MEE 599 Aircraft Design
Semester: Spring 2005
Instructor: Michel Elkhoury
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Course schedule: TTH 2:00-3:15 pm / ENG 402
Office & Office Hours: 401A / 1 hr after each class

DESCRIPTION:
Students will work in teams to develop the system requirements, define the overall architecture of an aircraft, conduct sizing, aerodynamics, propulsion, and trade studies to determine the most promising aircraft design, and begin to conduct laboratory work to end-up by building and flying the prototype version of the aircraft.

PREREQUISITE(S):
MEE 311.

OBJECTIVES:
• To effectively communicate by giving oral presentations, writing technical reports, and performing laboratory work
• To deepen your knowledge of topics relevant to aircraft design
• To identify and formulate the design requirements for an aircraft
• To apply engineering knowledge and skills acquired in class to the design problem

TEXTBOOK(S):

REFERENCE(S):

TENTATIVE COURSE OUTLINE:

1. Introduction to Aircraft Design (1 week) Phase of aircraft design, aircraft conceptual design process, takeoff weight buildup, empty weight estimation, fuel-fraction estimation, takeoff-weight calculation
2. Airfoil and Geometry Selection (1 week) Airfoil selection, wing geometry, tail geometry and arrangement
3. Thrust to Weight Ratio and Wing Loading (1 week) Thrust to weight ratio, wing loading, selection of thrust to weight and wing loading
4. Initial Sizing (0.5 week) Rubber engine sizing, fixed engine sizing, geometry sizing, control surface sizing
5. Configuration Layout and Loft (1.5 weeks) End products of configuration layout, conic lofting, conic fuselage development, flat-wrap fuselage lofting, circle to square adapter, fuselage loft verification, wing tail layout and loft, aircraft layout procedures, wetted area determination, volume determination, special considerations
6. Propulsion and Fuel System Integration (1 week) Propulsion selection, jet-engine integration, propeller-engine integration, fuel system
7. Landing Gear and Subsystems (0.5 week) Landing gear arrangements, tire sizing, shock absorbers, castoring wheel geometry, gear retraction geometry, seaplanes, subsystems
8. Aerodynamics (2 weeks) Lift, parasite drag, induced drag
9. Weights (0.5 week) Approximate group weights method, statistical group weights method
10. **Stability, Control, and Handling Qualities (1.5 weeks)** Longitudinal static stability and control, lateral directional static stability and control, stick free stability, effects of flexibility, dynamic stability, quasi-steady state, inertia coupling, handling qualities

11. **Performance and Flight Mechanics (1.5 weeks)** Steady level flight, steady climbing and descending flight, level turning flight, gliding flight, energy maneuverability methods, operating envelope, takeoff analysis, landing analysis

**ASSIGNMENTS:**
Quizzes will be given regularly. Students will be required to work on a design project during the semester. This project will need some hand-on skills.

**GRADING POLICY:**
Projects, and lab work 55 %
Quizzes 10 %
Final Examination 35 %

**CATEGORY CONTENT:**
*Mathematics and Basic Sciences:* None
*Engineering Science and Design:* 3 credit hour(s)
*General Education Component:* None

**ACADEMIC INTEGRITY:**
Projects turned in must be the students’ own work, not a carbon copy of a collaborative effort. Any attempt at cheating will result in a zero grade, and possibly further action. Helping each other by means of communication concepts is highly encourage while any evidence of using other’s work as your own will not be tolerated.