MAE 155B (4 units)
Engineering Design II

Class/Laboratory Schedule: four hours of lecture, three hours of lab, five hours outside preparation. 12 hours/week total

Course Coordinator(s): Mark Anderson

Textbooks/Materials:
1. Nicolai, Fundamentals of Aircraft Design (2010)
2. Meyer, Elements of Space Technology (1999)

Catalog Description: Fundamental principles of aerospace vehicle design including the conceptual, preliminary, and detailed design phases. Aeronautical or astronautical design project that integrates all appropriate engineering disciplines as well as issues associated with optimization, teamwork, manufacturability, reporting, and professionalism. Team design projects (initiated in MAE 155A) of an integrated system that is designed for a real world aerospace application.

Prerequisites: All Prerequisites for MAE 155A must be satisfied: Grade of C- or better in MAE 104 [Aerodynamics], MAE 113 [Propulsion], MAE 130C [Vibrations], MAE 142 [Dynamics and Control], MAE 150 [Computer-Aided Design], SE 2 [Materials] and SE 160B [Structures]. **Formal Prerequisites for MAE 155B**: Grade of C- or better in MAE 113, MAE 142, and MAE 155A.

- ■ Required Course
- □ Technical Elective Course
- □ Other: _____

Performance Criteria:

Objective 1 (AE Design)
1.1 Students will be given open-ended design problems which they will solve individually and in teams.

Objective 2 (AE Design, Application of Engineering Science)
2.1 Analysis will be used in the conceptual and preliminary design stages to evaluate feasibility of various design concepts.
2.2 Analysis used in the detail design stage to select and design components.
2.3 The performance of the aerospace system 2ill be evaluated, and engineering analysis will be used for redesign, optimization, and correlation of theory with practice.

Objective 3 (Design Project Management and Teamwork)
3.1 Students will be responsible for setting team deadlines, schedule, and budget allocation. Student teams will collectively make design decisions.
3.2 Peer review will be used for providing feedback regarding the contribution of individual team members.

Objective 4 (Contemporary Issues, Information Gathering)
4.1 Team reports will include documentation of safety, regulatory, other technological issues, utilization of reference information.

Objective 5 (Engineering Ethics)
5.1 Team reports will include documentation of safety concerns, performance limitations, and provide credit to external resources, utilizing reference materials from case studies with ethical components.

Objective 6 (Communication)
6.1 Oral presentations will be made of individual or team progress, and of designs. Video tapes of presentations may be made for assessment.
6.2 Students will write reports of their design projects, and post components of the reports on a web page, which can be used by the students as part of their portfolio.

Course Objectives:
(Numbers in parentheses refer to the specific MAE Program Outcomes)

Objective 1: To teach students how to solve open-ended design problems and to integrate knowledge of fundamental aeronautical and astronautical topics in the design of an aerospace system (3c, 5e, AE12, AE13, AE14).

Objective 2: To provide students with the experience of applying engineering science theory to real world design problems. (1a, 2b, 3c, 5e, AE12, AE13, AE14).

Objective 3: To train students to effectively work in teams, manage project priorities, and meet project deadlines (4d).

Objective 4: To provide students an understanding of contemporary technological issues, impact of engineering solutions, and need for information gathering (8h, 9i, 10j).

Objective 5: Engineering ethics relevant to the design projects will be introduced through case studies with an ethical component (6f).

Objective 6: To train students in graphical, written, and oral communication (7g).

Course Topics:
1. Design Problem Identification and Mission Performance Requirements
2. Concept Generation and Creativity, Concept Selection
3. System Engineering, Analysis of System Level Performance
4. Application of Engineering Science to Aerospace Systems Design and Analysis
5. Subsystem Selection and Procurement
6. Preliminary and Detail Design Techniques, System Development Process
7. Project Management: Scheduling, Risk Reduction Strategies
8. Cost/Economics, Reliability, Maintainability, other design factors

9. Teamwork, Professionalism, Engineering Ethics
10. Industrial and Government Practices, Regulatory and other Issues
11. Information Gathering (Literature Searching and Vendor Contact)
12. Application of Computer-Aided-Design and Computer-Aided-Analysis
13. Aeronautical Design: Ground and Flight Testing, System Safety
14. Astronautical Design: Build and Flight-test rockets

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