

AV 150 : AERODYNAMICS

Transcript title

Aerodynamics

Credits

4

Grading mode

Standard letter grades

Total contact hours

40

Lecture hours

40

Recommended preparation

MTH 102 (or one course from the foundational requirements math list) or minimum placement Math Level 14.

Course Description

An in-depth study of aerodynamics, beginning with a brief history of the development of flight and flight theory. The physics of lift, drag, weight and thrust are related to airfoil and aircraft design and operational characteristics. Aircraft stability and control are related to aircraft performance and safety. Students will demonstrate their knowledge of aerodynamics through projects in which they predict aircraft performance.

Course learning outcomes

1. Identify standard atmospheric variables and their sea-level values.
2. Compute atmospheric conditions using the universal gas laws.
3. State the relationships between indicated, calibrated, equivalent, and true airspeeds and how they change with altitude and temperature.
4. Understand lift, drag, and pitching moment curves versus angle of attack with differing wing shapes and high lift coefficient devices.
5. Explain characteristics of boundary layer composition caused by changes in friction and wing airfoil shape.
6. Examine the effects of velocity, density, area, and lift coefficient on lift and drag.
7. Compute stall speed and changes to stall speed due to variables such as weight load factor, altitude, and lift coefficient.
8. Discuss how wing platform characteristics, including wing area, wing span, mean aerodynamic chord, taper ratio, aspect ratio, affect lift, affect drag, and aircraft performance.
9. Determine maximum range, endurance speeds, and rate of climb airspeeds from plots of power, thrust, and drag versus airspeed and understand wind and fuel flow effects.
10. Diagram wing stall patterns.
11. Explain the aerodynamic characteristics of spins and spin recovery.
12. Discuss the effects of wake turbulence, ground effect, and induced drag on aircraft performance and flying qualities.
13. Explain factors affecting maneuvering envelope.
14. Solve problems involving the turn equations.
15. Diagram skids, slips, and normal turns.

16. Explain the cause and effects of compressibility and how the effects can be minimized.

17. Describe aerodynamic design features for high-speed transonic and supersonic flight.

18. Define types of stability and control with respect to axis, static, or dynamic and the primary contributors to each type.

19. Explain cross-coupling.

Content outline

- Aerodynamic Variables
- Atmospheric Conditions
- Lift
- Drag
- Thrust
- Performance
- Stability and Control
- Hi Speed Flight
- Flight Design
- Flight Testing

Required materials

Requires textbook and/or online learning materials.