

# THE DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS

## AA 411 AIRCRAFT DESIGN II

### SPRING QUARTER

#### CREDITS AND

**CONTACT HOURS:** 4 Credits, Three 2 hour group work sessions plus two 50 minute lectures/ project review sessions per week.

**COORDINATOR:** Eli Livne, Professor of Aeronautics and Astronautics

**TEXTBOOK:** Aircraft Design: A Conceptual Approach, Daniel Raymer, Fifth Edition, American Institute of Aeronautics and Astronautics, 2012.

#### SUPPLEMENTAL

**MATERIALS:** Fundamentals of Aircraft and Airship Design, AIAA Education Series, Leeland Nicolai and Grant Carichner, American Institute of Aeronautics and Astronautics, 2010.  
Airplane Design, J. Roskam, Roskam Aviation and Engineering Corporation, Vols. 1-8, 1985-1990.  
Synthesis of Subsonic Airplane Design, E. Torenbeek, Delft University Press, 1982.

**CATALOG DATA:** AIRCRAFT DESIGN II, Required  
Preliminary design of a modern airplane to satisfy a given set of requirements.  
Estimation of size, selection of configuration, weight and balance, and performance.  
Satisfaction of stability, control, and handling qualities requirements. Prerequisite: AA410. Offered: Sp.

#### PREREQUISITES BY TOPIC:

- 1) Aerodynamics
- 2) Dynamics
- 3) Propulsion
- 4) Flight mechanics
- 5) Structures

**OUTCOMES:**

- 1) Students will be able to carry out conceptual design and sizing of airplane systems.
- 2) Students will understand the interaction between key relevant disciplines, and the trade-offs, in airplane systems design.
- 3) Students will understand the function of aircraft components and subsystems and how they might be designed.
- 4) Students will understand systems engineering issues as they relate to mission goals and requirements.
- 5) Students will experience self-organization, delegation, teamwork, communication to peers and visitors, fiscal and schedule maintenance.
- 6) Students will experience hands-on prototyping and testing of their chosen design and supporting coupons and models.

#### RELATIONSHIP TO STUDENT OUTCOMES:

- a) An ability to apply knowledge of mathematics, science, and engineering.

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- b) An ability to design and conduct experiments, as well as to analyze and interpret data.
- c) An ability to design a system, component, or process to meet desired needs.
- d) An ability to function on multi-disciplinary teams.
- e) An ability to identify, formulate, and solve engineering problems.
- f) An understanding of professional and ethical responsibility.
- g) An ability to communicate effectively.
- h) The broad education necessary to understand the impact of engineering solutions in a global and societal context.
- i) A recognition of the need for, and an ability to engage in life-long learning.
- j) A knowledge of contemporary issues.
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

### TOPICS:

- 1) Refined aerodynamic and structural modeling
- 2) Loads
- 3) Airframe Structural Synthesis
- 4) Drag, lift and moment estimation
- 5) Stability derivatives using DATCOM and CFD techniques
- 6) Cost and weight analysis and correlation with final weight and cost.
- 7) Wind tunnel model design and testing
- 8) Landing gear kinematics and design.
- 9) Stability and control: simulation, augmentation. Effects of configuration and flight conditions.