CFII Curriculum

1. Fundamentals of Instruction
    a. Training/Teaching Delivery Methods
        i. Lecture Method
            1. Discussion Method
            2. Guided Discussion Method
        ii. Problem Based Learning
        iii. Electronic Learning
        iv. Cooperative or Group Learning
        v. Demonstration Performance Method
        vi. Drill and Practice Method
2. Technical Subject Areas
    a. Aircraft Flight Instruments and Navigation Equipment
        i. IFR Required Equipment (FAR 91.205(d))
            1. VFR day equipment (FAR 91.205(b))
            2. For night IFR flight, VFR night equipment (FAR 91.205(c))
            3. Two-way radio and navigation equipment suitable for route to be flown
            4. Gyroscopic rate of turn indicator, except for:
                a. airplanes equipped with a third attitude instrument system capable of 360° of pitch and roll indications consistent with installation prescribed in FAR 121.305(j).
            5. Slip-skid indicator
            6. Sensitive altimeter adjustable for barometric pressure
            7. A clock displaying hours, minutes, and seconds with a sweep-second pointer or digital clock with equivalent information.
            8. Generator or alternator of adequate capacity
            9. Gyroscopic pitch and bank indicator (with artificial horizon)
            10. Gyroscopic direction indicator (directional gyro or equivalent)
        ii. Which instruments are gyroscopic
            1. Attitude Indicator
            2. Heading Indicator
            3. Turn Indicator
        iii. What energy systems are there which power gyroscopic systems?
            1. Vacuum Pump
            2. Electrical
            3. Solid-State Inertial-Reference-Unit (IRU)
        iv. Which energy system is used in your aircraft to power gyroscopic systems?
        v. How does a static-pitot system work?
            1. Manometer Principle with two ports:
                a. Static pressure port
                    i. From perpendicular surface, normally along the plane parallel to the longitudinal and vertical axis, to

the altimeter which expands or contracts an aneroid wafer within and manipulates the display dial through an inner linkage mechanism giving an indication of altitude. As altitude increases, static pressure drops, then the wafer expands and the linkage is manipulated accordingly. The same is true in reverse as altitude decreases and static pressure increases.

ii. (Optional) vertical speed indicator is fed by static port with a similar mechanism, except with a calibrated orifice on the wall of the chamber where the wafer is stored allowing the wafer pressure to equalize with static pressure over time, usually 3 to 5 seconds.

b. Ram pressure port

i. Pitot tube with an opening facing the bow of the airplane collects ram air pressure. As the airplane increases in speed, this ram pressure increases and manipulates a linkage that indicates airspeed.

vi. Which instrument systems require static pressure to function?

1. Airspeed Indicator
2. Altimeter
3. Vertical Speed Indicator

vii. Which Instrument system(s) require ram pressure to function?

1. Airspeed Indicator

viii. What error indications can occur with a blockage/failure static port?

1. On the altimeter, we expect that there will be no corresponding change in indicated altitude against actual change in altitude.
2. On the airspeed indicator, we expect lower indicated airspeed with increase in altitude and higher indicated airspeed with decrease in altitude.

ix. What countermeasure can you take against static port blockage or failure? What errors, if any, can we expect if a countermeasure is used?

1. Open in-cabin alternate static source.
    a. We can expect that the altimeter can read approximately 50 ft higher than normal and approximately 3 knots faster than normal.
2. If Opening in-cabin alternate static source does not resolve the issue, you can break the VSI front glass to allow static pressure to enter the static line through the VSI instrument.

x. What error indications can occur with pitot port blockage failures?

1. If the pitot and bleed port is completely blocked, the airspeed will “freeze” and change only with change in altitude. With increase in

altitude, airspeed will appear to increase; with decrease in altitude, airspeed will appear to decrease.
2. If pitot power is blocked but the bleed port is not blocked, then the airspeed will slowly decrease to zero.

xi. What countermeasures can be taken against suspected pitot port blockage?
1. Activate the pitot heat both to prevent and correct a pitot port blockage, due to pitot icing, as needed.

xii. How many satellites are in the GPS constellation?
1. At least 24

xiii. How does a GPS derive your position?
1. Your position is calculated by:
    a. Synchronizing your on-board clock to the clock of the GPS system.
    b. The GPS satellites emit time signals at regular frequencies which can be read by your GPS receiver. It takes time for these emitted signals to reach your receiver. The difference in time between the time received from the GPS emitter and the on-board local time places your position at a certain radius to the GPS emitter which is in a known location.
    c. A combination of these radial vectors from the GPS receivers can be used to triangulate your position.

xiv. How many satellites are required for 2d positioning on the surface of the earth?
1. 3 satellites

xv. How many satellites are required for 3d positioning anywhere above the surface of the earth?
1. 4 satellites

xvi. What does RAIM stand for?
1. Receiver Autonomous Integrity Monitoring System

xvii. How many satellites are required for RAIM?
1. 5 or more satellites

xviii. What does WAAS stand for?
1. Wide Area Augmentation System

xix. How does WAAS work?
1. Equipment required: 4 satellites and 1 fixed ground station.
2. Procedure: The ground station references the calculated position from the satellites and compares this against an actual fixed and known ground-reference physical position. The difference between these two results in an error that is then broadcast to WAAS capable aircraft which then subtract the error from the aircrafts calculated position per the GPS thus increasing the accuracy of the GPS calculated position.

xx. What defines a precision approach?
    1. An approach that allows you to descend to a Decision Height/Altitude to at or below 300 feet AGL.

xxi. What defines a non-precision approach?
    1. An approach that allows you to descend to a Minimum Descent Altitude or Height of no lower than 300 feet AGL.

xxii. What are examples of Precision or Precision-like approaches?
    1. ILS - Instrument Landing System
    2. LPV - Localizer Performance with Vertical Guidance (GPS w/ WAAS)
        a. Can only be used when WAAS capable and active.

xxiii. What defines a non-precision approach?
    1. An approach that allows you to descend to a Minimum Descent Height or Altitude of no less than 300 feet AGL.

xxiv. What are examples of non-precision approaches?
    1. VOR - Very High Frequency Omnidirectional Range
    2. VOR/DME - VOR w/ Distance Measuring Equipment
    3. LOC - Localizer
    4. LDA - Localizer Type Directional Aid
        a. Localizer approach where the approach path is between 6° and 30° offset from the runway centerline. Typically used to avoid obstructions or obstacles that would normally interfere with an approach along the centerline.
    5. RNAV - Area Navigation (GPS)
    6. LNAV - Lateral Navigation (GPS)
    7. NDB - Non-Directional Beacon

xxv. What concerns/limitations are important to consider when using a VOR?
    1. Need direct Line of Sight for reception. 1,000 feet per NM distance.
    2. Cone of confusion where readings are unreliable when within 30° above VOR.

xxvi. What type of distance does a DME provide?
    1. Slant Line distance.

xxvii. What concerns/limitations are important to consider when using an ILS?
    1. False horizon. Resulting from resonance of the signals above the actual glide slope at approximately 17° slope as opposed to normal 3°.

xxviii. Flight Path - Green Needles - “Course Directional Indicator” (CDI)
    1. When to use?
        a. When cleared for an approach:
            i. Cleared for vector to final, or
            ii. When crossing Initial Approach Fix

xxix. Flight Path - Magenta Needles - “GPS based navigation course or guidance”

1. When to use?
    a. When using GPS for navigation, or
    b. When on a GPS based approach.

xxx. How to calculate cloud ceilings?
1. Find the Surface Temperature
2. Find the Dew Point
3. Subtract the Surface Temperature, from step (1), from the Dew Point, from step (2), to find the Surface-Temperature-Dew-Point Spread.
4. Divide the Surface-Temperature-Dew-Point Spread from step (3) by 2.5.
5. Multiply this figure from step (4) by 1000 to obtain your final solution in feet AGL.
6. To obtain an MSL figure, simply add field elevation to AGL figure, from step (5).

xxxi. How to calculate Freezing Level assuming surface temperature is greater than zero degrees Celsius?
1. Find the Surface Temperature.
2. Divide the Surface Temperature by standard temperature lapse rate of -2° per 1000 ft. In other words, divide surface temperature by 2.
3. Multiply the figure from (2) by 1000 to obtain freezing level in feet AGL.
4. To obtain an MSL figure, simply add the AGL figure from (3) to the field elevation.

b. Aeromedical Factors
i. What is Basic Med?
1. Medical endorsement which can be granted by any physician that authorizes a pilot to exercise certain privileges under certain limitations.

ii. How long is Basic Med Valid?
1. 4 years
2. Must do Comprehensive Medical Examination Checklist (CMEC) course every 2 years.

iii. Requirements for Basic Med?
1. Must have had a valid medical issued by an Airman Medical Examiner in the past.

iv. What are the privileges/limitations of Basic Med?
1. VFR and IFR permitted
2. Max 250 knots
3. Max 12,500 gross weight
4. Airplane has max certification for 7 occupants, including pilot
5. 18,000 feet or below
6. Instruction/Examinations permitted but not as PIC

v. How long is your medical good for?
    1. FAR 61.23
vi. What is Hypoxia?
    1. Deficit of oxygen transmission from blood to tissues.
vii. What are the 4 types of hypoxia?
    1. Hypoxic Hypoxia
        a. Occurs from lack of oxygen in air such as what might occur at high altitudes.
    2. Hypemic Hypoxia
        a. Occurs from blood's inability to bring in oxygen due to carbon monoxide or anemia
    3. Histotoxic Hypoxia
        a. Occurs when drugs or alcohol inhibit oxygen to be properly carried in blood
    4. Stagnant Hypoxia
        a. Occurs when there is a mechanical blockage of the blood

c. Regulations and Procedures related to IFR and CFI
    i. When is an IFR Rating Required?
        1. Flight through Class A Airspace
        2. To file an Instrument Flight Plan
        3. When intending flight on a flight plan with meteorological conditions that do not permit VFR; In other words, flight through IMC.
        4. Special VFR at night.
        5. Commercial flight for hire in excess of 50 NM from the departure airport
        6. Commercial flight for hire carrying passengers or cargo at night.
    ii. If you file a flight plan, how long is it valid?
        1. 30 minutes before Estimated Time of Departure (ETD)
        2. 2 hours after Estimated Time of Departure
    iii. What must you do if your ETD expires after 2 hours?
        1. You must refile your flight plan.
    iv. If you have a flight plan and obtain clearance for takeoff, how long is that clearance valid - what is your standard clearance void time if not advised to the contrary by ATC?
        1. Clearance void time cannot exceed 30 minutes. (AIM 5-2-1(a)(1))
    v. Where can you obtain your clearance for an IFR flight plan if at an uncontrolled airport?
        1. Clearance Frequency from the plate.
    vi. What is Special VFR (SVFR)?
        1. It is an authorization that must be granted by ATC which permits flying into a controlled airspace.
    vii. What weather visibility is required for SVFR?
        1. 1 SM

viii. What cloud clearance is required for SVFR?
    1. Remain clear of clouds.

ix. When might someone use SVFR?
    1. A prime example is approaching a destination airport at which a pilot intends to land on a VFR flight plan; however, the destination airport becomes IFR before arrival; the pilot determines that the weather is less than VFR minima (i.e. ceilings below 1000 ft AGL and 3 SM visibility), but above IFR minima.

x. What are the currency requirements for IFR?
    1. Within 6 months of obtaining currency:
        a. Every 6 months you must perform the “6 HIT”:
            i. 6 Holding Procedures
            ii. 6 uses of an approach with intercepting and tracking using electronic navigational systems.
        b. You can do them alone in IMC on an IFR flight plan, or
        c. You can do them with a Safety Pilot in VFR under a view limiting device.
        d. If you do your currency flights with a safety pilot in IMC, you may remove your view limiting device once past the Final Approach Fix.
    2. After 6 months have elapsed?
        a. You have a “grace period” of an additional 6 months, i.e. 12 months after you were last current, whereby you must perform the 6 HIT with a Safety Pilot
    3. After 12 months have elapsed?
        a. You must perform an Instrument Proficiency Check (IPC) with a Certified Flight Instrument-Rated Instructor (CFII) or examiner (DPE).
    4. What qualification must a Safety Pilot have?
        a. Must have a private pilot license
        b. Must have a current medical
        c. Must be appropriately rated in the category and class of aircraft
        d. Additionally, if the pilot is not instrument rated, the flight must be conducted such that appropriate visibility and cloud clearance, compliant with VFR, is observed during the flight.
    5. Must the 6 HIT be performed in an aircraft?
        a. No, the flight can be performed on an FAA authorized Flight Simulator.

xi. What elements must be included in an Instrument Proficiency Check?
    1. Non-Precision Approach - must perform two non-precision approaches to no lower than 300 ft Height Above Threshold.

2. Precision Approach - Must descend to at or below 300 ft Height Above Threshold.
3. Missed Approach
4. Circling Approach
5. Partial Panel Approach
6. Recovery from Unusual Attitudes
7. Intercepting and Tracking Procedures
8. Holding Procedures - Including Procedure Turns.
9. Complete list provided on Instrument Rating ACS page A-11.

xii. Endorsement record keeping requirements?
1. TSA endorsement for 5 years
2. All other endorsements for 3 years

xiii. What endorsements are required for an Instrument Rating?
1. Endorsement that Aeronautical Knowledge areas consistent with FAR 61.65(b) have been covered directly with the instructor or that instructor has reviewed learning received from home study course. Additionally, endorsement must state that the instructor has confirmed that study in the Aeronautical Knowledge areas has been logged.
2. Endorsement that the student is prepared to take the knowledge test.
3. Endorsement that the student has undergone Flight Proficiency training is areas consistent with FAR 61.65(c).
4. Endorsement that the student is prepared to take the practical test.

xiv. When must you hold short of an ILS Hold Short Line?
1. Only when told to hold short of the ILS Hold Short Line by Tower.

xv. When is an ILS Hold Short Line in use?
1. Tower will use the ILS Hold Short Line when weather is below:
    a. 800 feet Ceiling AGL, or
    b. 2 SM Visibility

xvi. What is the difference between a DA/DH and MDA/MDH?
1. Decision Altitudes are altitudes used for precision approaches where you are allowed to descend through whereupon:
    a. If the runway environment is in sight, then you may proceed with the approach, however
    b. If the runway environment is not in sight, then you may not continue with the approach and must execute a missed approach.
2. Minimum Descent Altitudes are altitudes used on non-precision approaches where you may not descend any further unless:
    a. You have crossed the Visual Descent Point, and
    b. The Runway Environment is in sight.

xvii. What is the difference between DA and DH?

1. Decision Altitudes are in MSL while Decision Heights are in AGL.

xviii. What is a Visual Descent Point? (AIM 5-4-5 (h))
1.

xix. What are valid components of the Runway Environment which allow you to descend below a DA/DH or an MDA/MDH? (FAR 91.165(c)(3))
1. The Approach Light System, except that the pilot may not descend to lower than 100 feet above the touchdown zone elevation unless the red terminating bars or the red side row bars are distinctly visible and identifiable.
2. Threshold
3. Threshold Markings
4. Threshold Lights
5. Runway End Identifier Lights
6. Visual Glide Slope Indicator
7. Touchdown Zone or Touchdown Zone Markings
8. Touchdown Zone Lights
9. Runway or Runway Markings
10. Runway Lights

xx. What color(s) are the runway edge lights?
1. Runway edge lights are white except the last 2,000 feet or have the runway, where they are YELLOW - whichever is less. (AIM 2-1-4(b))
2. Runway threshold lines are green facing away from the runway for landing aircraft and red facing toward the runway for departing aircraft. (AIM 2-1-4(c))

xxi. What color(s) are the runway centerline lights?
1. Runway centerline lights are white except the last 3,000 feet, where they are alternating red and white for 2,000 feet and solid red for the last 1,000 feet.

xxii. What color is the taxiway edge lights?
1. Blue.

xxiii. Approach Plates
1. What are expanded circling minimums for Category A aircraft on an approach?
    a. 1.3 NM
2. How much obstacle clearance are you guaranteed if you remain within expanded circling minimums at minimum circling altitude? (AIM 5-4-5 (g)(2))
    a. 300 feet
3. If you perform a missed approach and are now facing the opposite runway, however, you don't have the runway environment in sight, then what missed procedure do you perform?
    a. You perform the original missed approach procedure as prescribed on the original approach. I.e. you use only one

approach plate during the entire approach - even for performing missed approach after performing circling procedure.

4. What are Standard Takeoff minimums?
    a. 1 SM visibility for a single engine. No ceiling requirements
    b. ½ SM visibility for a multi-engine. No ceiling requirements
5. How can you tell if an airport or approach has non-standard takeoff minimums?
    a. On the approach plate, in the upper left, there will be a Black Triangle with the letter “T”.
6. What are the takeoff minimums in Springfield (M91)?
    a. There are none. Comply with standard takeoff.
7. What is a standard takeoff climb rate?
    a. 200 ft per NM.
8. How can you tell if an approach has non-standard alternate minimums?
    a. On the approach plate, in the upper left, there will be a black triangle with the letter “A”.
9. How can you tell if an approach is not authorized as an alternate?
    a. Next to the black triangle with a letter “A” there is an acronym “NA” for not authorized.
10. What does the acronym “NA” mean on an approach plate?
    a. “NOT AUTHORIZED”

3. Pre-Flight Preparations
    a. What legal information are you required as a pilot to procure before any flight?
        i. NWKRAFT
            1. NOTAMs
            2. Weather
            3. Known ATC Delays
            4. Runway Lengths
            5. Alternates - if required
            6. Fuel Requirements
            7. Take-off and Landing Performance Data
    b. Weather Information
        i. ATIS - Automated Terminal Information System (AIM 7-1-10)
            1. Updated every hour, usually 5 minutes before the hour.
            2. At least 20 mile radius
        ii. AWOS - Automated Weather Observation System (AIM 7-1-10)
            1. Updated minute-by-minute
            2. Maximum 10 mile radius
        iii. ASOS - Automated Surface Observation System (AIM 7-1-10)
            1. Updated minute-by-minute
            2. At least 5 mile radius
        iv. TAF - Terminal Aerodrome Forecast

1. Forecast of 24 to 30 hours
2. Updated 4 times a day
3. At least 5 mile radius

v. METAR - Aviation Routine Weather Report
1. Updated at least every hour, usually 5 minutes before the hour
2. At least 5 mile radius

c. In-Flight Weather Advisories (AIM 7-1-6)
i. Convective SIGMET - Valid for 2 hrs
1. Severe Thunderstorm due to:
a. Surface Winds >= 50 knots
b. Hail at surface >= ¾”
c. Tornadoes
2. Embedded T-Storms
3. A lines of T-Storms
4. T-Storm producing precipitation >= heavy precipitation affecting 40% of an area > 3,000 mi. sq.

ii. SIGMET - Valid for 4 hrs
1. Severe Icing
2. Severe or Extreme Turbulence or Clear Air Turbulence not associated with Thunderstorms
3. Widespread Dust/Sand Storms reducing visibility to below 3 miles
4. Volcanic Ash
5. Tornadoes
6. Lines of Thunderstorms
7. Embedded Thunderstorms
8. Hail greater than or equal to ¾” diameter.

iii. Airmet - Valid for 6 hours
1. 3 types:
a. Zulu - Known Icing
b. Tango - Turbulence
i. Moderate turbulence
ii. Winds > 30 knots
iii. Non-convective Low Level Wind Shear
c. Sierra - IFR conditions

d. Alternates
i. When are they required?
1. To determine if you need an alternate we apply the 1-2-3 Rule (FAR 135.223):
a. 1 hour before or after ETA, you must have
i. 2,000 foot ceilings AGL, or if Circling approaches are not authorized at the airport, then 1,500 feet above circling - whichever is higher. (FAR 135.223(b)(1) and (2))
ii. 3 SM visibility

        b. If weather conditions are not better than that from step (1), then an alternate is required. (FAR 135.223(b)(3))
    ii. What weather conditions must exist at an alternate to qualify the alternate as a valid alternate? (FAR 91.169(c)(1)(i) and FAR 91.169(c)(2))
        1. The weather minimums for a non-precision approach must be :
            a. 800 feet Ceilings AGL
            b. 2 SM Visibility
        2. The weather minimums for a precision approach must be:
            a. 600 feet Ceilings AGL
            b. 2 SM Visibility
        3. The weather minimums for airports without any published approaches must have weather conditions permitting descent from the MEA under Basic VFR.
e. Fuel Requirements (FAR 91.167(a))
    i. What are the fuel requirements for any IFR Flight?
        1. Sufficient fuel for taxi, takeoff, and landing from departure airport to destination airport, plus
        2. Sufficient fuel to go from initial departure airport to furthest alternate airport, plus
        3. Sufficient fuel for 45 minute reserves at cruise speed.