GEORGIA INSTITUTE OF TECHNOLOGY
George W. Woodruff School of Mechanical Engineering
ME 2110 - Creative Decisions and Design
Summer 2017

STUDIO 1

INTRODUCTORY DESIGN PROJECT: RESOURCE CONSERVING TOOTHBRUSH

PearlyWhites, co. plans to release a new environmentally sustainable toothbrush offering in the $5-$50 cost range to meet customer requests for more sustainable products. Your manager believes that opportunities exist to: (1) create a better toothbrush that reduces environmental impact by reducing the need for dental office visits; (2) reduce use of water and toothpaste through design; (3) reduce use of fossil fuels for rotating bristles; (4) reduce the environmental footprint of the materials composing the toothbrush. Your design team is tasked with exploring opportunities for design of a toothbrush that can address as many of these four objectives as possible. You are expected to present three or four new toothbrush design concepts and evaluate these designs, providing recommendations to your manager.

Your design should meet the minimum needs, and other needs that you identify:

1. Safe to use in a wet environment
2. Be affordable
3. Performance similar to powered toothbrushes
4. Ergonomic
5. Other needs your team identifies

Table 1: List of Assignments Due at the Beginning of Studio or Lecture

Assignment	Type	Results Due	Contents
Dissecting Existing Products	Team	Week 2 Studio	Executive Summary describing findings from reverse engineering analysis
HW #1: House of Quality	Individual	May 22 Lecture	House of Quality Focusing on Subset of Needs; Written Discussion
Problem Understanding Report	Team	Week 2 Studio	Report on problem understanding with abstract
Progress Documents	Team	Week 3 Studio	Function tree, morph chart, and specification list
HW #2: Design Concept	Individual	May 31 Lecture	Computer aided drawing (CAD) of one concept in detail; Written discussion of how the product meets customer needs
Final Report	Team	Week 4 Studio	Report on all three to four concepts and recommendations with executive summary
Final Presentation	Team	Week 4 Studio	Oral and visual presentation of concepts and recommendations

All written documents should be in 1.5 space and 12 point Times New Roman font with 1" margins. Images and Tables should be included in the appendices and do not count towards the page limits.

All deliverables should have a cover sheet with your names, your instructors name, your TA's name, and the course and section number.

1) Deliverables due at the beginning of studio in Week 2

i) Executive Summary of Toothbrush dissection and analysis exercise. (2 pts)

You will use the attached worksheet to perform a reverse engineering of existing competitors' products. An updated version of the project executive summary that takes into consideration the comments provided to you by your instructor and TA. The summary should be a maximum of one page in length. You may refer to Tables or Figures that show the toothbrushes or data in the summary. Discuss the major insights (i.e. what are promising ideas or things to improve upon from the existing market). (See Studio 1: Worksheet handout).

2) Deliverables due at the beginning of studio in Week 2

i) Report on problem understanding. (2 pages+abstract+appendix) (3 pts)

Describe the design problem as your team understands it. Describe or summarize a selection of existing good solutions from which your company might distinguish itself. Discuss the primary customer needs and specifications that your team will focus on. Do not present any preliminary design ideas. Include your teams' combined house of quality and preliminary specification sheet (i.e. items from the combined HWs) in the appendix. Cite these data in the text where appropriate. The abstract is a separate page between the cover page and the report.

3) Deliverables due at the beginning of studio in Week 3

Progress Documents (2 pts)

i) Function Tree:

A figure of a function tree (at least three levels) of a toothbrush with label and caption title.

ii) A morph chart of solutions

A figure of a morph chart with at least one function per team member and at least four solutions per function.

iii) Specification list

A table of the full specifications, target values, and sources. You should use the format and headings presented in the lecture. These should match the engineering requirements from your HOQ. You may have additional items if needed.

4) Deliverables due at the beginning of studio in <u>Week 4</u>

i) A presentation on your design concepts and recommendations (PowerPoint, 1 person, 7 min)

ii) A report containing the following: (8 pts)

1. Abstract
2. Introduction defining customer needs and main objectives of the design solutions.
3. Design Overview giving a detailed description of your designs (as many designs as there are team members) including CAD or other computer generated images that show its parts and how it operates.
4. Discussion of:
   - How the solutions satisfy the customer needs and specifications
   - Which features of which solutions appear to work best
   - Information in design tools that might be helpful in the discussion: House of Quality, Function Tree, Specification List, Evaluation Matrices, Morphological Chart.
5. Conclusions

The report should include a maximum of **four pages** of text, plus abstract as a separate page and as many figures and tables as necessary in the appendix. Please submit one hard copy in class and submit a second copy via T-Square.

Please submit 1 hard copy of each deliverable, and upload a digital copy to T-Square.