

Group Design Project: Trebuchet

Fall 2011

The group design project will involve researching, designing, building, and testing a trebuchet. Detailed modeling of the trebuchet will be performed using Inventor and simulation will be performed using an online trebuchet simulator.

The group project will involve several milestones in order to make sure that progress is being made on the project throughout the semester. Dates and assignment descriptions are provided below.

| Date | Assignment |
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| R, 9-15 | <u>Group Assignment 1: Research on Trebuchets</u> – This is an individual assignment. Write a 1 page report on trebuchets. Try out the online trebuchet simulator and adjust various parameters to see how distance is affected. Make a screen capture of your best attempt and attach it to your report. |
| R, 9-22 | <u>Form Teams:</u> – The class will be divided into teams of 3-4 students per team. Team members should compare their trebuchet simulations and discuss the design of the trebuchet. Discuss the parts provided and what else might be needed. |
| T, 10-4 | <u>Group Assignment 2: Sketches</u> – Each team should turn in the following: <ul style="list-style-type: none"> • Sketch of your team's trebuchet design – show as much detail as possible • Letter each wooden part on the trebuchet. • Scaled sketch of each (unique) lettered part on rectangular graph paper showing key dimensions. Include the scale (e.g., 1 square = 2"). • Sketch of a 3.5" x 48" board showing how all of your lettered parts can be cut from the board. Don't forget to allow for the saw kerf (1/8"). • Include a cover sheet with a title, the group number, and the names of each of the group members. |
| T, 10-11 | <u>Group Assignment 3: Model Parts in Inventor</u> – Model all parts of the trebuchet except the sling. Use appropriate dimensions and constraints in the sketches, but detailed drawing files are not required yet. Parts to be modeled include the base, all wooden parts cut from the 1x4 lumber, the wooden dowel, and the steel rod. You can ignore fasteners such as screws. Include holes where dowels or rods will be inserted. Note that a model of the 2.5 weight has been provided on the course web site. Find the center of gravity of the arm and make sure that the hole for the steel rod is placed such that the arm will be balanced away from the weighted end. Each team member must model at least one of the parts. |
| T, 10-18 | <u>Group Assignment 4: Assemblies</u> – Two assemblies are required: <ol style="list-style-type: none"> A) <u>Trebuchet Assembly</u> – Use the trebuchet base as the <i>base part</i>. Add other parts to form the assembly. When completed, the trebuchet should move as designed. Add a motion constraint to make the trebuchet move over a reasonable range. Create a drawing for the assembly. Add balloons for each part and a table of parts. Include appropriate team information in the title box. B) <u>Cutting Plan Assembly</u> – Create an assembly consisting of all of the parts to be cut from the 1x4x48 lumber. Use a minimum of 1/8" offsets between parts. Create a drawing for the assembly. Add overall dimensions for the board length and width to show that they are no more than 3.5" x 48". All cuts must be |

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| | reasonable (discuss in class). Add balloons for each part and a table of parts. Include appropriate team information in the title box. |
| T, 10-25 | <u>Group Assignment 5: Detail Drawings</u> – Produce detail drawings for each unique wooden part to be cut from the 1x4x48” lumber. Include all dimensions. The instructor will cut the parts using these drawings, so be sure that they are accurate and have the instructor review them for completeness. Include appropriate team information for each part. Also include the author’s name (each team member must create at least one part and create the related detail drawing). Include the scale. Show the location of the center of gravity for the trebuchet arm. |
| T, 11-1 | <u>Cut parts returned – begin assembly</u> – Each team will be given two trials to determine how far their car can travel down the main hallway in the ATC. The winning team will earn bonus points. |
| T, 11-15 | <u>Trebuchet Testing</u> – The trebuchets will be tested outside on campus. Details on the number of trials and scoring will be provided later. Each member of the team with the winning distance will receive a 3 point bonus on their course grade! |
| T, 11-22 | <u>Group Assignment 6: Team Presentation</u> – Make a 10-15 minute PowerPoint presentation before the class. Also demonstrate the motion of your assembly before the class using Inventor. The presentation should include: <ul style="list-style-type: none"> • Team Information • Summarize the project requirements • Show initial sketch and discuss your design. • Show final assembly in Inventor and simulate the motion before the class. • Discuss problems you encountered and modifications made to your trebuchet. • Show a simulation of your trebuchet using dimensions that match your design. • Discuss the performance of your trebuchet. Compare the performance to other trebuchets in the class and to the simulation. • Discuss potential improvements that could be made to your trebuchet. Turn in a printout of the PowerPoint presentation to the instructor. |
| T, 11-29 | <u>Team assessment</u> – Turn in form rating the performance of your fellow team members. |