AE 6015 - ADVANCED AERODYNAMICS

HOURS: 3-0-3

CATALOG DESCRIPTION (25 words or fewer):

Introduce concepts, derivation and application of aerodynamic fundamentals. Emphasis on advanced knowledge in analysis and design of fixed-wing, launch/atmospheric return vehicles, and rotating systems.

PREREQUISITES:

AE 3030

TEXTBOOKS:

Course notes

COURSE OBJECTIVES:

Develop advanced understanding of aerodynamic fundamentals for analysis and design of aerospace vehicles, with an emphasis on fixed-wing, launch/atmospheric return vehicles, and rotating systems. This course is the second course for the PhD qualifying exam in Aerodynamics/Fluid Dynamics. Lecture and assignment focus in the course will include introduction and practice for the qualifying examinations.

LEARNING OUTCOMES:

Students will

1. learn the theory, physics, and basic methods of solving aerodynamic problems;
2. understand aerodynamics from a graduate level perspective, including single-solution and open-solution problems to provide far-field transfer of knowledge to new configurations and problems of aerodynamic interest, including use of MATLAB, MAPLE, or MATHEMATICA programming;
3. develop improve engineering perspective of aerodynamics through interactive activities.

GRADING:

Assignments:	25%
Project(s):	25%
Midterm Exam:	25%
Final Exam:	25%

LEARNING ACCOMMODATIONS:

If needed, we will make classroom accommodations for students with documented disabilities. These accommodations must be arranged in advance and in accordance with the ADAPTS office (http://www.adapts.gatech.edu).

TOPICAL OUTLINE:

Topic	Lecture Hours
I. Introduction and Review of Basic Aerodynamic Topics (equations, physics, tools)	**14**
A. Incompressible Aerodynamics	
B. Slender Wing/Body	
C. Subsonic Transformations	
D. Transonic Flow (Features And Approaches)	
E. Supersonic Airfoils	
F. Boundary Layers: Laminar, Turbulent And Transition	
II. Integrated Aerodynamics	**4.5**
A. Wing/Body/Fuselage Interactions	
B. Interference Drag	
C. Missile/Fin and Slender Body Aerodynamics	
D. Design Approaches	
III. Introduction to Unsteady Aerodynamics	**6.5**
A. Piston Theory	
B. Vortex Flows	
C. Separated Flows	
D. Bluff Bodies	
E. Rotating Configurations	
IV. High Angle of Attack Aerodynamics	**4.5**
A. Lift and Drag Prediction	
B. High Lift Devices	
V. Hypersonic Flows	**13**
A. Hypersonic Aerodynamic Prediction for Blunt and Sharp LE bodies: Hypersonic Shock and Expansion Relations, Local Surface Inclination Methods	
B. Viscous Hypersonic Flow and Heat Transfer	
C. High Temperature Effects	
D. CFD Methods for Hypersonic Flows	
Tests/Exams/Reviews	**2.5**
Total	**45**