and comments. We will provide an assignment on blackboard where you can link to this blog.

Class 2 (week of 1/26): You will have this class primarily as working time as a team.

Competition (Friday 1/30, 3:00pm). Meet in the lobby of Caruth.