

FLORIDA STATE COLLEGE AT JACKSONVILLE  
COLLEGE CREDIT COURSE OUTLINE

COURSE NUMBER: AMT 1771

COURSE TITLE: Aviation Maintenance Technology Powerplant I

PREREQUISITE(S): None

COREQUISITE(S): None

STUDENT ADVISING NOTES: Completion of General I through IV

CREDIT HOURS: 6

CONTACT HOURS/WEEK: 16

CONTACT HOUR BREAKDOWN:

Lecture/Discussion:	8
Laboratory:	8
Other <u>lecture/lab combination</u> :	

FACULTY WORKLOAD POINTS: 8

STANDARDIZED CLASS SIZE ALLOCATION: 25 (FAA Limited)

COURSE DESCRIPTION: This course is designed to introduce skills and the necessary knowledge and understanding of aircraft reciprocating engine fundamentals, reciprocating engine ignition systems, reciprocating engine fuel, fuel metering and induction systems, reciprocating engine exhaust, cooling and lubrication; and propellers and propeller governing systems.

SUGGESTED TEXT(S):	<u>TITLE</u>	<u>NUMBER</u>
	Jeppesen A&P Technician Powerplant Textbook	ISBN # 0-88487-207-6
	Jeppesen A&P Technician Powerplant Workbook	ISBN # 0-88487-243-2
	Jeppesen A&P Technician Powerplant Test Guide	ISBN # 0-88487-310-2
	FAA AC 43.13-1B/2A Acceptable Methods, Techniques & Practices	ISBN #0-89100-306-1
	FAR Handbook for Aviation Maintenance Technicians	ISBN #0-88487-314-5
	Aviation Mechanic Handbook, by Dale Crane	#ASA-M-HB1

IMPLEMENTATION DATE: Summer Term, 2006 (20063)

REVIEW OR MODIFICATION DATE: Fall Term, 2008 (20091) - Outline Review 2007

COURSE TOPICS	CONTACT HOURS <u>PER TOPIC</u>
Note: § Denotes required project	
I. FUNDAMENTALS OF RECIPROCATING ENGINES	20
A. Safety	
Objectives:	
<ol style="list-style-type: none"> <li>1. List safety precautions relating to reciprocating engines.</li> <li>2. Discuss MSDS related to Reciprocating engines.</li> </ol>	
B. Basic Design and Construction of a reciprocating engine	
Objectives:	
<ol style="list-style-type: none"> <li>1. Discuss the basic terminologies used with reciprocating engines and systems.</li> <li>2. Discuss the different designs of reciprocating engines (Level 1) (App. D. I, a. 1)</li> <li>3. List the basic components of a reciprocating engine</li> </ol>	
C. Engine Theory and Operating Principles	
Objectives:	
<ol style="list-style-type: none"> <li>1. Discuss Operating Cycles</li> <li>2. Discuss the various formulas regarding engine operation</li> </ol>	
D. Unit Test	
II. RECIPROCATING ENGINE IGNITION SYSTEMS	50
A. Magneto Basic Theory and Test Equipment	
Objectives:	
<ol style="list-style-type: none"> <li>1. Define terms pertaining to reciprocating engine ignition systems.</li> <li>2. Discuss the electrical operation of magneto and battery ignition systems.</li> <li>3. Describe types of induction associated with basic magneto operation.</li> <li>4. Identify and discuss safe and proper operation of test equipment used in the shop.</li> <li>5. Demonstrate safe and proper operation of test equipment used in the shop.</li> </ol>	
B. Aircraft Reciprocating Engine Ignition Systems	
Objectives:	
<ol style="list-style-type: none"> <li>1. Describe the components of the battery ignition system and their functions.</li> <li>2. Discuss the mechanical systems of a magneto.</li> <li>3. Identify components of a magneto system.</li> <li>4. List characteristics of primary and secondary electrical circuits of a magneto.</li> <li>5. Identify mechanical and electrical auxiliary starting system components.</li> <li>6. § Disassemble a magneto. (Level 2) (App. D.II, e. 17,18) (PP1-001)</li> </ol>	

## COURSE TOPICS (continued)

Note: § Denotes required project

7. § Inspect and repair a magneto. (Level 2) (App. D.II, e. 17,18) (PP1-002)
8. § Reassemble and test a magneto. (Level 2) (App. D.II, e. 17,18) (PP1-003)
9. Discuss the construction and operation of an ignition harness.
10. Discuss inspection service and operation of spark plugs.
11. § Remove, inspect, service, clean and re-install spark plugs. (Level 2) (App. D.II, e. 18) (PP1-004)
12. Describe installation techniques for ignition harnesses.
13. Discuss various troubleshooting techniques or practices used on ignition harnesses.
14. § Test and service/repair an ignition harness. (Level 2) (App. D.II,e.17,18; c,12,13; e.19a.) (PP1-005)
15. List procedures for installing a magneto.
16. § Identify and perform service procedures on magnetos. (Level 2) (App. D.II, e.18) (PP1-006)
17. Discuss various troubleshooting techniques or practices to be used on magnetos.
18. § Install and time a magneto. (Level 2) (App. D.II, e.18) (PP1-007)

## C. Unit Test

III. RECIPROCATING ENGINE FUEL,  
FUEL METERING, AND INDUCTION SYSTEMS

30

## A. Terms and Safety

## Objectives:

1. Define terms and definitions related to fuel and fuel metering systems.
2. List safety hazards associated with fuel systems and fueling operations.
3. Identify and practice fuel safety precautions.

## B. Aviation Fuels

## Objectives:

1. Discuss types and grades of aviation fuel
2. Explain the purpose of a Reid Vapor pressure bomb.
3. Define octane number and performance number.
4. Discuss types, detection, and prevention of fuel contamination.
5. Discuss the combustion process.

## C. Fuel Systems

## Objectives:

1. List requirements of a fuel system.
2. Compare and contrast gravity-feed and pressure fuel systems.
3. Define vapor lock.
4. List fuel system components and their locations.
5. Identify and discuss the purpose and operation of fuel system components.
6. Discuss troubleshooting and maintenance of fuel system components.

CONTACT HOURS  
PER TOPIC

## COURSE TOPICS (continued)

Note: § Denotes required project

7. § Inspect, check, service, troubleshoot, and repair as needed an engine fuel system filter, sump, or strainer. (Level 3) (App. D.II, g. 24,25) (PP1-008)
8. § Disassemble, clean, inspect, and reassemble an engine-driven fuel pump. (Level 2) (App. D.II, g. 24) (PP1-009)
9. § Adjust the output pressure on an engine driven fuel pump. (Level 3) (App. D.II, g. 25) (PP1-010)
10. Discuss types of fuel system icing.

## D. Reciprocating Engine Fuel Metering Devices

## Objectives:

1. Discuss air/fuel mixture ratios.
2. Discuss principles of carburetion.
3. Discuss the purpose, construction, and operation of float-type carburetors.
4. Discuss troubleshooting and maintenance of float-type carburetors.
5. § Disassemble, clean, inspect, reassemble, and adjust a float-type carburetor. (Level 2) (App. D.II, f. 21,22; g. 24) (PP1-011)
6. Discuss the purpose and operation of pressure injection carburetor systems.
7. Discuss troubleshooting and maintenance of pressure injection carburetors.
8. Discuss the operating principles of the Bendix RSA fuel injection system.
9. Discuss the operating principles of the Teledyne Continental fuel injection system.
10. Discuss the operating principles of a direct fuel injection system.
11. Discuss fuel injection systems maintenance practices.
12. Discuss the purpose, construction, and operation of reciprocating engine water injection systems.

## E. Reciprocating Engine Induction Systems

## Objectives:

1. Identify induction system components.
2. Discuss types of air filters
3. Discuss the types and prevention of carburetor icing.
4. Discuss manifold pressure.
5. Discuss the purpose and operation of internal superchargers. (Level 1) (App. D.II, h. 27)
6. Describe supercharging limitations and altitude effects on engine power. (Level 1) (App. D.II, h. 27)
7. Discuss inspecting, checking, troubleshooting, and repairing of internal superchargers. (Level 1) (App. D.I, a.1; D.II, h. 27)
8. Discuss the purpose and operation of external turbochargers. (Level 1) (App. D.II, h. 27)
9. Discuss the purpose and operation of turbocharger control systems. (Level 1) (App. D.II, h. 27)
10. Discuss turbocharger construction.
11. Discuss inspecting, servicing, troubleshooting, and repairing of turbochargers and turbocharger control systems. (Level 1) (App. D.II, h.27)
12. § Inspect, check, service and repair carburetor intake and induction manifold. (Level 3) (App. D.II, h. 28) (PP1-012)

## F. Unit Test

## COURSE TOPICS (continued)

Note: § Denotes required project

## IV. RECIPROCATING ENGINE EXHAUST, COOLING AND LUBRICATING

30

## A. Terms and Safety

## Objectives:

1. Define terms and definitions related to reciprocating engines.
2. Discuss general safety precautions.
3. Identify reciprocating engine safety precautions.

## B. Types of Reciprocating Engines

## Objectives:

1. Discuss methods of classifying reciprocating engines.
2. Discuss and identify characteristics of radial engine inspection and repair. (Level 1) (App. D.I, a.1)
3. Discuss and identify characteristics of inline engines.
4. Discuss and identify characteristics of V-type engines
5. Discuss and identify characteristics of opposed engines.

## C. Reciprocating Engine Design and Construction

## Objectives:

1. Discuss requirements of aviation engines.
2. Identify specific sections of engine crankcases. (Level 1) (App. D.I, a. 1)
3. Identify and discuss types of crankshafts. (Level 1) (App. D.I, a. 1)
4. Identify and discuss types of connecting rods. (Level 1) (App. D.I, a.1)
5. Identify and discuss types of pistons. (Level 1) (App. D.I, a. 1)
6. Identify and discuss types of cylinders. (Level 1) (App. D.I, a. 1)
7. Identify and discuss types of valves. (Level 1) (App. D.I, a. 1)
8. Identify and discuss types of valve operating mechanisms. (Level 1) (App. D.I, a. 1)
9. Identify and discuss types of pushrods. (Level 1) (App. D.I, a. 1)
10. Identify and discuss types of rocker arms. (Level 1) (App. D.I, a. 1)
11. Identify and discuss types of bearings. (Level 1) (App. D.I, a. 1)
12. Discuss the purpose and operation of propeller reduction gearing. (Level 1) (App. D.I, a.1)
13. § Remove, inspect and reinstall an aircraft engine cylinder (Level 2) (App. D.I, a. 2) (PP1-013)

## D. Principles of Energy Transformation

## Objectives:

1. Discuss the energy transformation cycles of two stroke engines.
2. Discuss the energy transformation cycles of four stroke engines.
3. Discuss work/power considerations of aviation engines.
4. § Perform calculations to determine horsepower. (Level 2) (App. D. I. a. 3) (PP1-014)
5. Discuss factors affecting engine power.
6. Discuss the distribution of power in an aviation engine.

CONTACT HOURS  
PER TOPIC

## COURSE TOPICS (continued)

Note: § Denotes required project

## E. Reciprocating Engine Exhaust Systems

## Objectives:

1. Identify the characteristics of exhaust gases.
2. Discuss the types and operation of reciprocating engine exhaust systems.
3. Discuss the purpose and operation of mufflers and heat exchangers.
4. Discuss the purpose and operation of exhaust augmenters.
5. Discuss reciprocating engine exhaust system maintenance practices.
6. Discuss the purpose and operation of power recovery turbines.

## F. Reciprocating Engine Cooling Systems

## Objectives:

1. Explain the purpose of a reciprocating engine cooling system. (Level 1) (App. D.II, h. 27)
2. Discuss types and operation of various engine of cooling systems. (Level 1) (App. D.II, h. 27)
3. Identify and discuss cooling system components. (Level 1) (App. D.II, h. 27)
4. Discuss cooling system inspection and maintenance. (Level 1) (App. D.II, h. 27)
5. § Inspect, check, and repair as necessary an engine cooling system. (Level 3) (App. D.II, i. 30) (PP1-015)
6. § Inspect and re-profile a cylinder cooling fin. (Level 2) (App. D.II, i. 29)(PP1-016)

## G. Introduction to the Lubrication System

## Objectives:

1. Define terms related to reciprocating engine lubrication systems.
2. List classifications of lubricants.
3. Discuss properties of lubricants.
4. Discuss types and compatibility of reciprocating engine lubricants.
5. Discuss reciprocating engine oil ratings.
6. List functions of the lubrication system.

## H. Types of Lubricating Systems

## Objectives:

1. Discuss methods of lubricant application.
2. Explain characteristics and operating principles of wet-sump lubricating systems.
3. Explain characteristics and operating principles of dry-sump lubricating systems.
4. Use schematic to trace oil flow in wet and dry-sump systems.

## I. Operations and Components of the Lubricating System

## Objectives:

1. Identify the components of a reciprocating-engine lubricating system and their functions.
2. Discuss the importance of line size requirements and plumbing.
3. Describe the operation of a reciprocating-engine lubrication system.

CONTACT HOURS  
PER TOPIC

## COURSE TOPICS (continued)

Note: § Denotes required project

## J. Maintaining and Troubleshooting the Lubrication System.

## Objectives:

1. Describe cleaning, inspecting and testing of oil coolers.
2. Discuss inspection and cleaning of a reciprocating engine filter or strainer assembly.
3. § Identify and select engine lubricants. (Level 2) (App. D.II, d. 14) (PP1-017)

## K. Unit Test

## V. PROPELLERS AND PROPELLER GOVERNING SYSTEMS

60

## A. Introduction to Propellers and Propeller Control Systems

## Objectives:

1. Define terms related to propellers and propeller control systems.
2. Discuss and practice prop safety.
3. Discuss basic FAR's related to propellers.

## B. Basic Propeller Theory

## Objectives:

1. Discuss propeller aerodynamics.
2. Describe basic propeller design and construction.
3. Compare and contrast operations of various types of propellers.

## C. Auxiliary Systems

## Objectives:

1. List basic propeller auxiliary systems.
2. Discuss the operation of the governor control system, including the accumulator.
3. Differentiate between, and discuss inspection, service, operational checks, and repair of synchronizing and synchro-phasing systems. (Level 1) (App. D.II, k. 33)
4. Discuss inspection, service, operational checks, and repair of anti-icing and deicing systems. (Level 1) (App. D.II, k. 33)
5. Name the instruments involved in propeller control.
6. Describe the relationship of the instruments to propeller condition.

## D. Inspection, Service, Maintenance and Repair of Propeller Control Systems

## Objectives:

1. Discuss procedures for safe and proper use of a propeller balancing fixture and an arbor press.
2. Demonstrate safe and proper use of a propeller balancing fixture and an arbor press.
3. Discuss propeller balancing, installation and adjustment.
4. § Balance a propeller. (Level 2) (App. D.II, k. 35) (PP1-041)
5. List basic inspection procedures for propeller control systems.

CONTACT HOURS  
PER TOPIC

## COURSE TOPICS (continued)

Note: § Denotes required project

6. Discuss propeller servicing procedures.
7. § Identify and select propeller lubricants. (Level 2) (App. D.II, k. 34) (PP1-042)
8. Describe general propeller maintenance and repair procedures.
9. § Repair an aluminum propeller. (Level 3) (App. D.II, k. 37,39) (PP1-043)
10. § Remove a propeller. (Level 3) (App. D.II, k. 38) (PP1-044)
11. § Disassemble, inspect, and reassemble a constant-speed, feathering propeller. (Level 3) (App. D.II, k. 36,37) (PP1-045)
12. § Install and troubleshoot a propeller. (Level 3) (App. D.II, k. 38) (PP1-046)
13. § Use manufacturer's data to inspect, check, service and adjust, as required, a propeller governing system. (Level 3) (App. D.II, k. 36,37) (PP1-047)

E. Unit Test

## VI. POWERPLANT I REMEDIATION, REVIEW, AND TESTING

50

Powerplant Block I Final Exam

PROGRAM TITLE: Aviation Maintenance Management  
COURSE TITLE: Aviation Maintenance Technology Powerplant I  
CIP NUMBER: 1649.010401

## LIST PERFORMANCE STANDARD ADDRESSED:

NUMBER(S): TITLES(S):

- 25.0 MAINTAIN IGNITION SYSTEMS--The student will be able to:  
25.01 Overhaul magneto and ignition harness. [FAA FAR Part 147, Level 2]  
25.02 Inspect, service, troubleshoot, and repair reciprocating ignition systems and components. [FAA FAR Part 147, Level 2]
- 26.0 MAINTAIN-FUEL METERING SYSTEMS--The student will be able to:  
26.02 Overhaul carburetor. [FAA FAR Part 147, Level 2]  
26.03 Repair engine fuel-metering system components. [FAA FAR Part 147, Level 2]  
26.04 Inspect, check, service, troubleshoot, and repair reciprocating engine fuel-metering systems. [FAA FAR Part 147, Level 3]
- 27.0 MAINTAIN ENGINE FUEL SYSTEMS--The student will be able to:  
27.01 Repair engine fuel system components. [FAA FAR Part 147, Level 2]  
27.02 Inspect, check, service, troubleshoot, and repair engine fuel systems. [FAA FAR Part 147, Level 3]
- 28.0 MAINTAIN INDUCTION SYSTEMS--The student will be able to:  
28.01 Inspect, check, troubleshoot, service, and repair engine ice and rain control systems. [FAA FAR Part 147, Level 2]  
28.02 Inspect, check, service, troubleshoot, and repair heat exchangers and superchargers. [FAA FAR Part 147, Level 1]  
28.03 Inspect, check, service, and repair carburetor air intake and induction manifolds. [FAA FAR Part 147, Level 3]
- 29.0 MAINTAIN ENGINE COOLING SYSTEMS--The student will be able to:  
29.01 Repair engine cooling system components. [FAA FAR Part 147, Level 2]  
29.02 Inspect, check, troubleshoot, service, and repair engine cooling systems.[FAA FAR Part 147, Level 3]
- 30.0 MAINTAIN ENGINE EXHAUST AND REVERSER SYSTEMS--The student will be able to:  
30.01 Repair engine exhaust system components. [FAA FAR Part 147, Level 2]  
30.02 Inspect, check, troubleshoot, service, and repair engine exhaust systems. [FAA FAR Part 147, Level 3]

## LIST PERFORMANCE STANDARD ADDRESSED: (continued)

NUMBER(S):

TITLES(S):

- 31.0 MAINTAIN AIRCRAFT PROPELLERS--The student will be able to:
- 31.01 Inspect, check, service, and repair propeller synchronizing and ice control systems. [FAA FAR Part 147, Level 1]
  - 31.02 Identify and select propeller lubricants. [FAA FAR Part 147, Level 2]
  - 31.03 Balance propellers. [FAA FAR Part 147, Level 1]
  - 31.04 Repair propeller control system components. [FAA FAR Part 147, Level 2]
  - 31.05 Inspect, check, service, and repair fixed-pitch, constant-speed, feathering propellers, and propeller-governing systems. [FAA FAR Part 147, Level 3]
  - 31.06 Install, troubleshoot, and remove propellers. FAA FAR Part 147, Level 3]
  - 31.07 Repair aluminum alloy propeller blades. [FAA FAR Part 147, Level 3]



NOTE: Use either the Tab key or mouse click to move from field to field. The box will expand to accommodate your entry.

<i>Section 1</i>	
COURSE PREFIX AND NUMBER: <b>AMT 1771</b>	SEMESTER CREDIT HOURS: <b>6</b>
COURSE TITLE: <b>Aviation Maintenance Technology Powerplant 1</b>	

*Section 2*

TYPE OF COURSE: (Click on the box to check all that apply)

<input type="checkbox"/> AA Elective	X	AS Required Professional Course	<input type="checkbox"/> College Prep
<input type="checkbox"/> AS Professional Elective	X	AAS Required Professional Course	<input type="checkbox"/> Technical Certificate
<input type="checkbox"/> Other _____			
<input type="checkbox"/> General Education: (For General Education courses, you must also complete Section 3 and Section 7)			

*Section 3 (If applicable)*

INDICATE BELOW THE DISCIPLINE AREA FOR GENERAL EDUCATION COURSES:

<input type="checkbox"/> Communication	<input type="checkbox"/> Social & Behavioral Sciences	<input type="checkbox"/> Mathematics
<input type="checkbox"/> Natural Sciences	<input type="checkbox"/> Humanities	

*Section 4*

INTELLECTUAL COMPETENCIES:

X Reading	<input type="checkbox"/> Speaking	<input type="checkbox"/> Critical Analysis	X Quantitative Skills	<input type="checkbox"/> Scientific Method of Inquiry
X Writing	X Listening	<input type="checkbox"/> Information Literacy	<input type="checkbox"/> Ethical Judgment	X Working Collaboratively

Section 5	METHOD OF ASSESSMENT
LEARNING OUTCOMES	
• Inspect and repair a magneto	Practical test based on FAA Practical Test Standards
• Disassemble, clean and inspect a fuel pump	Practical test based on FAA Practical Test Standards
• Disassemble, clean and inspect a carburetor	Practical test based on FAA Practical Test Standards
• Perform calculations to determine horsepower	Written test created from FAA Test Bank of Questions
• Identify and select engine lubricants	Written test created from FAA Test Bank of Questions
• Disassemble, inspect, and reassemble a propeller	Practical test based on FAA Practical Test Standards
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*Section 6*

Name of Person Completing This Form: Richard Rozanski