

DESIGN TERM PROJECT

This is design project. You are asked to do both analytical solution and design of a **mechanical mechanism** of your selection, which is your own design or idea. It is the intention of this design project assignment that very few restrictions are placed on the selection of **mechanical mechanisms**. You are required to discuss with the instructor regarding the specific mechanical mechanism design throughout the analytical solution and design process. The objectives of this design project include:

1. Development and application of skills in mechanical mechanism design
2. Practice the concurrent engineering with analytical solution and design, as well as fabrication or manufacturing
3. Knowledge of statics, dynamics, strength and materials and failure and fracture theory for obtaining analytical solution
4. Knowledge of computer aided design (CAD, especially CATIA, Pro/E, SolidWorks, and UniGraphics, but there is no restriction. You can choose other software if you want)
5. Insights towards a specific mechanisms, as acquired through analytical solution, design, synthesis and analysis

The mechanical mechanism design is not restricted to any specific topic. Consultation with the instructor is strongly encouraged. You should feel free to look up other resources for candidate of your design. You will need to use CATIA or Pro/Engineer at HSH B15, please ask Lucy to access computer laboratory.

Your grade will depend upon the design creativity and analytical solution. The grading criteria are following.

To encourage participation of individuals in group discussion and to practice group design, this design project is organized on group basis. You must participate in all group discussions throughout the design process and write a final group project report (one written report per each group). Interactions with the instructor for directions and design criteria are strongly recommended. Through discussion are encouraged among different groups, report writing is strictly an individual group effort. If two group reports are found to be identical, both will receive no credit. See the course website "Report Format" for details.

All members in a group will receive the same grade, unless under very rare situation which warrants differential in grading among group member.

DETAILED DESIGN TERM PROJECT GUIDELINE

PRIMARY GOAL: The goal of the term project is to provide you with an opportunity to research a specific topic, develop your own ideas about that topic, present the ideas in the form of a scientific or technical paper, and communicate those results in the form of an oral presentation to the class. As scientists or engineers, this type of work is your most essential form of communication.

DUE DATES: Since the term project comprises 15% of your final grade, you should begin thinking about this project as soon as possible. I expect that you will devote significant time and energy to this project over the course of the semester. To avoid leaving things to the last minute, the design project will be developed throughout the semester. See "Important Dates" handout for specific due dates of each portion of the term project.

OVERVIEW: The report should follow the general style of a scientific journal article. To make it easier to meet deadlines at the end of the semester, the term project will be divided into several parts: a proposal, an outline, final paper, a class presentation, and revisions to the final report. These parts are as follows:

- **Proposal:** The proposal should be 1 page long, and should include one paragraph describing the proposed project, references relating to the project, and 2-3 figures that pertain directly to the project.
- **Outline:** The outline should be a full working outline describing the details of each section of the paper. An updated reference list with additional figures (relative to the proposal) should be included.
- **Paper:** The paper should be 5-7 pages long using normal fonts/margins/spacing, etc. (i.e., 12 pt. Times Roman, 1" margins, double spacing). This length does not include figures and figure captions.
- **Presentation:** The presentation should be around 15 minutes long, and should include a synopsis of the information from your project. We will discuss the details of this presentation later in the semester.
- **Revisions:** Revisions are THE most important step in the writing process! This is your opportunity to polish the rough edges after having several days away from the paper. I will return your paper to you ASAP to give you adequate time to perform revisions for an improved grade.

TOPICS: You should meet with the instructor to discuss your project topic well in advance of the proposal deadline.

OUTLINE: The outline should be a full working outline describing the details of each section of the paper. Complete/near complete sentences should be included. This outline is meant to be your roadmap for writing the paper, and to help you determine parts of the paper that you need to clarify with more detail. An updated reference list and 1-2 additional figures (relative to the propos should be included.

PAPER

COMPONENTS: While you should choose the exact organization of the paper, here is one possible format to follow:

- **ABSTRACT:** The abstract provides a concise synopsis of the details of the paper. It is generally one paragraph long. Particular emphasis should be placed on the results and implications of the research.
- **INTRODUCTION:** This section provides background material and motivation for the work discussed in the body of the report. It is generally short (1-3 paragraphs), and sets the stage for the rest of the paper.
- **DATA AND METHODS:** This section provides the technical details regarding how data was collected and processed, particularly if the process is new or a significant modification to previous analysis methods.
- **DISCUSSION:** The discussion is used for interpretation of the data. This section generally evaluates the implications of the results of the current study and how they relate to the results of previous studies. The discussion sets the stage for the conclusions section.
- **CONCLUSIONS:** This section is not a repeat of the abstract. It is generally used to clearly explain the well-constrained results, identify the less well-constrained results, and discuss new directions to investigate in future work. New material (i.e., more discussion of previous studies) is not included in this section.

OTHER COMPONENTS:

- **REFERENCES:** Use a standard reference style (i.e., GSA Bulletin, Journal of Geophysical Research).
- **FIGURES:** We strongly suggest that and encourage you to create original figures that synthesize the results of several studies. For figures that are directly copied from other papers, provide a reference to that paper. Please number all figures, beginning with Figure 1. All figures must be referred to in the text.
- **FIGURE CAPTIONS:** The figure captions tell the story for each figure. Your captions should be concise and to the point, but not so short that it is impossible to determine the figure content without searching through the main body text. Clearly identify all symbols, line styles, etc.

FIGURES AND FIGURE CAPTIONS: Figures should always be accompanied by a descriptive figure caption that includes the reference from which the figure originated. If the figure is your own creation based on the work of others, include a phrase such as “from Smith et al. [1990]” to avoid potential plagiarism issues. The caption should include a description (in your own words) of the key points of the figure, including items denoted by symbols, varying line types or widths, or color, as well as a brief summary of the pertinence of the figure.

ORAL PRESENTATIONS

Length: 10-15 minutes, with an additional 5-10 minutes for questions.

Format: The presentation should be given in a lecture-style professional format using PowerPoint or a similar electronic presentation product. Please see us for help and advice on creating a simple yet effective PowerPoint presentation. All members of the audience will write a short, anonymous critique of the presentation, and will include at least one question to help clarify points or provide more information about your presentation.

Grading: You will be graded on creativity, clarity, and coherence of your presentation. See the attached sheet for specific components that will be used in this evaluation.

GRADING: Your term project will be graded on clarity, organization, use of figures and illustration presentation, and your effort to incorporate material learned in the class. See the attached sheets for specific components that will be used in this evaluation. Points for each part of the project are as follows:

	Percentage of Grade	Due (Important) Date
Topic	10	Feb. 13
Proposal	15	Feb. 27
Outline	35	Mar. 13
First Draft	100	Apr. 17
Final Draft	100	May 08
Presentation	50	May 08
Total	310	

FORMAT OF WRITTEN REPORT

A formal written report is due on the date noted in the handout for each project assignment. The main body of the report, in a type font no smaller than 11 point, should not be too lengthy. It is your responsibility to spell-check the report. Points will be taken off poorly

written and unorganized reports. Details, such as standard and code, can be arranged in Appendix which has no page limits. The main body of this report must be typed; whereas, the appendices can be legibly handwritten. Your report should include the following:

TERM PROJECT PAPER GRADE SHEET – TOPIC

Name _____

Component	Points possible	Grade
Creativity: Does the author evaluate competing hypotheses? Are the conclusions coherent and logical?	5	
Feasibility: Can the project topic which is scratched or generated be done?	5	
Total	10	

TERM PROJECT PAPER GRADE SHEET – PROPOSAL

Name _____

Component	Points possible	Grade
Creativity: Does the author evaluate competing hypotheses? Are the conclusions coherent and logical?	10	
Use of figures: Do the figures and figure captions illustrate key points of the proposal?	5	
Total	15	

TERM PROJECT PAPER GRADE SHEET – OUTLINE

Name _____

Component	Points possible	Grade
Clarity: Is the paper properly motivated by introductory background material?	10	
Coherence: Are the author's points well-developed and presented in an ordered, logical manner?	10	
Creativity: Does the author evaluate competing hypotheses? Does the author develop new material or develop conclusions based on the work of others?	10	
Use of figures: Are the figures easy to read and effective in communicating the author's points?	5	
Total	35	

TERM PROJECT PAPER GRADE SHEET – FIRST DRAFT

Name _____

Component	Points possible	Grade
Clarity: Is the paper well-written, including proper grammar, sentence structure, and spelling? Is the paper properly motivated by introductory background material?	30	
Coherence: Are the author's points well-developed and presented in an ordered, logical manner?	30	
Creativity: Does the author evaluate competing hypotheses? Does the author develop new material or develop conclusions based on the work of others?	25	
Use of figures: Are the figures easy to read and effective in communicating the author's points?	15	
Total	100	

TERM PROJECT PAPER GRADE SHEET – FINAL DRAFT

Name _____

Component	Points possible	Grade
Clarity: Is there clear improvement and effort in the quality of the writing?	30	
Coherence: Is there clear progress in the order and development of ideas?	30	
Creativity: Does the author evaluate competing hypotheses? Are the conclusions coherent and logical?	30	
Use of figures: Do the figures and figure captions illustrate key points of the paper?	10	
Total	100	

ORAL PRESENTATION GRADE SHEET

Name _____

Component	Points possible	Grade
Clarity: Was the presentation easy to understand and properly motivated by introductory background material?	15	
Coherence: Did the presenter provide information in an ordered, logical manner?	15	
Creativity: Did the presenter develop new material or develop conclusions based on the work of others?	10	
Use of figures: Were the figures easy to read and effective in illustrating the presenter's points?	10	
Total	50	