REVISED
DESIGN EXPO & VIDEO GRADING RUBRIC
due in class Wednesday, December 5.
Cabral Center, John D. O'Bryant African American Institute
Upload your 10-15 minute video to Blackboard by 11:59pm Wednesday, Dec 5.

100 XPs TOTAL FOR EACH GUILD MEMBER
(must be present in class for credit)

Guild Expedition – Sundial Project   **480 XPs**

Background Research/Problem Statement	due 10/4	100 XPs
Shark Tank Pitch Proposal Presentation	due 10/15	80 XPs
Prototype Demo	due 11/1	100 XPs
Design Expo with Video	due 12/5	100 XPs
Written Report	due 12/7	100 XPs

In class Wednesday, December 5 in the Cabral Center:

- **All guild members are present** at Design Expo during your normal class time.

- **Sundial Project** is present and working. Demonstrate "live" (outside and video). [45 XPs]

- Play your **10 – 15 minute digital video** continuously (loop) on a fully charged laptop. Your video must demonstrate your <u>working</u> sundial project in action with <u>each guild member narrating</u> key features, innovations and capabilities with clear, enunciated voices. If possible, bring an extension cord if you have one since the power outlets in the room may be far from your table. Audio speakers optional but helpful. [55 XPs]

Required Video Segments (address in the exact following order, starting with the Title Slide):

- <u>Upload</u> your video (.mp4 formats <u>only</u>) to Blackboard through the link by 11:59pm Wednesday, December 5. If your .mp4 file is too big to upload, upload a .pdf with your guild's name, guild members' full names, and the video Google or YouTube link, viewable by anyone with the link. Do NOT email Professor Love a link to your video. 1 video submission per guild.

- <u>Each guild member</u> has significant and equal speaking parts in the video. (2 XPs)

- **<u>Title Slide</u>** – current picture of your <u>final</u> sundial project, course name (GE 1110 Engineering Design), semester (Fall 2018), guild name, each member's full name, & class time (9:15am or 1:35pm). *1 slide* (2 XPs)

- **<u>Official Problem Statement</u>** – add a picture of your authentic problem (something that shows the problem you identified in your problem statement). Include your Official Problem Statement (the final version of your Revised Problem Statement from Prototype Demo Day), including any suggested changes that Professor Love may have asked you to implement. Your Official Problem Statement <u>must be stated in this format</u>: *1 slide* (5 XPs)

  "The problem is that _____(fill in the blank)_____.

  _Who (fill in the blank)__ needs __what (fill in the blank)___.

  Design a sundial that __(fill in with all 3+ functions, 3+ objectives including Value Sensitive Design objective, and 2+ constraints)_."

- **Background Research** – display & cite at least 1 peer-reviewed scholarly journal article, scholarly newspaper or magazine article, book, or report that you specifically used to design your sundial, including your hour lines and any dial furniture. Show a picture of each source as either the 1st page of your peer-reviewed scholarly research, newspaper or magazine article, the book cover or the report cover, with a proper Harvard-style in-text citation in the figure label (convert .pdf page to a .jpg or .png). Examples shown in Figures 1, 2 & 3. Include a corresponding References slide(s) at the end of your video. *1 slide*. (3 XPs)

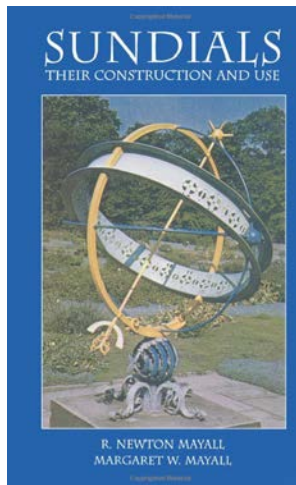Figure 1. First page of vertical sundial research article (Klein and Riskin, 2003).

Figure 2. Cover of sundial construction book (Mayall and Mayall, 2000).
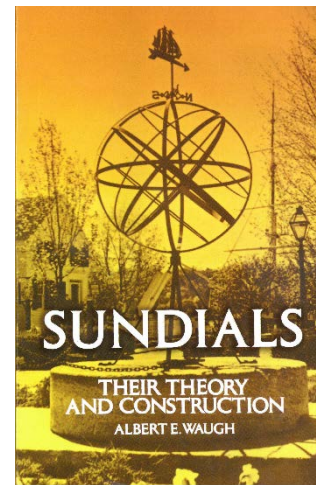

Figure 3. Cover of sundial theory and construction book (Waugh, 1973).

- **Market Research** – identify **at least 2** existing commercially available products in the market **that most closely relate to your sundial design** that attempt to address your Official Problem Statement. For example, if you designed a horizontal sundial, you should show pictures of at least 2 commercially available horizontal sundials. Show a picture of each existing product **with its cost** and with a proper Harvard-style in-text citation in the figure label, examples shown in Figures 4 & 5. Explain why these products fail or fall short of solving the problem you have identified and why your proposed project is better. *1 slide*. (2 XPs)
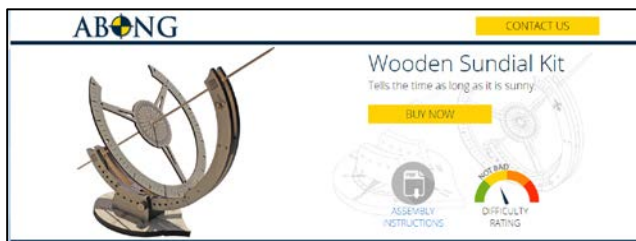

Figure 4. Commercially available Abong wooden equatorial sundial kit (Abong, 2018).

Figure 5. Commercially available birdbath horizontal sundial (Romeindustries.com, 2018).

- **<u>Video Demonstration of Your Working Sundial</u>** – using your guild's collective imagination and resourcefulness, demonstrate how your Sundial project actually works to solve the problem in your Official Problem Statement. In other words, video record your sundial in a realistic setting or context (you may need to be creative) that explicitly addresses the needs of the people you identified in your Official Problem Statement. <u>Record your sundial actually working by taking at least 10 static photographs at regular intervals throughout a sunny day with "clock" time stamps superimposed on each image in your video</u>. For example, if your sundial is designed for outdoor enthusiasts, you should record video of your sundial working in the woods along a trail (try the nearby Muddy River, Back Bay Fens Emerald Necklace Park, for example). If your sundial is designed to be portable, demonstrate how it works in multiple locations. If your sundial is designed to be stationary, demonstrate how it works in the exact same location throughout a full sunny day. Collect your photographs between 8am – 4pm, Eastern Standard Time for Boston, latitude 42°N, longitude 71°W (daylight savings time no longer applies). You should narrate and/or label any specific photographs or video clips as necessary. *Video (25 XPs)*

  1. Demonstrate how your sundial achieves at least 3 desired functions from your Official Problem Statement.

  2. Demonstrate how your sundial meets at least 3 design objectives from your Official Problem Statement, including your Value Sensitive Design objective.

  3. Demonstrate how your sundial meets at least 2 quantifiable and measurable constraints from your Official Problem Statement. Use text and/or graphics to communicate your project's <u>actual</u> dimensions in inches when it is set up and being used by your user.

  4. Demonstrate and explain how it should be set up for a specific latitude, how to align it to geographical north (not magnetic north), how to read the hour lines, and how to convert the local solar time to "clock" time using the Equation of Time and any longitude correction, if applicable.

  5. Explain any dial "furniture" or additional components you may have added to your dial plate, such as dial mottoes, the Equation of Time plot, time for other cities, lines of declination, ¼ hour lines, ½ hour lines, and/or any artistic or functional decorations.

  6. Identify the materials your sundial is made from, how it was fabricated (laser cut, 3D printed, hand-made), and how it is packaged and/or transported by the intended user.
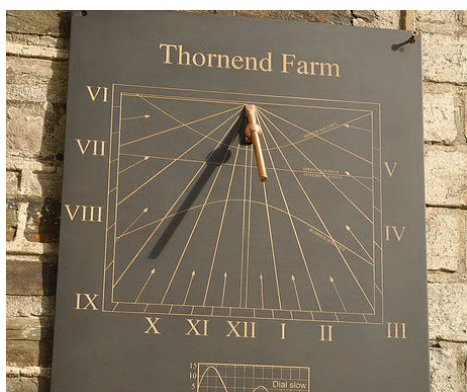

Figure 6. Hour lines and lines of declination on a vertical sun dial with Equation of Time at bottom.

Figure 7. Hour lines and more precise time indicator lines on a horizontal sun dial with Equation of Time.

- **Hour Lines & Dial Furniture** – Illustrate which method you used to draw your hour lines and any lines of declination (graphical or mathematical or a combination of both). Specifically cite Mayall and Mayall's book (posted on Blackbaord), Waugh's book (posted on Blackboard) or another credible, scholarly, peer-reviewed source from your literature review for the technical information you used to draw your hour lines in SolidWorks. Show screenshot(s) of any SolidWorks part files or assembly files with Smart Dimensions (edit Sketch) of your hour lines and any lines of declination. *1 slide* (3 XPs)

- **3D Printed Component** – label your 3D printed component (zoom in on a close up photograph of your sundial's 3D printed component). Explain what function or value this component adds to your sundial project and why you chose this sundial component to be 3D printed (as opposed to another component to be 3D printed instead). Show a screenshot of the SolidWorks part file (isometric view of the SolidWorks part or assembly file) that was used to 3D print it. *1 slide* (5 XPs)

- **Bill of Materials** – a Bill of Materials is an itemized list of every part and component in the project, including the quantity of each part, cost per part and a total of ALL the money you spent on this project, including shipping, laser cutting, hardware, any raw materials, and a separate line item for your prototype costs. List everything, even if you exceeded the maximum allowable $50.00. List your bonus SharkTank award as a separate line item. If you acquired the part for free from the FYELIC, use $0 cost. If you paid for any shipping costs, please list those costs separately. Refer to Table 1 for an example and the required format, including required column headers. You will need to include a copy of all scanned receipts in your written final report. *1 slide* (3 XPs)

Table 1. Bill of Materials (you must use this table format please!).

Part Name	Actual Cost Per Part	Quantity	Line Item Cost = Actual Cost per Part × Quantity
Gnomon (acrylic)	$1.00	1	$1.00
Dial plate (acrylic)	$4.00	1	$4.00
Hardware (stainless steel screws)	$5.00	1 bag	$5.00
3D printed part (FYELIC)	$0.00	1	$0.00
Laser cutting (Snell Library)	$15.00	1	$15.00
Prototype sun dial	$5.00	1	$5.00
Sub-Total: Parts			$30.00
Shipping Costs	$10.00	1	$10.00
Total Cost			**$40.00**
Total Allowable Budget ($50)			*under budget* ✓
Shark Tank Award $5.00			- *$5.00*

- **<u>Conclusion, Challenges, & Reflections</u>** – Briefly summarize what your project achieves and reflect on what you have been able to accomplish this semester. Identify what your guild has learned about engineering design, sundial technology, 3D printing, laser cutting, SolidWorks, teamwork, engineering ethics and other skills. What challenges did you overcome to ensure the success of your project? What new knowledge and reflections on your team's achievements have you discovered now that your project is complete? Looking back on your project, what is your team most proud of and why? *1 slide* (3 XPs)

- **<u>References</u>**. Starting on a new slide, list all of your full citations, <u>in alphabetical order by author or source (the first letter in the citation)</u>. Use Harvard style reference formatting for the appropriate type of source. For example, <u>format each research article as a journal article</u> including the authors, name of the journal (*italicized*), volume, page numbers and date (you can include the DOI number). Do NOT format research articles as online search engine results or as online sources. Please use RefWorks, EndNotes, Mendeley or any other citation software, including the website [www.citethisforme.com,](www.citethisforme.com) and select "Harvard" and then the appropriate type of source. Check the accuracy of your citation information. Harvard is slightly different from MLA and APA reference formatting. See example references (next page) for this document. *1 slide.* (2 XPs)

References (*always start on a new page or slide!*) – use Harvard style formatting guidelines.

Abong. (2018). [online] Available at: http://www.abong.com/products/sundial [Accessed 5 Oct. 2018].

Klein, J.L. and Riskin, A. (2003). Learning by the Sun: Observing Seasonal Declination with a Vertical Sundial. *Journal of Science Education and Technology,* 12(1), pp. 81-88.

Mayall, R. and Mayall, M. (2000). *Sundials: Their Construction and Use*. Mineola, NY: Dover Publications.

Romeindustries.com. (2018). *Rome's collection of solid brass sundials*. [online] Available at: http://www.romeindustries.com/brassdials.html [Accessed 5 Oct. 2018].

Waugh, A.E. (1973). *Sundials; Their Theory and Construction.* United States: Dover Publications.

Innovative Design Award: Visiting students, staff, faculty and local sundial experts will be invited to evaluate each guild's oral presentation of their project on a 1 – 5 point scale for originality, authenticity, engineering design, accuracy of time telling, creativity, craftsmanship, and guild teamwork. **Top 2 teams** who earn the most votes in class (every student, professor and judge will cast 1 vote but students cannot vote for their own team). The Innovative Design Award is for the Sundial project that demonstrates superior *engineering design, originality, authenticity, creativity, accuracy, craftsmanship, teamwork and professional communication skills* in delivering an *authentic engineering solution* that undoubtedly addresses the problem as stated in the project's Official Problem Statement.

+10 XPs bonus per team.