ENME 204 Project Deliverable 7

Final Report

Due: May 21 at 11:59pm. This is predominantly a group assignment, with an additional individual component. For the group assignment, one assignment per team should be submitted on Blackboard as a .pdf. For the individual assignment, one assignment per individual should be submitted on Blackboard as a .pdf.

Report Format:

This report is a rigorous documentation of your design process. While there is no formal page minimum or maximum, most quality reports are around 12 pages of text (in addition to the title page, table of contents, references, and images.)

Font should be 11-point, Arial, Times New Roman, or similar. Margins should be 0.75" inches on all sides. Font should be single-spaced. Statements should be supported with references. Figures and tables should have figure and table captions, which may be 10- or 11-point font. IEEE reference format should be followed. All pages of the report except the cover page should include page numbers.

A few example reports are posted. Please note that instructions from the sample report and your report are not identical. Please read the instructions of this deliverable.

This group report is worth 25% of your team design project grade and the individual report is worth 50% of your individual design project grade. This is 7.5% and 2.5%, respectively, of your overall grade.

Group Report Sections:

1) **Title (Cover) Page**
    - **a)** Title (e.g., "ENME 204 Project Final Report")
    - **b)** Team name
    - **c)** Names of team members
    - **d)** Date
    - **e)** Picture of final product. This picture does not need a figure caption, but all other figures in the report do.

2) **Table of Contents**
    - **a)** Report section name and page number
    - **b)** List of figures, tables, graphs with page numbers

3) **Team Contract.**
    - **a)** Goals

i) What were your team's goals at the beginning of the project? You may find it helpful to look back to Deliverable 1A.

ii) Now that the project is at the end, reflect on these goals. To what extent did you succeed or fail? Knowing what you know now, would you change the goals that you outlined at the beginning of the project?

b) Working style

i) What is each team members' working style, including their true color and/or 16 personalities assessment? How did you expect this to inform your teams' strengths and weaknesses? In what ways did you expect you may need to compromise to work well together? You may find it helpful to look back to Deliverable 1A.

ii) Now that the project is at the end, reflect on these working styles. To what extent were you right or wrong about how your personalities informed your strengths and weaknesses? To what extent were you right or wrong about how you may need to compromise to work well together?

c) Team performance expectations

i) What did you expect of one another at the beginning of the project? What rules did you agree on to help you meet your goals and expectations? You may find it helpful to look back on Deliverable 1A**.**

ii) Now that the project is at the end, reflect upon how well your team wrote and followed expectations. To what extent did your team meet or fail to meet these expectations? Knowing what you know now, would you change the expectations you outlined at the beginning of the project?

d) Strategies for conflict resolution

i) At the beginning of the project, how did you decide that you will make decisions if you disagreed? How did you decide you will address non-performance regarding the goals you outlined? You may find it helpful to look back to Deliverable 1A.

ii) Now that the project is at the end, reflect upon these strategies for conflict resolution. Did you need to use them? Did you use them well? Knowing what you know now, would you change the strategies for conflict resolution that you outlined at the beginning of the project?

4) Project Definition. This section and beyond should contain numerous references.

a) Background

i) Why is toy accessibility important? What are the problems with the accessibility of toys?

ii) You may find it helpful to look back on Deliverable 1B. However, this section should be updated to reflect your current understanding of the background and the project direction you took.

b) Discover design projects.

i) What are opportunities to design a more accessible toy? Please describe at least two directions that are identified based on technology push, two that are identified based on market pull, and two that are identified based on product change. Please make it clear which project directions correspond with technology push, market pull, or product change. You may find it helpful to look back on Deliverable 1B.

c) Choose projects

i) What project direction did you choose? Which of the three "discover design project" directions best fits the project you choose? Please describe your reasoning.

a) Plan project: tasks and schedule

i) Planning the tasks and schedule is a part of project definition. Now that the project has come to an end, include an up-to-date Gantt chart.

ii) In paragraph form, reflect upon your original Gantt chart (from Deliverable 1B) and your final one. To what extent were you correct about your intended timeline? To what extent were you incorrect?

b) Plan project: costs

i) Estimating costs is a part of project definition. Now that the project has come to an end, include a budget table with itemized expenses and a total cost spent.

(1) If your team 3D printed with us, your budget is charged $\$5/in^3$

(2) If your team 3D printed at home/at a private printer not accessible to every person in ENME 204, your budget is charged $\$5/in^3$ or you must justify an alternative budget

(3) If your team 3D printed at another UMBC resource that is accessible to everyone at UMBC (e.g., the new 3D printer in the library), you can charge whatever amount you were charged there.

(4) Please be clear in your paragraphs (below) about your reasoning for the cost you charged if it is different than $\$5/in^3$

ii) In paragraph form, describe what your budget was, the general breakdown of your expenses (3D printing, other parts, shipping, etc.), and whether you fit within your budget.

5) Product Definition

a) Identify customers

i) Identify customers. Who makes the decision to buy or recommend the product you developed? Who uses it? Who is it used with? You may find it helpful to look back on Deliverable 2A. However, this section should be

updated to reflect your current understanding of the customers and the project direction you took.

b) Generate customers' requirements

i) What are the customers' requirements? Please be sure to consider and address requirements with consideration of public health, safety, welfare, as well as global, cultural, social, environmental, and economic factors. How did you identify the customers' requirements (i.e., scholarly sources, talking with needs experts)? You may find it helpful to look back on Deliverable 2A and/or 2B. However, this section should be updated to reflect your current understanding of the customers' requirements and the project direction you took.

c) Evaluate competition

i) What products are competitors of your product? How is your product different? What need(s) do your product meet that other competitors do not? You may find it helpful to look back on Deliverable 2A and/or 2B. However, this section should be updated to reflect your current understanding of the competition and the project direction you took.

d) Generate engineering specifications and set targets

i) What engineering specifications should your project meet? Are these specifications discriminatory, measurable, orthogonal, universal, and external? You may find it helpful to look back on Deliverable 2B. However, this section should be updated to reflect your current understanding of engineering specifications and the project direction you took.

e) Quality function deployment (QFD)

i) Include a QFD. You may find it helpful to look back on Deliverable 2B, but your QFD should be updated to reflect your current understanding and the project direction you ultimately took. The team has found that many students are not reading the instructions and lose points as a result. If you are reading the instructions, email the whole teaching team your funniest appropriate meme and we will grant you some extra points. These extra points are individual and the fewer students that email us, the more points you get.

ii) What were the results of the QFD? How did the QFD drive your team's decisions?

6) Conceptual Design

a) Concept generation

i) Describe your concept generation process and highlight at least 3 concepts generated. Describe the brainstorming method(s) used. You may find it

helpful to look back on Deliverable 3. However, this section should be updated to reflect your current understanding and the project direction you took.

b) Concept evaluation
  - **i)** Create a Pugh's Matrix to evaluate your concepts.
  - **ii)** What was the results of the Pugh's Matrix? How did the Pugh's Matrix drive your team's decisions?

7) Product Development

a) Generate product(s)
  - **i)** What did you generate (you should describe your final product and any prototypes you generated)? What is the products mechanism? Which part(s) are 3D printed? Describe the product, mechanism, and 3D printed component in paragraph form and with images. Include CAD drawings/sketches and pictures of the product.
  - **ii)** Include a bill of materials. List all parts and supplies (including descriptive names) with part number.
  - **iii)** Standards. How does the design adhere to the standard discussed in class?

b) Evaluate product
  - **i)** Complete a FEM on a part of subsystem of your toy. Apply appropriate loading and explain why you chose that amount.
  - **ii)** Include a description of any other engineering analysis you conducted in designing your product and/or in evaluating the function of your product after you created it.

8) Discussion

a) Universal design principles
  - **i)** In what ways does your final product meet (and fail to meet) the universal design principles?

b) Needs experts interactions
  - **i)** Which needs experts did you interact with to inform your project? At what stages did you interact with them? What did you ask them and learn from them? How did their feedback inform your design process?

c) Future work
  - **i)** If you had another semester to work on this project, what would you do next? What changes would you make?

9) References/Bibliography – IEEE format

a) With the exception of the executive summary (below), statements should be supported by references throughout the report.

10) **Appendices**
    - **a)** Appendix A. Poster.
    - **b)** Appendix B. Respective contributions. What did each team member do in each step of the process?
    - **c)** Appendix C. Acknowledgements.
    - **d)** Anything else you think would be useful to explain your design process. The team has found that many students are not reading the instructions and lose points as a result. Please ensure you have read this document in its entirety.

Individual Report Sections:

1) **Executive Summary**
    - **a.** Summarize your project in one paragraph.
        i. If a reader only read this paragraph, would they have a basic understanding of what you designed, how you designed it, and why you designed it? They should.
    - **b.** This paragraph should be the most highly edited, perfect paragraph in the report.
    - **c.** Most executive summaries are about ½ - ¾ of a page and they should not exceed one page.
    - **d.** Executive summaries do not need references, but everywhere else in the report does.
    - **e.** Executive summaries should have their own page and should not share a page with the table of contents or title page.
2) **Respective contributions comment.** To what extent do you agree with the respective contributions listed in your group report? To what extent do you disagree? Please write 2+ sentences to describe your agreement and/or disagreement.