**Aero 481: Aircraft Design**

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<tr>
<th>COURSE #: AE 481</th>
<th>COURSE TITLE: AIRCRAFT DESIGN</th>
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<td>TERMS OFFERED: Fall</td>
<td>PREREQUISITES: 315, 325, preceded or accompanied by 335, 345</td>
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<tr>
<td>INSTRUCTOR(S): Friedmann, Bernal</td>
<td>SCIENCE/DESIGN CREDITS: 1/3 (one of AE 481 or AE 483 required)</td>
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**CATALOG DESCRIPTION:**
Multidisciplinary integration of aerodynamics, performance, stability and control, propulsion, structures and aeroelasticity in a system approach aimed at designing an aircraft for a set of specifications. Includes weight estimates, configuration and powerplant selection, tail-sizing, maneuver and gust diagrams, wing loading, structural and aeroelastic analysis. Students work in teams, effective teamwork nurtured.

**COURSE TOPICS:**
1. Overview of aircraft design process.
2. Aerodynamics, aircraft polars, airfoil data, lifting-line, wing planform, high lift devices, drag estimation.
3. Design speeds, performance, Breguet eq., takeoff and landing.
4. Propeller design and power plant selection.
5. Level flight and trim, horizontal and vertical tail sizing.
6. Basic, limit and ultimate loads, FAR Part 23 and/or Part 25.
7. Aircraft structural design, V-n diagrams for maneuver and gust.
8. Computation of bending, shear, and torsional wing loading.
9. Thin walled multi-cell built-up structures subject to combined bending and torsion; buckling and failure criteria.
10. Introduction to aeroelasticity, wing divergence.

**COURSE OBJECTIVES**
1. Familiarize students with the important issues and methodologies of aircraft design.
2. Illustrate the process of aircraft synthesis as an outcome of the integration of the disciplines of aerodynamics, performance, stability and control, propulsion, structures and aeroelasticity.
3. Introduce students to CAD drawing and rapid prototyping to make a small 3-D model of the final design.
4. Develop the ability to function as a member of a team in a design setting; including the ability to conduct a peer review of the other team members.
5. Familiarize students with Federal Aviation Regulations as a means for ensuring passenger safety.
6. Further enhance and develop technical communication skills.

**COURSE OUTCOMES**
On completion of Aero 483, students can:
1. Perform preliminary design of a complete aircraft based on the specifications provided (assessed by 1, 2 and 3).
2. Conduct trade-off between the conflicting demands of different disciplines by performing a detailed preliminary design of a complete aircraft. (assessed by 1, 2 and 3).
3. Demonstrate familiarity with aircraft safety based on FAA regulations. (assessed by 1, 2 and 3).
4. Work effectively as a member of a multidisciplinary design team. (assessed by 3, 4 and 5).

**ASSESSMENT TOOLS**
1. Biweekly progress reports which evolve gradually into the final report.
2. Midterm preliminary design review including team presentations, followed by each group meeting individually with the instructors to receive a detailed evaluation of the state of their project.
3. Final project design report, three-dimensional models of the aircraft built using rapid prototyping.
4. Peer review of competing designs, each team reviews the design of another team before the final presentations are due.
5. Internal team peer review.

Generated: May 1999
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