

**Course Outline**

**COURSE:** AMT 121                      **DIVISION:** 50                      **ALSO LISTED AS:**

**TERM EFFECTIVE:** Spring 2018                      **CURRICULUM APPROVAL DATE:** 03/27/2017

**SHORT TITLE:** POWERPLT SYS/TECH

**LONG TITLE:** Aviation Powerplant Systems Technology

<u>Units</u>	<u>Number of Weeks</u>	<u>Type</u>	<u>Contact Hours/Week</u>	<u>Total Contact Hours</u>
13.5	18	Lecture:	9	162
		Lab:	13.5	243
		Other:	0	0
		Total:	22.5	405

**COURSE DESCRIPTION:**

This course is part of the curriculum required by the Federal Aviation Administration to obtain certification as an aircraft powerplant maintenance technician. This certificate allows the rated technician to perform maintenance, preventive maintenance repairs and alterations to USA FAA certified aircraft powerplants. This section covers theory of operation, maintenance, repair, and troubleshooting procedures of powerplant systems and their relationship to the total powerplant installation package. To include lubrication, electrical systems, instrument systems, fuel metering, fire protection, starting systems, powerplant control systems, and the aerodynamics, theory and maintenance of propellers and their control systems. **PREREQUISITE:** Successful completion of AMT 100 and 101. Basic hand tools required. Details at the first class meeting.

**PREREQUISITES:**

- Completion of AMT 100, as UG, with a grade of C or better.
- AND Completion of AMT 101, as UG, with a grade of C or better.

**COREQUISITES:**

**CREDIT STATUS:** D - Credit - Degree Applicable

**GRADING MODES**

- L - Standard Letter Grade

**REPEATABILITY:** N - Course may not be repeated

**SCHEDULE TYPES:**

- 02 - Lecture and/or discussion
- 03 - Lecture/Laboratory
- 04 - Laboratory/Studio/Activity

## **STUDENT LEARNING OUTCOMES:**

1. The student demonstrates the ability to meet the written test standards outlined in FAA AC 147-3 – Certification and Operation of Aviation Maintenance Technician Schools.

Measure of assessment: Homework assignments, quizzes and written tests.

2. The student demonstrates the ability to meet the oral/practical test standards outlined in FAA AC 147-3 – Certification and Operation of Aviation Maintenance Technician Schools.

Measure of assessment: Shop/lab projects and oral/practical demonstrations

3. Demonstrate the ability to inspect and determine if components and aircrafts meet airworthy standards outlined in FAA AC 43.13-1B – Acceptable Methods, Techniques, and Practices – Aircraft Inspection and Repair.

Measure of assessment: Shop/lab projects and oral/practical demonstrations

Year assessed, or planned year of assessment: 2016

## **CONTENT, STUDENT PERFORMANCE OBJECTIVES, OUT-OF-CLASS ASSIGNMENTS**

Curriculum Approval Date: 03/27/2017

### **LECTURE CONTENT:**

36 Hours

#### **FUEL, FUEL METERING SYSTEMS AND COMPONENTS**

**CONTENT:** Types of fuels used in aircraft engine; fuel supply systems; float type carburetors; pressure type carburetors; fuel injection systems; turbine engine fuel control systems; and water injection systems.

**STUDENT PERFORMANCE OBJECTIVE:** The student will be able to identify and select the correct fuel for each engine type; diagram an aircraft fuel supply system; explain the operation of a float type carburetor; perform an overhaul on a float type carburetor; explain the operation of a pressure carburetor; able to perform an overhaul a pressure type carburetor; explain the operation of a fuel injection system; perform an overhaul a fuel injection system; explain the operation of the component parts of a turbine engine fuel control system; adjustment a fuel control system; explain the operation of a water injection system; and conduct an airworthiness inspection of a fuel metering system.

27.5 Hours

#### **LUBRICANTS AND LUBRICATION**

**CONTENT:** Types of lubricants used in aircraft engines; theory of fluid lubrication; reciprocating engine lubrication systems; dilution systems; and turbine engine lubrication systems

**STUDENT PERFORMANCE OBJECTIVE:** The student will be able to identify and select aircraft engine lubricants; explain the theory of fluid lubrication; diagram a reciprocating lubrication system; explain the operation of an oil dilution system and the procedure for oil dilution; explain the function of the component parts of a turbine engine lubrication system; and perform a conformity inspection on a lubrication system.

27 Hours

#### **POWERPLANT ELECTRICAL SYSTEMS**

**CONTENT:** Generators; generator control, vibrating contact and carbon pile regulators; alternators; alternator control, vibrating contact and transistor regulators; and generator paralleling.

**STUDENT PERFORMANCE OBJECTIVE:** The student will be able to explain the theory of operation of a generator; perform an overhaul a generator; generator control, including vibrating constant and carbon pile regulators; perform adjustments to generator control units; the theory of operation of an alternator; explain alternator control, including vibrating contact and transistor regulators; perform adjustments the control circuit for generators operating in parallel; and perform a conformity inspection of a powerplant electrical system.

9 Hours

#### **ENGINE FIRE PROTECTION SYSTEMS**

**CONTENT:** Fire detection systems; fire extinguishing systems; and types of extinguishing agents.

**STUDENT PERFORMANCE OBJECTIVE:** The student will be able explain the operation of a continuous loop fire detection system; test a continuous loop detection system; explain the operation of a fire protection system; identify types of extinguishing agents by specification number; and perform a conformity inspection (examination) on fire systems.

9 Hours

#### ENGINE STARTING SYSTEMS

CONTENT: Reciprocating engine starters; starter clutches; electric starter circuits; turbine engine start systems; and air turbine starters and control.

STUDENT PERFORMANCE OBJECTIVE: The student will be able to explain the operation of a reciprocating engine starter; perform an overhaul an electric starting motor and know how to perform an adjustment to a starter clutch; schematically diagram an electrical start circuit; explain the starting sequence of a turbine engine; explain the operation of an air turbine starter; and schematically diagram the control system of an air turbine starter and illustrate airflow through the system.

9 Hours

#### POWERPLANT INSTRUMENT SYSTEMS

CONTENT: Engine instrument mechanisms and design; engine instrument interpretation; and engine troubleshooting using instrument readings.

STUDENT PERFORMANCE OBJECTIVE: The student will be able to explain the operating mechanisms of engine instruments and compare design features of various types; interpret instrument readings; and perform troubleshooting of an engine using instrument readings.

9 Hours

#### ENGINE CONTROL SYSTEMS OPERATION AND MAINTENANCE

CONTENT: Control system design and control system maintenance and rigging.

STUDENT PERFORMANCE OBJECTIVE: The student will be able to explain the function of each of the engine controls; compare design features of various control systems; and perform the maintenance and rigging of engine controls.

36 Hours

#### AERODYNAMICS, INSPECTION, SERVICE AND REPAIR OF PROPELLERS AND PROPELLER CONTROL SYSTEMS

CONTENT: Propeller theory and aerodynamics; fixed pitch propellers; constant speed propellers; propeller servicing, and maintenance; propeller governors; turboprop propeller control systems; and turboprop control system rigging and adjustments.

STUDENT PERFORMANCE OBJECTIVE: The student will be able to explain the aerodynamics of an operating propeller; able to compare the difference in thrust and engine performance between fixed pitch and constant speed propellers; perform installation and adjustment of pitch stops on a constant speed propeller; service and perform maintenance on fixed and controllable pitch propellers; explain the operation of a propeller governor; perform the adjustments of the RPM setting of a propeller governor; explain the operation of a turboprop propeller control system operating in the Alpha and Beta mode; perform rigging a turboprop propeller and control system; and perform a conformity inspection on a propeller and its control system.

LAB CONTENT:

54 Hours

#### FUEL, FUEL METERING SYSTEMS AND COMPONENTS

LAB PROJECTS: Overhaul a float type carburetor; overhaul a pressure type carburetor; overhaul a fuel injection system; adjustment a fuel control system; and conduct an airworthiness inspection of a fuel metering system.

40 Hours

#### LUBRICANTS AND LUBRICATION

LAB PROJECTS: Identify and select aircraft engine lubricants and perform a conformity inspection on a lubrication system.

40.5 Hours

#### POWERPLANT ELECTRICAL SYSTEMS

LAB PROJECTS: Adjustments to generator control units; adjustments the control circuit for generators operating in parallel; perform a conformity inspection of a powerplant electrical system; and disassemble, inspect commutator, reassemble and test a generator to specifications.

13.5 Hours

#### ENGINE FIRE PROTECTION SYSTEMS

LAB PROJECTS: Using a meg/ohmmeter, the student will be able to test the continuous loop detector to locate system defects; select and identify by specification number the correct extinguishing agent for the system; and using the aircraft manufacturer's manual and checklist, the student will be able to inspect a fire system for conformity to specifications.

13.5 Hours

#### ENGINE STARTING SYSTEMS

LAB PROJECTS: Using the overhaul manual, the student will disassemble, inspect, reassemble and test an electric start motor; and using the appropriate tools and clutch specifications, perform an adjustment to the clutch at the correct torque setting.

13.5 Hours

#### POWERPLANT INSTRUMENT SYSTEMS

LAB PROJECTS: Using an aircraft instrument panel with the engine operating, the student will interpret the readings of the instruments in their correct unit of measurement and relate those readings to the engine's operating parameters; and using instrument readings from a malfunctioning engine and comparing them to normal, and diagnose problems in an engine.

13.5 Hours

#### ENGINE CONTROL SYSTEMS OPERATION AND MAINTENANCE

LAB PROJECTS: Perform the correct maintenance and rigging procedures for the engine controls on an operational aircraft.

54 Hours

#### AERODYNAMICS, INSPECTION, SERVICE AND REPAIR OF PROPELLERS AND PROPELLER CONTROL SYSTEMS

LAB PROJECTS: Using the appropriate equipment, perform the installation and pitch stop adjustment of a constant speed propeller; perform the correct servicing and maintenance on a fixed pitch and a controllable pitch propeller; perform adjustments to the propeller to the correct RPM setting; on an operating engine, perform the correct rigging of a turboprop propeller and control system; and using the manufacturer's checklist, conduct an airworthiness conformity inspection on a propeller and its control systems.

20 Hours

#### POWERPLANT RESEARCH

#### **METHODS OF INSTRUCTION:**

Instruction will be done by: Classroom lecture with the use of visual aids and laboratory demonstration. Evaluation will be done by written oral and practical examination, lab project sheets and by satisfactory completion of lab projects.

#### **METHODS OF EVALUATION:**

Writing assignments

Percent of total grade: 10.00 %

Category 1 Range of 10% to 20% of Total Written Homework Lab Reports Term or Other Papers

Problem-solving assignments

Percent of total grade: 10.00 %

Category 2 – 10% to 20% Computational or non-computational problem solving demonstrations including: Homework Problems Quizzes Exams

Skill demonstrations

Percent of total grade: 10.00 %

Category 3 – 10% to 20% Class Performance/s

Objective examinations

Percent of total grade: 30.00 %

Category 4 – 30% to 50% Multiple Choice True/False Matching Items

Other methods of evaluation

Percent of total grade: 10.00 %

Category 5 – 10% to 20% Research Project

**OUT OF CLASS ASSIGNMENTS:**

Required Outside Hours: 13

Assignment Description:

FUEL, FUEL METERING SYSTEMS AND COMPONENTS

Homework: Complete reading assignments and answer question sheets.

Required Outside Hours: 10

Assignment Description:

LUBRICANTS AND LUBRICATION

Homework: Complete reading assignments and answer question sheets.

Required Outside Hours: 10

Assignment Description:

POWERPLANT ELECTRICAL SYSTEMS

Homework: Complete reading assignments and answer question sheets.

Required Outside Hours: 4

Assignment Description:

ENGINE FIRE PROTECTION SYSTEMS

Homework: Complete reading assignments and answer question sheets.

Required Outside Hours: 4

Assignment Description:

ENGINE STARTING SYSTEMS

Homework: Complete reading assignments and answer question sheets.

Required Outside Hours: 4

Assignment Description:

POWERPLANT INSTRUMENT SYSTEMS

Homework: Complete reading assignments and answer question sheets.

Required Outside Hours: 4

Assignment Description:

ENGINE CONTROL SYSTEMS OPERATION AND MAINTENANCE

Homework: Complete reading assignments and answer question sheets.

Required Outside Hours: 13

Assignment Description:

AERODYNAMICS, INSPECTION, SERVICE AND REPAIR OF PROPELLERS AND PROPELLER CONTROL SYSTEMS

Homework: Complete reading assignments and answer question sheets.

Required Outside Hours: 20

Assignment Description:

POWERPLANT RESEARCH

Computer based Aircraft Powerplant 10 page research project and student generated Teaching Video.

**REPRESENTATIVE TEXTBOOKS:**

Required Representative Textbooks

Dale Crane. Aviation Maintenance Technician Series "Powerplant", ASA-AMT-P Third edition. ASA,2011.

Reading Level of Text, Grade: Reading level of texts: 12 grade. Verified by: Microsoft word grammar check.

FAA Department of Transportation. AC43.13-1B 09/98, FAA.

FAA Department of Transportation. Airframe and Powerplant Mechanics General Handbook FAA-H-8083-30. 2008.

FAA Department of Transportation. Airframe and Powerplant Mechanics Powerplant Handbook FAA-H-8083-32 Vol I and Vol II. 2012.

Otis and Vosbury. Aircraft Gas Turbine Jeppesen JS312648. 2010.

Recommended Other Texts and Materials

FAA AC443-13 & 8083-30 & 32 Vol I & II are available from the FAA website free as a PDF download!

### **ARTICULATION and CERTIFICATE INFORMATION**

Associate Degree:

CSU GE:

IGETC:

CSU TRANSFER:

Transferable CSU, effective 199050

UC TRANSFER:

Not Transferable

### **SUPPLEMENTAL DATA:**

Basic Skills: N

Classification: Y

Noncredit Category: Y

Cooperative Education:

Program Status: 1 Program Applicable

Special Class Status: N

CAN:

CAN Sequence:

CSU Crosswalk Course Department: AMT

CSU Crosswalk Course Number: 121

Prior to College Level: Y

Non Credit Enhanced Funding: N

Funding Agency Code: Y

In-Service: N

Occupational Course: B

Maximum Hours:

Minimum Hours:

Course Control Number: CCC000573690

Sports/Physical Education Course: N

Taxonomy of Program: 095020