Fall 2019

ME 408-HM1: Mechanical Systems Design II

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MECHANICAL SYSTEMS DESIGN II

I. ME 408 Mechanical System Design II. A continuation of ME 403 from a more integrated viewpoint with lectures on special topics. Concepts in optimization and computer simulations are considered in the design and synthesis or mechanical engineering systems. The projects are more comprehensive, emphasizing creative design, and requiring design decisions of a more sophisticated nature. Prerequisite: ME 403.

Textbooks: Atila Ertas, Jesse Jones, The Engineering Design Process, John Wiley & Sons, 1996, 2nd Edition

Application Packages: Pro/ENGINEER, ANSYS, AUTOCAD

WEEK	
1	Project proposal. Bar-chart tasks. Indicate how computers will be used. Obtain instructor's approval of written proposal.
2	Begin feasibility study. Limit scope of project to that which can be accomplished in a professional manner. Special topics lecture, computer aided design assignment.
3	Background work, Library and other searches for information. Demonstrate how to find, evaluate and use information. Progress Report 1. See note.
4	Present Computer aided design assignment progress (team approach).
5	Special topics lecture.
6	Continue design, incorporate changes suggested by comments at progress report. Update task bar-chart as required throughout term.
7	Special topics lecture. Report on team CAD project. Progress Report 2. See note.
8,9	Continue design, incorporate changes suggested by comments at progress report. Special topics lecture:
10	Progress Report 3. See note.
11,12	Continue design, incorporate changes suggested by comments at progress report.
13,14	Project final report due. Project presentations.

Note:
Progress reports should include an updated project plan. Indicate tasks completed and the status of work in progress. Use of Spread sheets and PowerPoint to make presentations.

The project reports should indicate:

a) your problem solving methodology
b) methods to find, evaluate, use and communicate information
c) methods of analysis and synthesis
d) engineering principles used in the design
e) selection of failure theories and design criteria (consider fatigue, stability, etc.)
f) creative thinking, decision making
g) optimization

h) design prototype building and/or computer simulation
i) identification of your work and research done to find, evaluate and use other information obtained during this project.

The final report should include literature review and background information, conceptual designs, detailed designs and design equations, sample calculations, and references. It should be indexed. Use the index as the cover sheet. Include sketches an engineer could understand. Try to write your progress reports and final report as you go along to save time.

Extensive computer usage is required..

The collaborative project involves finite element analysis (using Pro/ENGINNER, ANSYS and PRO MECHANICA) as well as a check using analytical methods solved with MATLAB. Interpretation of computer generated FEA stress and deflection plots is stressed. Satisfaction of loading and boundary conditions is checked.

COURSE REQUIREMENTS

Project requirements. See catalog description. Note emphasis on creative design and design decisions. Projects will include optimization and computer aided engineering. FEA programs (e.g. PRO ENGINEER, ANSYS), mathematics modeling (MATLAB) spreadsheets (e.g.MS Excel), and user-written programs may be used. You need to incorporate applicable knowledge from previous courses including ME-215, 321,305,312,315,316,403, etc. Interpretation of results and comparison with researched data are important. Do not present results which you do not understand. The instructor will help interpret results if you ask before the report due-date.

Most mechanical designs on the market represent many engineer-years of development. Your time is very limited. The task you select will demand creativity. It is expected that ME aspects of the design will be given priority. Detailed analysis may be limited on one aspect of the design if the scope is too large. Your success will be measured by the quality of your innovative thinking, analysis and interpretation, rather than by comparing your proposed design with a commercially-available product.

Keep a design notebook/log. Date entries, and bring the log to each class. Write up the project as you go along.