

DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS

AA440 FLIGHT MECHANICS I

AUTUMN QUARTER

CREDITS AND

CONTACT HOURS: 3 credits, Three 50 minute lectures per week.

COORDINATOR: Rolf Rysdyk and Paul Robertson 9/2006

TEXTBOOK: TBD

SUPPLEMENTAL MATERIALS:

Airplane Performance, Stability & Control, Perkins & Hage , Wiley, 1949.
Fluid Dynamic Drag, S.F. Hoerner, Hoerner 1965.
Boundary Layer Theory, H. Schlichting, McGraw-Hill 1985.
Theory of Wing Sections, Abbott & VonDoenhoff,, Dover 1959.

CATALOG DATA: FLIGHT MECHANICS I, Selective Elective
Calculation of aerodynamic characteristics of aircraft and their components including stability derivatives. Relation to wind tunnel and flight data. Vehicle equations of motion within the atmosphere, characteristics of propulsion systems and components including propellers. Prediction of performance, stability, and control characteristics for a specific aircraft.
Offered: W.

PREREQUISITES BY TOPIC:

- 1) Basic Aerodynamics
- 2) Fundamental Theorems (conservation of mass, momentum & energy; vortices)
- 3) Introductory Flight Mechanics

OUTCOMES: Students will show:

1. Basic understanding of the principles of atmospheric flight,
2. The ability to apply knowledge of mathematics, science, and engineering,
3. The ability to identify, formulate, and solve engineering problems,
4. The ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

RELATIONSHIP TO STUDENT OUTCOMES:

- a) an ability to apply knowledge of mathematics, science, and engineering
- b) an ability to design and conduct experiments, as well as to analyze and interpret data
- e) an ability to identify, formulate, and solve engineering problems
- g) an ability to communicate effectively
- k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

TOPICS

- 1) Airplane Aerodynamics
Prediction of aerodynamic forces on airplanes and components including maximum lift and compressibility effects
- 2) Airplane Performance
Characteristics of turbine and piston engines; propeller performance
Definition of flight envelope; cruise, takeoff and landing characteristics
- 3) Airplane Stability and Control
Equations of motion for aircraft in non-steady flight
Contribution of aircraft components to stability derivatives; stability criteria. Control surface effectiveness, hinge moments, stick forces
Asymmetrical flight effects