

## **Private Pilot Ground School: An Outline**

The following pages illustrate an outline of a very thorough ground school class offered by Jim Dukeman. For those interested in starting such a program, the outline listed will provide a good starting point so you do not feel like you are reinventing the wheel.

**Course Syllabus**  
**Private Pilot Ground School**  
**A Curricular Outline for Students in Grades 10-12**

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**I. COURSE DESCRIPTION:**

This detailed comprehensive 84 hour course will thoroughly prepare the student to satisfy the mandatory requirement of passing the Federal Aviation Administration (FAA) written examination and oral exam.

The FAA written and oral exams are two (2) of three (3) mandatory requirements necessary to obtain the private pilot's certificate. This Beginning Ground Course and Private Pilot Certificate are mandatory for a career in aviation.

The specific requirements for obtaining a Private Pilot's License are:

1. Pass the FAA Private Pilot written exam with a minimum passing score of 70% (This 84 hour course prepares the student for this requirement)
2. Pass an oral exam with a designated FAA examiner. (This course adequately prepares the student to easily pass this requirement)
3. Pass a flight exam with a designated FAA examiner. (This requirement is completed with the student and his/her individual flight instructor in an aircraft)

**II. OBJECTIVE**

Successful completion will authorize and prepare the student to take the Federal Aviation Administration's (FAA) written examination with a mandatory minimum passing score of 70%.

Prepares individual applicant for a beginning career in aviation. Provides a comprehensive background for the pleasure private pilot.

**III. LENGTH OF COURSE**

Lecture 6 Hours per week for approximately 14 weeks

**IV. PREREQUISITE**

At least 16 years of age and have an interest in aviation, but not yet a licensed pilot.

## COURSE OUTLINE

1. Orientation and Registration 3 hours (3 hr)
  - A. Course Goals/Requirements
  - B. Outline
  - C. Registration
  - D. Ordering Text Material
  
2. The Airplane and its Components 3 hours (6 hr)
  - A. Varieties of Aircraft
    - I. Lighter than air
    - II. Gliders
    - III. Rotorcraft
    - IV. Airplane
      - a) Category
      - b) Class
      - c) Type
  - B. Airplane Components
    - I. Wings
      - a) Type
      - b) Basic Construction (Aileron Flaps)
      - c) Location and Purpose
    - II. Fuselage
      - a) Type
      - b) Purpose
      - c) Location
    - III. Empennage
      - a) Type
      - b) Construction
      - c) Location and Purpose
    - IV. Trim Tabs
      - a) Location

- b) Purpose
- V. Landing Gear
  - a) Type
  - b) Construction
  - c) Location and Purpose
- VI. Brakes
  - a) Type
  - b) Location
  - c) Purpose

C. Power Plant

- I. Types
- II. Location
- III. Purpose

D. Propellers

- I. Type
- II. Location
- III. Purpose

3. Aerodynamics 3 Hours (9 hr)

- E. Bernoulli's Principle
- F. Airfoils
- G. Four Forces of Flight
  - I. Lift
  - II. Thrust
  - III. Weight
  - IV. Drag
- H. Stalls and their causes
  - I. Angle of attack
  - II. Factors Affecting
  - III. Flaps
  - IV. Angle of bank
- I. Center of Gravity

- J. Load Factors
- K. Frost/Ice/Snow
- L. Turbulence
- M. Misconceptions Regarding Stalls
  - I. Design of Wing
  - II. Platform
  - III. Angle of incidence
  - IV. Center of Lift Location
  - V. Wash-out or Twist
  - VI. Stall Strips
  - VII. Spanwise Airfoil Variation
- N. Stall Recovery
- O. Gravity
- P. Thrust
- Q. Drag
- R. Ground Effect
- S. Lift to Drag Ratio

4. The Three Axes 3 Hours (12 Hrs)

- A. The Three Axes
  - I. Roll Longitudinal
  - II. Pitch Lateral
  - III. Yaw Vertical
- B. Aircraft Stability
- C. Longitudinal Stability
- D. Lateral Stability
- E. Directional Stability
- F. Turning Effects
  - I. Torque
  - II. Precession
  - III. Asymmetrical Thrust
  - IV. Spiraling Slipstream
  - V. How A/C Turns

5. Basic Aircraft Performance 3 Hours (15 Hrs)
  - A. Effects of temperature and altitude
  - B. Density Altitude and AC performance
  - C. Density Altitude Computation
  - D. Take-off Performance and Effects
    - I. Density Altitude
    - II. Pressure
    - III. Temperature
    - IV. Wind
    - V. Aircraft Weight
    - VI. Runway Gradient
    - VII. Turbulence
    - VIII. Humidity
6. Performance Charts 3 Hours (18 Hrs)
  - A. Take-off Performance
    - I. Tables
    - II. Graphs
    - III. Interpolation
    - IV. Cross Wind Component Chart
  - B. Climb Performance
    - I. Best Rate
    - II. Angle
    - III. Normal
    - IV. Performance Chart (Graph-Tables)
    - V. Interpolation
    - VI. Misconceptions Regarding Wind/Climb performance
  - C. Cruise Performance
    - I. Tables
    - II. Graphs
    - III. Interpolation
  - D. Landing Performance
    - I. Approach Speed

- II. Weight and Configurations
- III. Tables
- IV. Graphs
- V. Interpolation
- VI. Wind Component Chart

E. Wake Turbulence

- I. \_\_\_\_\_  
types
  - a) Jet Blast
  - b) Terrain Features
  - c) Heavy Aircraft Operations
- II. \_\_\_\_\_  
avoidance of Wake Turbulence

7. Aircraft Flight Instruments 3 Hours (21 Hrs)

A. Magnetic Compass

- I. Principle of Operation
- II. Construction
- III. Deviation
- IV. Magnetic Dip
- V. Turning Effects
  - a) Northerly
  - b) Southerly
  - c) Easterly
  - d) Westerly
- VI. Acceleration/Deceleration Errors
- VII. Turns to heading

B. Outside Air Temperature Gauge

C. Pitot Static System

- I. Construction
- II. Purpose
- III. Instruments Required
  - a) Airspeed

- b) Altimeter
- c) VSI

8. Aircraft Flight Instruments 3 Hours (24 Hrs)

A. Air Speed Indicator

- I. Source of Power
- II. Basic Operation
- III. Deffinations
  - a) Indicated
  - b) Calibrated
  - c) True
- IV. Color coding
- V. Maneuvering Speed
- VI. Errors

B. Altimeter

- I. Construction
- II. Setting Altimeter
- III. Types
  - a) Pressure
  - b) Indicated
  - c) True
  - d) Absolute
- IV. Reading indications
- V. Power Source and Operation

C. Vertical Speed Indicator

- I. Construction
- II. Operation
- III. Reading Indications

D. Gyro Instruments

- I. Principle of Operation
- II. Turn and Slip Indicator
  - a) Types
  - b) Indications
  - c) Principle of Operation

- III. Turn Coordinator
  - a) Indications
  - b) Principle of Operation
- E. Attitude Indicator
  - I. Construction
  - II. Principle of Operation
  - III. Errors
- F. Heading Indicator
  - I. Construction
  - II. Principle of Operation
- G. Gyro Principles
  - I. Precession
  - II. Power Sources
  - III. Vacuum Operation
  - IV. Venturi
  - V. Electrical
  - VI. Rotors
  - VII. Using All Instruments At Once
- 9. Reciprocating Engine and Related Systems 3 hours (27 Hrs)
  - A. Basic Reciprocating Engine
    - I. Construction
    - II. Operation
    - III. Cooling
    - IV. Detonation
    - V. Pre-ignition
    - VI. Ignition Systems
    - VII. Magnitoes
    - VIII. Throttle
    - IX. Engine Gauges
      - a) Oil Temperature
      - b) Cylinder Headwind
      - c) Pressure
      - d) Fuel Pressure

X. Tachometer

XI. Manifold Pressure Gauge

B. Aircraft Propellers

I. \_\_\_\_\_  
Fixed Pitch

a) \_\_\_\_\_  
limb

b) \_\_\_\_\_  
rise

c) \_\_\_\_\_  
combination

II. \_\_\_\_\_  
Constant Speed

a) Prop Control

b) Manifold pressure vs. RPM

10. Reciprocating Engines and Systems 3 Hours (30 hrs)

A. Fuel System

I. Type of system

II. Type of fuel

III. System Operation

IV. Straining

V. Tank Selection

VI. Pressure Systems (Injected)

VII. Primer

VIII. Mixture Control

B. Carburetor

I. Operation

II. Heat

III. Ice

C. Electrical System

I. General Aircraft Diagram

II. Alternators

III. Generators

- IV. Ammeter
- V. Master Switch
- VI. Fuses
- VII. Batteries

D. Pre-Flight of AC

11. Airports

A. Runways

- I. Numbers
- II. Markings
  - a) VFR
  - b) IFR
  - c) Grass

III. Active

IV. Closed

B. Threshold

I. Displaced

II. Normal

C. Stabilized or Descriptive Areas

D. Over-Run – Stopway Area

E. Taxiway

F. Parking Area Ramps

G. Wind Indicators

I. Sock

II. Tetrahedron

III. Wind Tee

H. Segmented Circle

I. Lighting

I. Threshold

II. Runway

III. Taxiway

IV. Centerline

V. Approach

VI. VASI

VII. Beacons

J. Airport Traffic

- I. Takeoff LEG
- II. Crosswind LEG
- III. Downwind LEG
- IV. Base
- V. Final

K. Traffic Pattern Entry and Exit

- I. Segmented Circle

12. Radio Communication and Air Traffic Control 3 hours (36 Hrs)

A. Equipment

II. Basic Radio

- a) VHF
- b) UHF
- c) COMM.
- d) NAV
- e) Tuning
- f) Using Microphone
- g) Phonetic Alphabet
- h) Phraseology
  - Numbers
  - Letters

B. Unicom

C. Ground

D. Clearance

E. Tower

F. Enroute

G. Atis

H. Light Signals

I. Flight Service Stations

J. Emergency Procedures

III. DF

IV. 121.5

V. No Radio

13. Weight and Balance 3 Hours (39 Hrs)

A. Importance

Safety

Regulations

B. Load Factors

C. Position of Weight and Effects

D. Aircraft Balance

E. Center of Lift

F. Center of Gravity

I. Forward

II. Rearward

III. Extreme Forward or Rearward

G. Weights and Balance Computation

I. Computation

II. Graph

III. Table

14. Weather Theory 3 Hours (42 Hrs)

a. Basic Atmosphere

b. Temperature

c. Wind

d. Coriolis Effect

e. Air mass

f. Air mass Source Region

g. Air mass Modification

h. Cloud formation and Type

i. Classification

1. High

2. Middle

3. Low

ii. Type

a) Stratus

- b) Cumulus
- c) Vertical Development
- d) Lens shape
- i. Elements
  - I. Moisture
  - II. Stability
  - III. Inversions

15. Pressure and Wind 3 Hours (45 Hrs)

- A. Station pressure
- B. Types of Pressure Systems
  - I. Isobars
  - II. Low
  - III. High
  - IV. Trough
  - V. Ridge
  - VI. Col.
- C. Pressure Gradient Force
- D. Friction Effect
- E. Local Wind Systems
- F. Land and Sea Breezes
- G. Effects of Weather Elements
  - I. Fog
    - a) Causes and conditions
    - b) Types
      - Advection
      - Radiation
      - Steam
      - Upslope
- H. Haze
- I. Smoke
- J. Visibility Restrictions Due to Wind
- K. Sky Conditions

- L. Fronts
  - I. Definition
  - II. How formed
  - III. Types
    - a) Cold
    - b) Warm
    - c) Occluded
    - d) Stationary
  - IV. Weather Associated with Each

- M. Thunderstorms
  - I. Causes
  - II. Effects
  - III. Stages

- N. Mountain Weather
  - I. Mountain Waves
  - II. Low level Wind Shear
  - III. Iceing
    - a) Structure
      - Rime
      - Clear

16. Weather Reports and Forecasts 3 Hours (48 Hrs)

- A. Weather Service Outline and Structure
- B. Sequence Reports (SA)
- C. Terminal Forecast (FT)
- D. Area Forecast (FA)
- E. Wind and Temperature Aloft (FD)
- F. Inflight Advisories
  - I. Airmets
  - II. Sigmets
  - III. Pireps
  - IV. Convective Sigmets

V.  
Watch

Severe Weather

- a)
- b)
- c)

Hurricane  
Thunderstorm  
Squall Lines

17. Weather Chart and Briefing 3 hours (51 Hrs)

- I. Surface Analysis
- II. Weather Depiction
- III. Radar Summary
- IV. Prog. Chart 12-24, 36-48
- V. How to obtain a good weather briefing

18. Federal Aviation Regulations 3 Hours (54 Hrs)

- A. Part 1 Glossary
- B. Part 61: Requirements for Pilot's Certification/Rating

19. Federal Aviation Regulations 3 Hours (57 Hours)

- A. Part 91: General Operating Rules
- B. Part 830: Accident Reporting

20. Aeronautical Charts 3 Hours (60 Hrs)

- A. Latitude
- B. Longitude
- C. Chart Symbol and Terminology

21. Air Space Utilization 3 Hours (63 Hrs)

- A. Uncontrolled
- B. Controlled
  - I. Positive Controlled Area
  - II. Continental Controlled Area
  - III. VOR Federal Airways
  - IV. Transition Areas
  - V. Control Zones
  - VI. Airport Traffic Areas
  - VII. Airport Advisory Area
  - VIII. Terminal Control Area

- a)

Group I

b)

Group II

c)

Group III

C. Special Use Airspace

I. Prohibited Area

II. Restricted Area

III. Warning Area

IV. Military Operations Area

V. Low Level Military Operations

a) Visual Flight Rules

b) Instrument Flight Rules

VI.

Avoidance

Collision

22. Navigation 3 Hours (66 Hrs)

I. Dead Reckoning

I. Plotting Course

II. Measuring Distance

II. Visual OMNI Range (VOR)

I.

Advantage

a)

Accuracy

b)

Reliability

II.

Disadvantage

a) Line of Sight

III.

Equipment

Required

a) Ground

➤ Transmitter

➤ Receiver

b)

airborne

➤ Receiver

➤ Indicator

• OMNI Bearing Selector

• Left\Right Meter

• To/From Indicator

- IV. Procedures Navigation
- V. VOR Indicators
- VI. Reverse Sensing
- VII. Intercepting
- Radials
- VIII. Tracking
- Inbound/Outbound
- IX. Orientation
- X. Test Signals

23. Navigation 3 hrs (69 Hrs)

A. Area Navigation

B. ADF

- I. Equipment Required
- II. Relative Bearings
- III. Tracking
- IV. Homing

C. Radar Navigation

I. Terminal

- a) Stage I
- b) Stage II
- c) Stage III

II. Enroute

D. Transponders

I. Phraseology

II. Codes

24. Airmen's Informational Manual 3 Hours (72 Hrs)

- A. Navigation Aids
- B. Airspace
- C. Air Traffic Control
- D. Safety of Flight
- E. Good Operation Practices
- F. Pilot Controller Glossary

- G. Airport Facility Directory
- H. Notice to Airmen
- 25. E6B Computer 3 Hours (75 Hrs)
  - A. Calculator Side
    - I. True Airspeed
    - II. True Altitude
    - III. Time
    - IV. Distance
    - V. Fuel Consumption and Range
    - VI. Density Altitude
- 26. E6B Computer 3 Hours (78 Hrs)
  - A. Wind Side
    - I. True Heading
    - II. Ground Speed
    - III. Wind Speed
    - IV. Wind Direction
    - V. Wind Correction Angle
- 27. Medical Facts For Pilots 3 Hours (81 Hrs)
  - A. Hypoxia
  - B. Carbon Dioxide
  - C. Hyperventilation
  - D. Vertigo
  - E. Night Vision
  - F. Drugs and Alcohol
  - G. Psychological Considerations
    - I. Anxiety
    - II. Stress
- 28. Review 3 Hours (84 Hrs)
  - A. Instructions FAA Test
  - B. Scheduling FAA Test
  - C. Question/Answer Session