

SAN BERNARDINO VALLEY COLLEGE COURSE OUTLINE

I. CATALOG DESCRIPTION

AERO 111: Powerplant Maintenance Laboratory – Systems and Components
15 hours lab = 5 units

This Federal Aviation Administration approved curriculum provides training in powerplant system and components. Satisfactory completion of AERO 104 and AERO 105, in conjunction with their labs, qualifies students to take the FAA examination for the powerplant certificate. Topics covered include basic systems for instrumentation, fire protection, electrical lubrication, ignition, fuel and fuel metering, induction, cooling, exhaust and propellers.

Prerequisite(s): AERO 101: Airframe and Power Plant General Curriculum – Servicing/Materials and AERO 107: Airframe and Power Plant General Laboratory – Servicing/Materials

Corequisite: AERO 105: Power Plant Maintenance Lecture – Accessory Overhaul

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One

III. EXPECTED OUTCOME FOR STUDENTS:

Upon completion of the course, student should be able to:

- A. Accomplish those basic areas which the Federal Aviation Administration outlines in Federal Aviation Regulation, Part 147, as necessary to satisfactorily pass the FAA examinations (written, oral and practical).
- B. Research textbooks, maintenance manuals and other written materials and be able to explain in writing and verbally the operation, servicing, troubleshooting and repair of engine systems and components.
- C. Research Airworthiness Directives, Federal Aviation Regulations, Type Certificate Data Sheets and Advisory Circulars and determine applicability to specific engines.
- D. Read and follow written instructions in the performance of task on aircraft including filling out F.A.A. form 337, Major Repair and Alteration Forms, and associated maintenance record entries to F.A.A. standards.
- E. Compare and contrast different types of systems and or repair procedures and explain advantages and disadvantages in relation to acceptability for different applications.

- F. Draw diagrams, systems and circuits for systems and components. Recognize and label components and symbols.
- G. Research appropriate manuals, directives, service bulletins or other relevant information in inspection, repair, alteration, or overhaul of engine and components

IV. CONTENT:

A. FUEL METERING SYSTEMS

- 1. Troubleshoot and adjust turbine engine fuel metering systems and electronic engine fuel controls.
 - a. Troubleshoot and adjust turbine engine fuel metering systems.
 - b. Troubleshoot and adjust turbine engine fuel controls.
- 2. Overhaul carburetor.
 - a. Identify venturi size and describe function.
 - b. Interpret and use charts or diagrams to explain fuel and airflow through float and pressure carburetors.
 - c. Remove, install and explain the principles of fuel metering through a jet.
 - d. Identify and describe the operation of an air bleed.
 - e. Locate and describe the operation of the main discharge nozzles in a pressure carburetor.
 - f. Identify acceleration systems in float and pressure carburetors and describe the operation of each system.
 - g. Identify economizer and power enrichment systems and describe the operation of the systems in float and pressure type carburetors.
 - h. Identify mixture controls incorporated in float and pressure type carburetors and describe operation of the system.
- 3. Repair engine fuel metering system components.
 - a. Locate, remove, clean and reinstall screens in fuel metering system components.
 - b. Inspect and describe the repair of carburetor floats.
 - c. Inspect float needle and seat, measure and float level of carburetor.
 - d. Inspect a pressure type carburetor and describe operation resulting from clogged impact tubes and ruptures, diaphragms.
- 4. Inspect, check, service, troubleshoot, and repair reciprocating and turbine engine fuel metering systems.
 - a. Explain temperature, pressure and humidity effects on operation of a carburetor.
 - b. Describe the operation of a float carburetor.
 - c. Identify a pressure type carburetor and a direct fuel injection system and describe the operation of each system.
 - d. Explain the function of a vapor separators and vapor vents.

- e. compare continuous flow fuel injection and direct cylinder injection systems.
- f. Inspect, remove and install a pressure carburetor operate the engine and adjust idle speed and idle mixture.
- g. Inspect, remove and install a pressure carburetor or fuel injection system, operate the engine and adjust idle speed and idle mixture.
- h. Identify the dangers of excessively rich and excessively lean fuel air mixture.
- i. Rig the fuel control unit on a static turbojet engine and describe the trimming of the engine.

B. INDUCTION SYSTEMS

1. Inspect, check, service, and repair engine ice and rain control systems.
 - a. Describe induction icing and identify probable location.
 - b. Inspect, check, service and repair a carburetor pre-heat system or hot spot.
 - c. Describe the operation of thermal anti-icing systems for turbine engine air intakes.

C. ENGINE COOLING SYSTEMS

1. Repair engine cooling system components.
 - a. Repair baffles and re-profile cylinder fins.
2. Inspect, check, troubleshoot, service, and repair engine cooling systems.
 - a. Inspect, check and service engine cooling systems.
 - b. Troubleshoot and repair engine cooling systems.

D. ENGINE EXHAUST SYSTEMS AND REVERSER SYSTEMS

1. Repair engine exhaust system components.
 - a. Recognize materials used in exhaust system components and describe repair procedures.
2. Inspect, check, troubleshoot, service, and
 - a. Inspect, remove, and replace, exhaust systems.
 - b. Identify and describe the operation of turbo supercharger.

E. IGNITION AND STARTING SYSTEMS

1. Overhaul magneto and ignition harness.
 - a. Disassemble, identify components, and reassemble a magneto.
 - b. Inspect, and select serviceable magneto breaker assemblies.
 - c. Internally time a magneto.
 - d. Install high tension leads.
 - e. Assemble, operate and disassemble and impulse coupling on a magneto.

2. Inspect, service, troubleshoot and repair reciprocating and turbine engine ignition system and components.
 - a. Operate and test a magneto on a test bench.
 - b. Inspect, service, troubleshoot and repair a turbine ignition system.
 - c. Use a coil tester to test ignition coils.
 - d. Check and test ignition leads for faults.
 - e. Inspect, recondition, and test spark plugs.
 - f. Time magnetos to an engine.
3. Inspect, service, troubleshoot, and repair turbine engine electrical starting systems.
 - a. Inspect, service, troubleshoot, and repair turbine engine electrical starting system.
4. Inspect, service, troubleshoot, and repair turbine engine pneumatic starting system.
 - a. Inspect, service, troubleshoot, and repair turbine engine pneumatic starting system.

F. PROPELLERS

1. Inspect, check, service, and repair propellers synchronizing and ice control systems.
 - a. Identify components and describe the operation of propeller anti-icing systems.
 - b. Locate reference information and describe the operation of propeller synchronizing systems.
2. Identify and select propeller lubricants.
 - a. Identify the lubricant to be used to service a specific propeller.
3. Balance propellers
 - a. Interpret information and describe the procedure for balancing fixed pitch and variable pitch propellers.
4. Balance propellers.
 - a. Describe the action of a propeller governor and the forces which control propeller pitch.
 - b. Perform the operation necessary to match direction of governor rotation to the rotation of the engine drive.
5. Inspect, check, service, and repair fixed-pitch constant-speed and feathering propellers, and propeller governing systems.
 - a. Identify and describe the forces acting on a propeller.
 - b. Measure propeller blade pitch angles.
 - c. Locate and interpret engine-propeller "critical range" information.
 - d. Locate and interpret "static limit" information for fixed pitch propellers.
 - e. Describe the operation and control by a counter-weight propeller.

- f. Describe the operation and control of a Hydromatic Propeller.
 - g. Describe the operation and control of a non-counterweight variable pitch, feathering, reversing propellers.
 - h. Describe the operation and control of a turbine engine propeller system.
 - i. Inspect and identify probable location of defects in the metal tipping of propellers.
6. Install, troubleshoot, and remove propellers.
 - a. Check operation of a full feathering propeller.
 - b. Remove and install a propeller on a tapered shaft.
 - c. Remove and install a propeller on a splined shaft.
 - d. Check track of a propeller.
 - e. Externally adjust and rig a propeller governor.
 - f. Troubleshoot descriptions of faults in a hydromatic propeller.
 7. Repair aluminum alloy propeller blades.
 - a. Smooth nicks, cuts, and scratches in the leading and trailing edges of metal propeller blades.

G. TURBINE ENGINES

1. Overhaul turbine engines
 - a. Illustrate Newton's Laws and the Brayton cycle
 - b. Explain relationship of RPM and thrust in a turbine engine.
 - c. Identify and explain the characteristics of different turbine compressors.
 - d. Identify major components and explain airflow in fan or by-pass turbine engines.
 - e. Identify airflow in diffusers.
 - g. Identify types and characteristics of combustion chambers.
 - h. Identify impulse and reaction blades and thrust reversers.
 - i. Compare characteristics of turboprop and reciprocating engines.
 - j. Overhaul turbine engine.
 - k. Describe modular overhaul.
2. Inspect, check, service, and repair turbine engines and turbine engine installations.
 - a. Remove and install a combustion case and liner.
 - b. Remove and install a compressor section of a turbine engine.
 - c. Remove and install a fuel nozzle in a turbine engine.
3. Install, troubleshoot, and remove turbine engines.
 - a. Remove and install a turbine engine.
 - b. Identify damaged turbine blades.
 - c. Identify compressor surge.

H. UNDUCTED FANS

1. Inspect and troubleshoot unducted fan systems and components.
 - a. Interpret information and describe the principle of an unducted fan.

I. AUXILIARY POWER PLANTS

1. Inspect, check, service, and troubleshoot auxiliary powerplants.
 - a. Inspect, check and service and auxiliary power unit.
 - b. Troubleshoot and inspect an auxiliary power unit.

V. METHODS OF INSTRUCTION

1. Lecture
2. Assignment of writing exercise and worksheets
3. Class discussion
4. Use of audiovisual aids
5. Demonstration
6. Field trips

VI. TYPICAL ASSIGNMENTS:

VII. EVALUATIONS:

1. Grades assignments
2. Quizzes
3. Phase Examinations
4. Mid-term Examination
5. Final Examination
- Typical Questions

VII. TYPICAL TEXT BOOKS:

Title: Aircraft Powerplants seventh edition

Author: Bent Mckinley

Publisher: Glenco

Date of Publication: 1994

Title: A& P Technician Powerplant FAA Exam Book

Author: FAA

Publisher: ASA

Date of Publication: 199

IX. OTHER SUPPLIES REQUIRED OF STUDENTS:

- A. Calculator
- B. Colored Pencils
- C. Scan-trons