Department of Mechanical Engineering

ME 408 Mechanical Systems Design II

(Required)

Catalog Description: ME 408 (1-2-2)

A continuation of ME 403 from a more integrated viewpoint, with lectures on special topics. Concepts in optimization and computer simulation are considered in the design and synthesis of mechanical engineering systems. The projects are more comprehensive, emphasizing creative design, and requiring design decisions of a more sophisticated nature.

Prerequisites: ME 403 - Mechanical Systems Design I
ME 407 - Heat Transfer

Textbook(s) Materials Required:

1. A. Ertas and J.C. Jones, The Engineering Design Process, 2nd Edition, John Wiley, 1996
2. M. H. Lawry, IDEAS Student Guide, 2nd Edition, EPS PLM Solutions, 2004

Course Supervisor: Harry V. Kountouras

Course Objectives[1]:

1. To develop the student's ability to write a detailed proposal for a comprehensive design project. The project is team oriented and multidisciplinary. The proposal will establish need, technical and economic feasibility and will assess societal and environmental impact. (A B, C, E)
2. To develop the student's ability to analyze defined problems and synthesize creative and optimal solutions through a comprehensive design project. Students will make extensive use of the principles of engineering science to make analytical computations as well as the use of the tools of Mechanical Computer Aided Engineering to perform simulations and optimizations in mechanical and thermal/fluid systems associated with the project. (A, B, C, E)
3. To provide the student with experience in model building and prototype fabrication associated with a design project. Support for such fabrication will be supplied by the Technical Staff of the Department of Mechanical Engineering as well as the NJIT Factory Floor. (A, B, C, E)
4. Development of communication skills of Mechanical Engineering students needed in industry. Those skills include written communication, oral communication and visual presentation methods. (A, B, C, E)

Topics[2]:

1. Review formats for design proposal, project report, interim reports, progress reports and design notebook. (3 hrs)
2. Submit design proposal for approval. If necessary, resubmit for revision. Establish design task definitions and bar chart time schedule. Lecture: Health, safety and environmental issues associated with engineering design projects. (3 hrs)
3. Submit weekly progress reports and design notebooks during bi-weekly team-instructor consultations. (3 hrs)

4. Submit First Interim Report. Incorporate changes as suggested and continue design. (3 hr)
5. Submit weekly progress reports and design notebooks during bi-weekly team-instructor consultations. Incorporate design change suggestions and make note of appropriate consultants available throughout the NJIT campus. (9 hrs)
6. Submit Second Interim Report. Incorporate changes as suggested and continue design. Lecture: Confirmation of FEA results using simplified models from elementary theories. (3 hrs)
7. Submit weekly progress reports and design notebooks during bi-weekly team-instructor consultations. Where appropriate, make arrangements for prototype or model fabrication with Department or Factory Floor. (9 hrs)
8. Submit Third Interim Report. Incorporate changes as suggested and prepare for submission of Final Report. Also begin preparation of oral report and presentation. (3 hrs)
9. Final weekly progress report and review of design notebook. Further preparation for oral report and visual presentation. (3 hrs)
10. Submit Final Written Report and notebook. Make team oral presentation of Design Project (3 hrs)

Evaluation Method[2]:

1. Design Proposal
2. Interim Reports
3. Progress Reports
4. Design Notebook
5. Final Written Report
6. Final Oral Presentation

Schedule: Lecture Recitation: 3 hours per week
Professional Component: Engineering Design
Program Objectives Addressed: A, B, C, E
Course Outcomes[3] :
Objective 1
1.1 Students recognize the proper formats for design proposals, progress reports, design reports and design notebooks. (1,2,3,4) (b,d,f,g)
1.2 Students submit a Design Proposal. That Proposal incorporates evaluation of need, technical and economic feasibility and environmental impact. (1) (c,d,f,g,k,o)
1.3 Students develop a list describing critical design tasks accompanied by a scheduling time chart for the project. In addition, a design notebook is initiated for the project. (1, 4) (c,d,e,f,g,o)
Objective 2
2.1 Design teams will submit weekly progress reports during bi-weekly consultations with instructor. In addition, design notebooks for individual students will be signed. (3, 4) (b,c,d,f,g,k,o)
2. 2 Students will generate a comprehensive written project through submission of interim reports every four weeks. Students understanding of relevant principles of engineering science, simulations and optimization as they pertain to their project will be reinforced during bi-weekly consulting sessions. (2,3,4) (a,c,d,e,f,g,o)

Objective 3

3.1 When appropriate for their particular project, students will get experience in the building of models and prototypes with the assistance of staff from the ME Department machine shop and the NJIT Factory Floor. (1,2,5) (b,d,e,g,k)

Objective 4

4.1 Students will demonstrate both written and oral communication skills in a final presentation. A final comprehensive written report will be submitted and the entire design team will make an oral presentation. Skill in the use of visual aid software in the presentation is acquired. Ability to engage in question and answer sessions is developed. (5,6) (d,,e,g,k)

Prepared by: Harry Kountouras Date: September 29, 2006

[1] Capital Letters in parenthesis refer to the Program Objectives of the Mechanical Engineering
Department. Listed in Sec 2 d Tables B-2-9, B-2-12. Table B-2-8 links Program Objectives with the ABET a-k Criterion.

[2] Topic numbers in parenthesis refer to lecture hours. (three hours is equivalent to 1 week)

[3] Outcome numbers in parenthesis refer to evaluation methods used to assess the student performance. Lower case letters in parenthesis refer to ABET a-k outcomes.