

COMMON COURSE NUMBER: ASC 1550

COURSE TITLE: Aerodynamics

CREDIT HOURS: 3

CONTACT HOURS BREAKDOWN:

Lecture/Discussion 48

Lab

Other

Contact Hours/Week 3

CATALOG COURSE DESCRIPTION:

Prerequisite: ATT1100 and ASC1100

Corequisite: None

An analysis of the physical laws and aerodynamic principles which govern the flight and performance of aircraft stability and control, weight and balance, and aircraft instruments affecting flight operational considerations of controllable pitch propellers, retractable gear, weather, and precision maneuvers. Prerequisite: Private pilot's license, or instructor's permission.

General Education Requirements - Associate of Arts Degree, meets Area(s):
General Education Requirements - Associate in Science Degree, meets Area(s):

UNIT TITLES:

1. The Four Forces: Lift
2. The Four Forces: Drag and Weight
3. The Four Forces: Thrust
4. Flight Instruments
5. Stability and Load Factors
6. Design
7. Performance
8. High Speed Flight

I. Course Overview:

Upon successful completion of this course, the students should be able to acquire the aeronautical knowledge to successfully meet the written examination requirements for a commercial pilot certificate with an airplane category and single engine class rating in the following areas: the physical forces and laws pertaining to flight, flight instruments, stability and control, load factors, design, aircraft performance, weight and balance, and high speed flight.

II. Units:

Unit 1. The Four Forces: Lift

General Outcome:

- 1.0 The students should be able to demonstrate an understanding of lift and its various associated components.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 1.1 Describe the physics of lift, including Bernoullis' Principle and the Law of Continuity.
- 1.2 Describe how an airfoil creates lift and define airfoil terminology.
- 1.3 Distinguish between cambered and symmetrical airfoils.
- 1.4 Describe the stalled condition, understand the physics leading to this condition, and distinguish among the differing stalling characteristics of differing airfoil designs.
- 1.5 Describe downwash and how it is created.
- 1.6 Display an understanding of aspect ratio and lift coefficient.
- 1.7 Recognize different flap design and other devices controlling lift.

Unit 2. The Four Forces: Drag and Weight

General Outcome:

2.0 The students should be able to demonstrate an understanding of Drag and Weight.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 2.1 Define and discuss the differences between parasite, induced, and total drag.
- 2.2 Explain boundary layers specifically including the differences between laminar and turbulent layers.
- 2.3 Describe Reynolds number.
- 2.4 Define Drag Coefficient.
- 2.5 Discuss ground effects and its effect on flight operations.

Unit 3. Flight Instruments

General Outcome:

3.0 The students should be able to understand the basic principles and operation of aircraft instruments.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 3.1 Distinguish among and categorize aircraft instruments.
- 3.2 Discuss the use, operation and interpretation, of each of the pilot-static instruments.
- 3.3 Discuss the use, operation and interpretation of each of the gyroscopic instruments.
- 3.4 Discuss the use, operation and interpretation of the magnetic compass.
- 3.5 List and explain each of the errors of the magnetic compass.

Unit 4. Airplane Weight and Balance

General Outcome:

- 4.0 The students should be able to work airplane weight and balance problems.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 4.1 Determine the importance of weight and balance.
- 4.2 Calculate CG positioning as well as contrast the effects of a forward and aft CG position.
- 4.3 Calculate weight and balance problems using the computation method.
- 4.4 Calculate weight and balance problems using the graphical method.
- 4.5 Calculate weight and balance problems using the tabular method.
- 4.6 Define terms associated with weight and balance calculations.

Unit 5. Airplane Performance

General Outcome:

- 5.0 The students should be able to understand various factors which effect airplane performance and how to calculate various aspects of performance.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 5.1 Discuss the effects of altitude, humidity, and temperature on airplane performance.
- 5.2 Determine pressure and density altitude using appropriate charts.
- 5.3 Determine take-off performance using appropriate charts, tables and graphs.
- 5.4 Determine climb and cruise performance using appropriate charts. Define associated V speeds.
- 5.5 Determine landing performance using appropriate graphs and tables.

Unit 6. Aviation Weather

General Outcome:

- 6.0 The students should be able to understand basic weather terminology and be able to recognize general types of weather conditions. Also, the students should have the ability to identify dangerous weather situations and avoid them.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 6.1 Explain the composition and structure of the atmosphere, atmosphere pressure, its measurements and relation to altitude.
- 6.2 Discuss atmospheric circulation, turbulence, highs and lows, associated winds, isobars and their relation to wind velocity.
- 6.3 Recognize the relationships existing between moisture and temperature as well as understanding basic terminology associated with those concepts.
- 6.4 Identify and explain various cloud formations and their associated characteristics.
- 6.5 Discuss air mass characteristics and frontal hazards.
- 6.6 List and explain the steps involved in the life cycle of a thunderstorm.
- 6.7 Compare/Contrast icing types; identify icing hazards, and the effects of frost on the airfoils.

Unit 7. Using Aviation Weather Services

General Outcome:

- 7.0 The students should be able to read and interpret reports, forecasts, and weather charts appropriate for the private pilot.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 7.1 Discuss the networking of weather information.
- 7.2 Interpret and identify teletype weather reports and forecasts. (Hourly sequence reports, terminal forecasts, and area forecasts.)
- 7.3 Identify and discuss weather maps and charts. (Surface charts, weather depiction, radar summary and low level Prog.)
- 7.4 Understand how to get a weather briefing and what is included in that briefing.
- 7.5 Define radio broadcast material (HIWAS, TWEB, Sigmet, Airmets, Pireps, etc.)

Unit 8. Federal Aviation Regulations

General Outcome:

- 8.0 The students should have an understanding of the regulations in FAR Part 1, 61, 91 and NTSB 830 appropriate for the private pilot.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 8.1 Define terms and abbreviations in FAR Part 1 appropriate to the private pilot.
- 8.2 Discuss regulations in FAR Part 61 pertinent for a private pilot.
- 8.3 Discuss regulations in FAR Part 91 pertinent for private pilot operations.
- 8.4 Discuss regulations under NTSB Part 830 pertinent to airplane operations.