ME 1030 Final Exam & Research Report

Note: **This Final Research Report activity replaces the final exam for this course for this term.**

Course Grading: **This Final Course Report is worth 10% of your total course grade!**

Due Date: **The completed report is due 6 December for the Monday through Thursday ME 1030 sections and on 8 December for the Saturday sections.**

Task

You will do independent research on the design, development, testing, and analysis of one of the three following machines:

A. Small scale trebuchet to be used in the Wright State University Trebuchet Competition in December 2013.
B. Small scale soda bottle rocket launcher capable of shooting a two liter soda bottle repetitively and at different angles.
C. BOE BOT basic stamp driven robot to be used to simulate the 'basketball operations' as demonstrated in the class videos.

Specific Instructions for each option:

If you select option:

A. **The Trebuchet.** You must use the Wright State University rules and regulations found at the Internet link below. You must 'design' your machine to meet or exceed all the rules and regulations for the 2012 competition. You must use either the Wintreb software or an equivalent one for your initial, conceptual model of the trebuchet. You may use Matlab, SolidWorks, or any other CAD/CAE software to perform design and analysis activities. You must address all of the issues discussed in the section below on what to include in your report.

   http://www.cecs.wright.edu/students/activities/trebuchet/home

B. **The Soda Bottle Rocket Launcher.** You are expected to produce a design of a machine that can launch at least three different two liter soda bottles **at the same time or individually**. Each individual soda bottle must be able to launch at different angles from 0 to 90 degrees. Each bottle must be at least 12 inches from another soda bottle to prevent injuries or accidents to a user. Design at least two different types of 'retaining fixtures' for the soda bottle to stay in place before firing. Design a stable platform that can launch all three bottles and not tip. Design the machine so you can reload one bottle and not affect the performance of the other two bottles. You may use Matlab,

SolidWorks, or any other CAD/CAE software to perform design and analysis activities. You must address all of the issues discussed in the section below on what to include in your report.

C. **The BOE BOT Basketball Simulation. You are to design a set of two BOE BOT robots to simulate the playing of an American basketball game as shown in the videos in the classroom.** You must discuss all the components, devices, fixtures, throwing or retaining fixtures needed to simulate the game. You are produce **valid computer programs** a person can implement and demonstrate the performance of the game. You must include a discussion of the types of sensors and control devices for this activity. Include proper pin outs, component implementation and configuration details in your report. You may use Matlab, SolidWorks, or any other CAD/CAE software to perform design and analysis activities. You must address all of the issues discussed in the section below on what to include in your report. The website below shows the video of a group, who have performed this activity at another university.

*forums.parallax.com/content.php?25-**Boe-Bot-Basketball***

Report Structure

The report should be at least 10 (10) pages plus the additional pages of the bibliography and appendices. You must have at least five (5) documented research and literature review resources. At least one research source must be a textbook in a valid library. The coversheet does not count as a page. Photographs, images, tables, or other illustrations may not cover more than 40% of any single page. Use any format you wish for your bibliography.

Please understand, WIKIPEDIA IS NOT A RELIABLE RESOUCE! It **may not** be cited as a reference source in the body of the text or in the bibliography.

Your final report is to be double spaced, with 12pt font. You are expected to use Times New Roman font. Include a cover page. You must print copies of each website you visit for your report, even if, you did not include the material in your writing. All the information in the research you obtain must be included in the appendices. The report appendices may add several pages to your report. If you cannot staple your report, go to the Mechanical Engineering Department office and use their 'large format stapler'.

What is a literature review, then?

A literature review discusses published information in a particular subject area, and sometimes information in a particular subject area within a certain time period.

A literature review can be just a simple summary of the sources, but it usually has an organizational pattern and combines both summary and synthesis. A summary is a recap of the important information of the source, but a synthesis is a re-organization, or a reshuffling, of that

information. It might give a new interpretation of old material or combine new with old interpretations. Or it might trace the intellectual progression of the field, including major debates. And depending on the situation, the literature review may evaluate the sources and advise the reader on the most pertinent or relevant.

But how is a literature review different from an academic research paper?

The main focus of an academic research paper is to develop a new argument, and a research paper will contain a literature review as one of its parts. In a research paper, you use the literature as a foundation and as support for a new insight that you contribute. The focus of a literature review, however, is to summarize and synthesize the arguments and ideas of others without adding new contributions.

What to include in your report:

The report should contain the following sections:

- **Cover Sheet:** Include course name, project title, submitted by, submitted to, submitted on and other pertinent information. Do NOT include a graphic on this page.
- **Abstract:** 250 word summary of the research you conducted.
- **Introduction:** Explains to the reader what they are about to read. This is NOT a summary.
- **Purpose:** Why are you writing the report and what is the significance of your selected machine?
- **Research and literature review**: Try to obtain information about your selected machine that answers the following questions: What is the function of the selected machine? Who uses the machine today or in the past? Who studies these types of machines today? What types of current versions of your machine is used today? Discuss the significance of miniaturization as it applies to your machine. What jobs can you obtain (potentially) in the research and production area for your machine? What other universities use the selected machine in their course of study? Include any other relevant information to this topic.
- **Design:** This section must include engineering sketches of an initial design, valid engineering computations (at least five different engineering computations for your selected machine), software models, computer programs and an explanation of the functions, computer-aided designs (if applicable) of your designed machine, bill-of-materials (BOM), sources of materials for the machine (as if you actually were to construct the machine), advantages and disadvantages of materials selected for the project, and a final design for your machine.
- **Analysis:** This section must include at least two pages of valid engineering analysis on your selected machine. Types of analysis might be what is the maximum payload, thrust, torque, or travel produced by your selected machine. Other analysis may focus on the

different performances of materials (yield strengths, loading, etc.). Include at least one tabulated set of experimental results with your designed machine.

- **Conclusion:** What did you learn? How will you use this new information? Do you have any recommendations for future students doing the same research paper?
- **Bibliography:** You may use any valid method (APA, ASME, IEEE, ISI, DOD, etc.)
- **Appendices**: Include printed copies of each source used to develop this paper.

What to submit and to whom:

You must submit one paper copy of your completed report to the course instructor only. This will not be accepted through any other person (teaching assistant, friend, boss, parent, etc.). The instructor may request an electronic copy, if grading issues arise. Please be prepared to submit one, if requested.