

COURSE OUTLINE

Aviation and Transportation 122 Meteorology

Catalog Statement

AT 122 presents the basic principles of meteorology with emphasis placed on the physical laws that operate in the atmosphere, particularly as they affect aircraft flight. Weather maps, reports, and forecasts and their interpretation are stressed. Weather briefings and self-evaluation will be discussed.

Total Lecture Units: 3.0

Total Laboratory Units: 0.0

Total Course Units: 3.0

Total Lecture Hours: 48.0

Total Laboratory Hours: 0.0

Total Laboratory Hours To Be Arranged: 0.0

Total Faculty Contact Hours: 48.0

Prerequisite: None.

Recommended Preparation: completion of AT 120 or possession of a private pilot's certificate.

Course Entry Expectations

Prior to enrolling in the course, the student should be able to:

- summarize the physical forces at work in the atmosphere;
- outline the theory of pressure systems and fronts;
- reproduce by sketch, large and small wind systems;
- interpret weather reports, charts and forecasts;
- predict weather outcomes from aviation weather services available to pilots.

These objectives will meet the standards of the Federal Aviation Administration and the examination criteria in this outline.

Course Exit Standards

Upon successful completion of the required coursework, the student will be able to:

- explain the composition, properties, layers, and levels of the earth's atmosphere;
- compare and contrast the types of weather briefings and their sources;
- describe the formation and stages of thunderstorms and the hazards they present for pilots;
- evaluate actual weather reports and forecasts to determine if safe flight is possible;
- identify the weather conditions consistent with stable and unstable airmasses.

Total Faculty Contact Hours = 48.0

Course Content

Basic Concepts (6 hours)

- Atmospheric layers and levels
- Atmospheric composition
- Physical properties of the atmosphere
- Atmospheric pressure
- Weather and the atmosphere
- International Standard Atmosphere

Temperature (2 hours)

- Temperature scales
- Lapse rates
- Transport of heat
- World temperatures

Pressure (2 hours)

- Standards and scales
- Charting atmospheric pressure
- Isobars and pressure systems
- Effect of altitude
- Pressure gradient force
- Altimeters
- World pressure

Density (2 hours)

- Air density changes due to altitude
- Air density changes due to temperature
- Methods for calculating density altitude
- Changes in aircraft performance

Moisture (2 hours)

- Water vapor
- Humidity
- Dew point
- Saturation
- Distribution of water vapor
- Changes in state
- Heat exchange
- Precipitation

Stability (3 hours)

- Atmospheric stability
- Adiabatic lapse rates (dry and saturated)
- Stability of dry air
- Stability of saturated air
- Vertical motion and convection
- Effects of stability on weather
- Effects of stability on safety of flight

Atmospheric circulation (**3 hours**)

- Local wind patterns
- Global wind patterns
- Coriolis force
- Friction force
- The jet stream
- Cyclones and hurricanes

Airmass weather (**3 hours**)

- Air masses
- Fronts
- Source regions
- Designations of air masses
- Elements of air mass weather

Frontal weather (**2 hours**)

- Frontal characteristics
- Stationary fronts
- Warm fronts
- Cold fronts
- Wave development
- Occlusion
- Fronts aloft
- Instability lines and squall lines
- Average world frontal zones

Thunderstorms (**4 hours**)

- Conditional instability
- Lifting action
- Moisture
- Types of thunderstorms
 - Frontal thunderstorm
 - Air mass thunderstorm
 - Severe thunderstorms
- Stages of thunderstorms
 - Cumulus stage
 - Mature stage
 - Dissipating stage
- Vertical development
- Drafts and gusts
- Lightning
- Microbursts
- Surface phenomena
- Freezing level and structural icing
- Embedded thunderstorms

Fog (**2 hours**)

- Definition
- Saturation of air
- Temperature-dewpoint spread

Fog types
Fog types that require wind
Fog vs. mist

Aviation weather hazards (6 hours)

Wind shear
 Definition
 Causes
 Reporting
Turbulence
 Definition
 Causes
 Reporting
Icing
 Induction icing
 Structural icing
 Types of structural icing
 The icing environment
 Pilot response and reporting
Additional weather hazards
 Volcanic ash
 Atmospheric electricity
 White-out
 Runway hazards

Aviation weather resources (2 hours)

The forecasting process
Graphic weather products
Printed forecasts
Printed reports
Weather information sources
Weather briefings
 Outlook briefing
 Standard briefing
 Abbreviated briefing
 Official sources
Weather evaluation for flight
In-flight weather evaluation

Methods of Instruction

The following methods of instruction may be used in this course:

- lectures;
- demonstrations;
- videos and photographs;
- in-class group projects;
- guest speakers.

Methods of Evaluation

The following methods of evaluation may be used in this course:

- multiple choice quizzes;
- multiple choice mid-term exam;
- multiple choice final exam;
- presentation of a research project using a real time weather briefing for the purpose of making a “go, no-go” decision;
- in-class group projects.

Textbook

Lester, Peter. *Aviation Weather*. 4th ed.
Englewood, CO: Jeppesen 2013. Print.
10th Grade Reading Level ISBN: 978-0-88487-594-9

Student Learning Outcomes

Upon successful completion of the required coursework, the student will be able to:

- describe the earth’s atmosphere;
- explain the causes of different types of weather conditions;
- review and interpret weather reports and forecasts;
- identify potential weather-related hazards related to safe flight.
- obtain and evaluate a standard weather briefing.