

# Course Outline

Transportation

REVISED: August/2017

**Job Title:**  
Powerplant Technician

**Career Pathway:**  
Systems Diagnostics and Service

**Industry Sector:**  
Transportation

**O\*NET-SOC CODE:**  
49-3011.00

**CBEDS Title:**  
Aircraft Mechanics

**CBEDS No.:**  
5653

**79-70-90**

## Powerplant Technician Trainee

**Credits:** 40

**Hours:** 900

### Course Description:

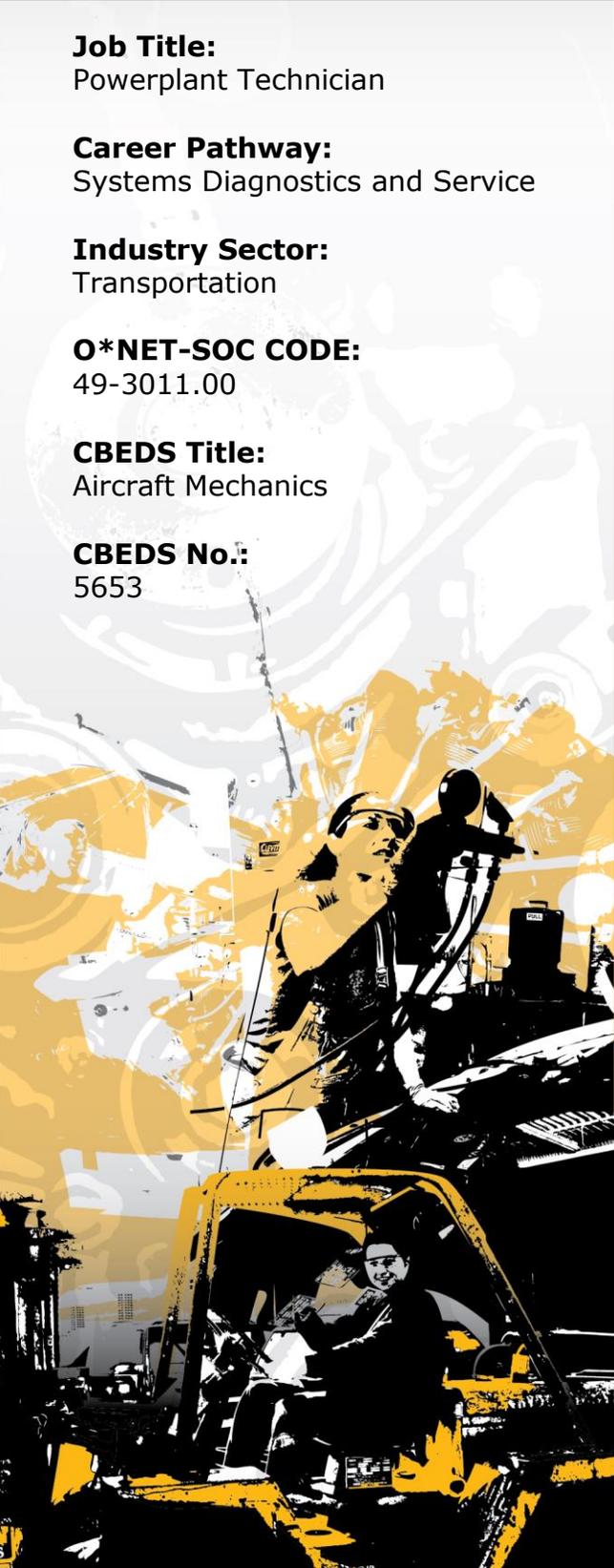
This competency-based course includes instruction in aircraft turbine and piston engine theory, maintenance, and overhaul, using specifications of the Federal Aviation Administration (FAA) and manufacturers. It prepares students to pass the FAA's written, oral, and practical examinations for powerplant mechanics and prepares them for employment in the aviation industry. The competencies in this course are aligned with the California High School Academic Content Standards and the California Career Technical Education Model Curriculum Standards.

### Prerequisites:

Enrollment requires a minimum 9.0 reading level as measured by the TABE D 9/10 and a minimum 9.0 math level as measured by the TABE 9M. Complete Battery Test and the minimum age of 16. Successful completion of the Airframe and Powerplant Technician (79-70-50) course.

**NOTE:** For Perkins purposes this course has been designated as a **concentrator/capstone** course.

This course cannot be repeated once a student receives a Certificate of Completion.



## **COURSE OUTLINE COMPETENCY-BASED COMPONENTS**

A course outline reflects the essential intent and content of the course described. Acceptable course outlines have six components. (Education Code Section 52506). Course outlines for all apportionment classes, including those in jails, state hospitals, and convalescent hospitals, contain the six required elements:

(EC 52504; 5CCR 10508 [b]; Adult Education Handbook for California [1977], Section 100)

### **COURSE OUTLINE COMPONENTS**

### **LOCATION**

#### **GOALS AND PURPOSES**

Cover

The educational goals or purposes of every course are clearly stated and the class periods are devoted to instruction. The course should be broad enough in scope and should have sufficient educational worth to justify the expenditure of public funds.

The goals and purpose of a course are stated in the COURSE DESCRIPTION. Course descriptions state the major emphasis and content of a course, and are written to be understandable by a prospective student.

#### **PERFORMANCE OBJECTIVES OR COMPETENCIES**

pp. 7-16

Objectives should be delineated and described in terms of measurable results for the student and include the possible ways in which the objectives contribute to the student's acquisition of skills and competencies.

Performance Objectives are sequentially listed in the COMPETENCY-BASED COMPONENTS section of the course outline. Competency Areas are units of instruction based on related competencies. Competency Statements are competency area goals that together define the framework and purpose of a course. Competencies fall on a continuum between goals and performance objectives and denote the outcome of instruction.

Competency-based instruction tells a student before instruction what skills or knowledge they will demonstrate after instruction. Competency-based education provides instruction which enables each student to attain individual goals as measured against pre-stated standards.

Competency-based instruction provides immediate and continual repetition and In competency-based education the curriculum, instruction, and assessment share common characteristics based on clearly stated competencies. Curriculum, instruction and assessment in competency-based education are: explicit, known, agreed upon, integrated, performance oriented, and adaptive.

**COURSE OUTLINE COMPETENCY-BASED COMPONENTS**  
**(continued)**

<b>COURSE OUTLINE COMPONENTS</b>	<b>LOCATION</b>
<b>INSTRUCTIONAL STRATEGIES</b>	p. 18
<p>Instructional techniques or methods could include laboratory techniques, lecture method, small-group discussion, grouping plans, and other strategies used in the classroom.</p> <p>Instructional strategies for this course are listed in the TEACHING STRATEGIES AND EVALUATION section of the course outline. Instructional strategies and activities for a course should be selected so that the overall teaching approach takes into account the instructional standards of a particular program, i.e., English as a Second Language, Programs for Adults with Disabilities.</p>	
<b>UNITS OF STUDY, WITH APPROXIMATE HOURS ALLOTTED FOR EACH UNIT</b>	Cover
<p>The approximate time devoted to each instructional unit within the course, as well as the total hours for the course, is indicated. The time in class is consistent with the needs of the student, and the length of the class should be that it ensures the student will learn at an optimum level.</p> <p>Units of study, with approximate hours allotted for each unit are listed in the COMPETENCY AREA STATEMENT(S) of the course outline. The total hours of the course, including work-based learning hours (community classroom and cooperative vocational education) is listed on the cover of every CBE course outline. Each Competency Area listed within a CBE outline is assigned hours of instruction per unit.</p>	
<b>EVALUATION PROCEDURES</b>	pp. 18-19
<p>The evaluation describes measurable evaluation criteria clearly within the reach of the student. The evaluation indicates anticipated improvement in performances as well as anticipated skills and competencies to be achieved.</p> <p>Evaluation procedures are detailed in the TEACHING STRATEGIES AND EVALUATION section of the course outline. Instructors monitor students' progress on a continuing basis, assessing students on attainment of objectives identified in the course outline through a variety of formal and informal tests (applied performance procedures, observations, and simulations), paper and pencil exams, and standardized tests.</p>	
<b>REPETITION POLICY THAT PREVENTS PERPETUATION OF STUDENT ENROLLMENT</b>	Cover
<p>After a student has completed all the objectives of the course, he or she should not be allowed to reenroll in the course. There is, therefore, a need for a statement about the conditions for possible repetition of a course to prevent perpetuation of students in a particular program for an indefinite period of time.</p>	

## **ACKNOWLEDGMENTS**

Thanks to JOHN ALVAREZ for developing and editing this curriculum. Acknowledgment is also given to ERICA ROSARIO for designing the original artwork for the course covers.

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# **CALIFORNIA CAREER TECHNICAL EDUCATION MODEL CURRICULUM STANDARDS**

## **Transportation Industry Sector Knowledge and Performance Anchor Standards**

### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Transportation academic alignment matrix for identification of standards.

### **2.0 Communications**

Acquire and accurately use Transportation sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.

### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.

### **4.0 Technology**

Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Transportation sector workplace environment.

### **5.0 Problem Solving and Critical Thinking**

Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Transportation sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.

### **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Transportation sector workplace environment.

### **7.0 Responsibility and Flexibility**

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Transportation sector workplace environment and community settings.

### **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms.

### **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the SkillsUSA career technical student organization

### **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Transportation sector, following procedures when carrying out experiments or performing technical tasks.

### **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Transportation anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and through the SkillsUSA career technical student organization.

## ***Transportation Pathway Standards***

### **C. Systems Diagnostics and Service Pathway**

The Systems Diagnostics and Service pathway prepares students for postsecondary education and employment in the transportation industry, which includes but is not limited to motor vehicles, rail systems, marine applications, and small-engine and specialty equipment.

Sample occupations associated with this pathway:

- ◆ Service Technician/Maintenance Worker/Shop Foreman
- ◆ Technical Writer
- ◆ Dispatcher
- ◆ Engineer
- ◆ Investigator/Inspector

- C1.0 Demonstrate the practice of personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards.
- C2.0 Practice the safe and appropriate use of tools, equipment, and work processes.
- C3.0 Use scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems.
- C4.0 Perform and document maintenance procedures in accordance with the recommendations of the manufacturer.
- C5.0 Apply and understand appropriate business practices.
- C6.0 Demonstrate the application, operation, maintenance, and diagnosis of engines, including but not limited to two- and four-stroke and supporting subsystems.
- C7.0 Demonstrate the function, principles, and operation of electrical and electronic systems using manufacturer and industry standards.
- C8.0 Demonstrate the function and principles of automotive drivetrain, steering and suspension, brake, and tire and wheel components and systems in accordance with national industry standards.

**CBE**  
**Competency-Based Education**

**COMPETENCY-BASED COMPONENTS**  
**for the Powerplant Technician Trainee Course**

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
<p>A. ORIENTATION</p> <p>Understand, apply, and evaluate classroom and workplace policies and procedures.</p> <p>(3 hours)</p>	<ol style="list-style-type: none"> <li>1. Describe the scope and purpose of the course.</li> <li>2. Complete the designated safety examination with 100 percent accuracy.</li> <li>3. Understand the safe use of hand tools and equipment.</li> <li>4. Understand the necessity for proper clothing and eye and hearing protection.</li> <li>5. Describe the Material Safety Data Sheet (MSDS) as it applies to the aviation industry.</li> <li>6. Learn pertinent Federal Aviation Administration (FAA) regulations.</li> </ol>	<p><b>Career Ready Practice:</b> 1, 5, 9, 12</p> <p><b>CTE Anchor:</b> Career Planning and Management: 3.1, 3.9 Problem Solving and Critical Thinking: 5.2, 5.3, 5.4 Health and Safety: 6.1, 6.2, 6.3, 6.4, 6.6, 6.7 Responsibility and Flexibility: 7.8 Ethics and Legal Responsibilities: 8.1, 8.2 Technical Knowledge and Skills: 10.1, 10.2 Demonstration and Application: 11.1, 11.2</p> <p><b>CTE Pathway:</b> C1.1, C1.2, C1.3, C1.4, C1.5, C2.1, C2.2, C2.3, C2.4, C2.5, C2.6, C2.7, C3.1, C3.3, C3.4, C3.5, C3.7, C4.1, C4.2, C4.3, C5.1, C5.2, C5.3, C5.4, C5.5, C5.6, C6.2, C6.3, C6.4, C7.1, C7.2, C7.3, C7.5, C7.7</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
<p>B. THEORY AND CONSTRUCTION OF AIRCRAFT RECIPROCATING ENGINES</p> <p>Understand, apply, and evaluate the theory and construction techniques for the different types of aircraft reciprocating power plants.</p> <p>(136 hours)</p>	<ol style="list-style-type: none"> <li>1. Identify the various designs of aircraft reciprocating engines.</li> <li>2. Understand the history of aircraft engines.</li> <li>3. Explain the operation of the Otto cycle.</li> <li>4. Explain the function of the various reciprocating engine components.</li> <li>5. Know how to calculate engine power and efficiency.</li> <li>6. Understand factors which affect engine power output.</li> <li>7. Understand engine cylinder numbering.</li> <li>8. Determine engine cylinder firing order.</li> <li>9. Understand the requirements for engine overhaul.</li> <li>10. Learn standard engine overhaul procedures.</li> <li>11. Overhaul an engine in accordance with manufacturer's instructions for disassembly, cleaning, inspection, repair, and reassembly.</li> <li>12. Know how to use the Table of Fits and Limits and accomplish precision measurements with standard industry tools and equipment.</li> <li>13. Prepare an inspection report.</li> <li>14. Prepare a maintenance record entry for an overhaul inspection.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Technical Knowledge and Skills: 10.1</p> <p><b>CTE Pathway:</b> C2.4, C3.1, C3.6, C3.7, C4.1, C4.2, C6.3</p>
<p>C. ENGINE INDUCTION SYSTEMS</p> <p>Understand, apply, and evaluate the inspection, maintenance, and troubleshooting techniques for the induction systems.</p> <p>(21 hours)</p>	<ol style="list-style-type: none"> <li>1. Compare the various types of induction systems.</li> <li>2. Know the types of induction air filters.</li> <li>3. Understand the effects of induction icing.</li> <li>4. Describe alternate air doors.</li> <li>5. Understand the carburetor heat system.</li> <li>6. Inspect and rig a carburetor heat control.</li> <li>7. Understand the operation of superchargers.</li> <li>8. Know the components of a turbocharging system.</li> <li>9. Disassemble, inspect, and reassemble a turbocharger.</li> <li>10. Explain inlet anti-vortex destroyers.</li> <li>11. Compare sub-sonic and super-sonic turbine inlet ducts.</li> <li>12. Know the operation of a turbine inlet anti-ice system.</li> <li>13. Perform an Airworthiness Directive Inspection on a selected induction filter.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Technical Knowledge and Skills: 10.1</p> <p><b>CTE Pathway:</b> C3.1, C4.2</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
<p>D. ENGINE FUEL SYSTEMS</p> <p>Understand, apply, and evaluate the inspection, maintenance, and troubleshooting techniques for the fuel systems.</p> <p>(25 hours)</p>	<ol style="list-style-type: none"> <li>1. Compare the characteristics of aviation fuels.</li> <li>2. Know the requirements for an aircraft fuel system.</li> <li>3. Understand the requirement for filtering out water and contaminants.</li> <li>4. Learn the fuel system components and their relationship.</li> <li>5. Inspect the four (4) most popular fuel pumps and compare their principles of operation.</li> <li>6. Understand fuel tank repair procedures.</li> <li>7. Demonstrate knowledge of the fuel systems on four selected aircraft.</li> <li>8. Inspect a fuel system and prepare a report.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Technical Knowledge and Skills: 10.1</p> <p><b>CTE Pathway:</b> C3.1, C4.1, C4.2, C6.4</p>
<p>E. ENGINE FUEL METERING SYSTEMS</p> <p>Understand, apply, and evaluate the inspection, maintenance, and troubleshooting techniques for the aircraft fuel metering systems.</p> <p>(60 hours)</p>	<ol style="list-style-type: none"> <li>1. Compare the various types of reciprocating engine fuel metering systems.</li> <li>2. Understand the principles of operation of a float type carburetor.</li> <li>3. Learn the components of a float carburetor and their functions.</li> <li>4. Know the five (5) systems in a float carburetor and compare their relationships.</li> <li>5. Understand the importance of correct fuel/air ratio.</li> <li>6. Perform an overhaul inspection on a float carburetor using manufacturer's data.</li> <li>7. Adjust float lever using a test bench and appropriate data and procedures.</li> <li>8. Compare Teledyne Continental and Bendix fuel injection systems.</li> <li>9. Understand how anti-detonation injection (ADI) affects engine performance.</li> <li>10. Understand the operation of a turbine engine fuel control.</li> <li>11. Describe direct fuel injection and continuous flow fuel injection.</li> <li>12. Know the external inputs to a turbine engine fuel control.</li> <li>13. Learn turbine engine fuel control trim procedures.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Technical Knowledge and Skills: 10.1</p> <p><b>CTE Pathway:</b> C3.1, C6.4</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
<p>F. ENGINE IGNITION SYSTEMS</p> <p>Understand, apply, and evaluate the inspection, maintenance, and troubleshooting techniques for the ignition systems.</p> <p>(88 hours)</p>	<ol style="list-style-type: none"> <li>1. Compare a battery ignition system and a magneto ignition system.</li> <li>2. Disassemble, inspect, service, repair, assemble, and test a magneto.</li> <li>3. Understand electromagnetic induction.</li> <li>4. Properly time a magneto to an engine.</li> <li>5. Compare low tension and high tension ignition systems.</li> <li>6. Inspect and test a high tension ignition harness.</li> <li>7. Inspect and service spark plugs.</li> <li>8. Understand spark plug nomenclature and heat ranges.</li> <li>9. Contrast types of turbine engine ignition systems.</li> <li>10. Understand the dangers of turbine ignition high amperage systems.</li> <li>11. Differentiate ignition analyzer patterns.</li> <li>12. Troubleshoot ignition systems.</li> <li>13. Clean, inspect, and service turbine engine igniter plugs.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Problem Solving and Critical Thinking: 5.1, 5.2, 5.3, 5.4 Health and Safety: 6.5, 6.6 Technical Knowledge and Skills: 10.1</p> <p><b>CTE Pathway:</b> C6.4, C7.3</p>
<p>G. ENGINE ELECTRICAL SYSTEMS</p> <p>Understand, apply, and evaluate the inspection, maintenance, and troubleshooting techniques for the engine electrical systems.</p> <p>(60 hours)</p>	<ol style="list-style-type: none"> <li>1. Understand powerplant electrical systems.</li> <li>2. Know the requirements for proper bonding.</li> <li>3. Demonstrate wire and cable stripping.</li> <li>4. Prepare a proper solder connection.</li> <li>5. Learn the proper use of terminal crimpers.</li> <li>6. Inspect wire installations and determine compliance with standards.</li> <li>7. Determine correct conduit size for a wire bundle.</li> <li>8. Understand wire tying procedures.</li> <li>9. Using appropriate data, determine correct electrical components for a designated installation.</li> <li>10. Disassemble, inspect, and safely install a cannon plug.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Technical Knowledge and Skills: 10.1</p> <p><b>CTE Pathway:</b> C7.1</p>
<p>H. ENGINE LUBRICATION SYSTEMS</p> <p>Understand, apply, and evaluate the inspection, maintenance, and troubleshooting techniques for the engine lubrication systems.</p>	<ol style="list-style-type: none"> <li>1. Know the history of oil production and development.</li> <li>2. Understand the various oil producing areas and the types of crude produced.</li> <li>3. Learn the seven (7) functions of lubricating oil.</li> <li>4. Compare the characteristics of mineral oil and ashless dispersant oil.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Technical Knowledge and Skills: 10.1</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(69 hours)	<ol style="list-style-type: none"> <li>5. Compare automotive engine oil to aircraft engine oil.</li> <li>6. Understand the proper oil for reciprocating engine break-in.</li> <li>7. Disassemble, inspect, repair, and reassemble various types of reciprocating engine oil pumps.</li> <li>8. Know the definition of a micron.</li> <li>9. Compare the various types of oil filters.</li> <li>10. Inspect an oil filter for contamination.</li> <li>11. Disassemble, inspect, and reassemble a turbine engine oil pump.</li> <li>12. Understand the operation of oil coolers and heat exchangers.</li> <li>13. Inspect various oil systems and pass an oral examination.</li> <li>14. Understand the need for frequent oil and filter changes.</li> </ol>	<p><b>CTE Pathway:</b> C6.2</p>
<p>I. PROPELLERS</p> <p>Understand, apply, and evaluate the inspection, maintenance, and troubleshooting techniques for the different types of propellers.</p> <p>(66 hours)</p>	<ol style="list-style-type: none"> <li>1. List the basic types of propellers.</li> <li>2. Compare a tractor propeller to a pusher propeller.</li> <li>3. Explain how a propeller produces thrust.</li> <li>4. Know the five (5) forces acting on a propeller.</li> <li>5. Understand the propeller nomenclature.</li> <li>6. Remove and install a fixed pitch propeller.</li> <li>7. Remove and install a constant speed propeller.</li> <li>8. Describe propeller balancing and balance a propeller.</li> <li>9. Understand the importance of repairing nicks and scratches in a propeller.</li> <li>10. Repair a damaged propeller blade.</li> <li>11. Understand the operation of a hydromatic propeller.</li> <li>12. Describe the operation of a propeller governor.</li> <li>13. Properly rig a propeller governor.</li> <li>14. Explain propeller synchronization.</li> <li>15. Understand the operation of turboprop propeller systems.</li> <li>16. Compare the types of propeller de-icing systems.</li> <li>17. Inspect, service, and repair a propeller installation.</li> <li>18. Properly track propeller blades.</li> <li>19. Inspect a propeller for correct blade angles.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Technical Knowledge and Skills: 10.1</p> <p><b>CTE Pathway:</b> C6.3</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
<p>J. ENGINE REMOVAL AND REPLACEMENT</p> <p>Understand, apply, and evaluate the removal and replacement techniques for an aircraft engine in accordance with manufacturer's data.</p> <p>(54 hours)</p>	<ol style="list-style-type: none"> <li>1. List the reasons for replacing an aircraft engine.</li> <li>2. Understand the safety precautions to be observed when removing and installing an engine.</li> <li>3. Know what equipment is included in a QECA engine package.</li> <li>4. Assemble the proper tools and equipment to perform an engine removal.</li> <li>5. Prepare an engine for installation.</li> <li>6. Understand the manufacturer's procedure for engine removal and replacement.</li> <li>7. Hoist an engine out of an aircraft.</li> <li>8. Learn how to safely depressurize an engine storage container.</li> <li>9. Install an engine on an aircraft.</li> <li>10. Prepare an engine for operational testing.</li> <li>11. Understand the requirement for post installation ground inspections and testing.</li> <li>12. Perform a ground run-up of the engine.</li> <li>13. Prepare a maintenance record entry for an engine change and operational check.</li> <li>14. Understand procedures for engine preservation and corrosion control.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Technical Knowledge and Skills: 10.1</p> <p><b>CTE Pathway:</b> C1.4, C2.2, C2.3, C3.7, C4.4, C6.1</p>
<p>K. ENGINE FIRE PROTECTION SYSTEMS</p> <p>Understand, apply, and evaluate the inspection, maintenance, and troubleshooting techniques for the engine fire detection and extinguishing systems.</p> <p>(21 hours)</p>	<ol style="list-style-type: none"> <li>1. Understand the need for engine fire protection systems.</li> <li>2. Learn the requirements for reciprocating engine fire protection systems.</li> <li>3. Understand the requirements for turbine engine fire protection systems.</li> <li>4. Compare fire zones.</li> <li>5. Contrast fire extinguishing agents.</li> <li>6. Understand the various fire detection systems.</li> <li>7. Understand the various fire protection systems.</li> <li>8. Learn fire protection system maintenance practices.</li> <li>9. Inspect, service, and repair a fire protection system.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Health and Safety: 6.5, 6.6 Technical Knowledge and Skills: 10.1</p> <p><b>CTE Pathway:</b> C6.3</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
<p>L. ENGINE INSPECTION</p> <p>Understand, apply, and evaluate techniques for achieving a 100-hour engine inspection performance.</p> <p>(30 hours)</p>	<ol style="list-style-type: none"> <li>1. Understand requirements for scheduled engine inspections.</li> <li>2. Learn inspection techniques.</li> <li>3. Research Type Certificate Data Sheets, Airworthy Directives, and Service Bulletins.</li> <li>4. Understand the types of special inspections.</li> <li>5. Perform a 100-hour inspection and make a report of discrepancies.</li> <li>6. Prepare a maintenance record entry for a 100-hour inspection.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Technical Knowledge and Skills: 10.1, 10.2</p> <p><b>CTE Pathway:</b> C4.2, C6.1</p>
<p>M. ENGINE STARTING SYSTEMS</p> <p>Understand, apply, and evaluate the operational, maintenance, and troubleshooting techniques for the different types of engine starting systems.</p> <p>(21 hours)</p>	<ol style="list-style-type: none"> <li>1. Understand the direct cranking electric starter.</li> <li>2. Compare the hand crank inertia starter and the electric inertia starter.</li> <li>3. Understand turbine engine starter-generator systems.</li> <li>4. Compare the shotgun starter and the cartridge/pneumatic starter.</li> <li>5. Understand direct cranking turbine engine starters.</li> <li>6. Explain operation of a fuel/air combustion starter.</li> <li>7. Know the operation of a jet fuel starter.</li> <li>8. Perform an overhaul inspection on a pneumatic air turbine starter.</li> <li>9. Understand proper turbine engine starting procedures.</li> <li>10. Understand proper reciprocating engine starting procedures.</li> <li>11. Know how an Auxiliary Power Unit (APU) is used to start a turbine engine.</li> <li>12. Operate a Ground Power Unit (GPU).</li> <li>13. Understand the various methods of starting a Boeing 737.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Technical Knowledge and Skills: 10.1</p> <p><b>CTE Pathway:</b> C3.4, C7.1</p>
<p>N. ENGINE MAINTENANCE AND OPERATION</p> <p>Understand, apply, and evaluate the operational, maintenance, and troubleshooting techniques for the different types of aircraft engines.</p>	<ol style="list-style-type: none"> <li>1. Understand the basic operating principles of reciprocating engines.</li> <li>2. Understand the basic operating principles of turbine engines.</li> <li>3. Describe factors affecting engine operation.</li> <li>4. Learn starting and run-up procedures for a reciprocating engine equipped with a fixed pitch propeller.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Technical Knowledge and Skills: 10.1</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(87 hours)	<ol style="list-style-type: none"> <li>5. Learn starting and run-up procedures for a reciprocating engine equipped with a constant speed propeller.</li> <li>6. Clean and service spark plugs.</li> <li>7. Perform an engine cylinder compression check.</li> <li>8. Perform a cold cylinder check.</li> <li>9. Service valves and valve mechanisms.</li> <li>10. Learn starting and run-up procedures for a turbine engine.</li> <li>11. Understand turbine engine trim procedures and trim a turbine engine.</li> <li>12. Borescope a turbine engine combustion section.</li> <li>13. Understand the purpose of a jet calibration test.</li> </ol>	<p><b>CTE Pathway:</b> C3.1, C6.1, C7.1</p>
<p>O. ENGINE COOLING SYSTEMS</p> <p>Understand, apply, and evaluate the inspection, maintenance, and troubleshooting techniques for the engine cooling systems.</p> <p>(21 hours)</p>	<ol style="list-style-type: none"> <li>1. Understand how pressure cooling is able to properly cool an air-cooled engine.</li> <li>2. Know how to repair cylinder baffles and deflectors.</li> <li>3. Inspect a cooling system.</li> <li>4. Restore a damaged cooling fin to airworthy condition.</li> <li>5. Understand the liquid cooling of aircraft engines.</li> <li>6. List the components in a cooling system.</li> <li>7. Calibrate a cylinder head temperature gauge.</li> <li>8. Learn the methods of turbine engine cooling.</li> <li>9. Inspect a turbine engine heat exchanger.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Technical Knowledge and Skills: 10.1</p> <p><b>CTE Pathway:</b> C6.2</p>
<p>P. ENGINE EXHAUST SYSTEMS</p> <p>Understand, apply, and evaluate the operational, maintenance, and troubleshooting techniques for the different types of engine starting systems.</p> <p>(21 hours)</p>	<ol style="list-style-type: none"> <li>1. Understand the importance of a properly maintained exhaust system.</li> <li>2. Compare radial engine exhaust systems to opposed engine exhaust systems.</li> <li>3. Inspect an exhaust system and list defects noted.</li> <li>4. Adjust heat shields.</li> <li>5. Compare sub-sonic and super-sonic turbine engine exhaust ducts.</li> <li>6. Understand the various types of thrust reversers and their operation.</li> <li>7. Explain the use of “mice” in turbine engine exhaust ducts.</li> <li>8. Perform an operational check of a thrust reverser.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Technical Knowledge and Skills: 10.1</p> <p><b>CTE Pathway:</b> C3.7</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
<p>Q. THEORY AND CONSTRUCTION OF AIRCRAFT TURBINE ENGINES</p> <p>Understand, apply, and evaluate the operational, maintenance, and troubleshooting techniques for the different types of aircraft turbine engines.</p> <p>(90 hours)</p>	<ol style="list-style-type: none"> <li>1. Know the history of turbine engine development.</li> <li>2. Understand turbine engine design and construction.</li> <li>3. Explain the Brayton cycle.</li> <li>4. Compare the Brayton cycle to the Otto cycle.</li> <li>5. Compare turbojet, Turbofan, Turboprop, and Turbohaft engines.</li> <li>6. Understand how Bernoulli's Principle, Newton's Laws of Motion, and Boyle's Gas Law effect turbine engine operation.</li> <li>7. Explain how atmospheric conditions affect turbine engine performance.</li> <li>8. Identify and know the function of various turbine engine components.</li> <li>9. Calculate thrust and thrust horsepower.</li> <li>10. Describe turbine engine overhaul procedures.</li> <li>11. Overhaul a turbine engine using manufacturer's disassembly, inspection, repair, and reassembly instructions. Prepare a report of condition.</li> <li>12. Prepare a maintenance record entry for a turbine engine overhaul.</li> <li>13. Operate a turbine engine.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Technical Knowledge and Skills: 10.1</p> <p><b>CTE Pathway:</b> C3.1, C4.2, C7.7</p>
<p>R. ENGINE INSTRUMENT SYSTEMS</p> <p>Understand, apply, and evaluate the inspection, maintenance, and troubleshooting techniques for the different types of instruments used in engine installations.</p> <p>(24 hours)</p>	<ol style="list-style-type: none"> <li>1. Learn the requirements for engine indicating instruments.</li> <li>2. Learn the principle of operation of bourdon tube instruments.</li> <li>3. Understand the operation of electrically powered instruments.</li> <li>4. Calibrate an Exhaust Gas Temperature (EGT) system.</li> <li>5. Connect and calibrate an electric tachometer system.</li> <li>6. Compare types of flowmeters.</li> <li>7. List the minimum engine instruments for flight operations.</li> </ol>	<p><b>Career Ready Practice:</b> 1</p> <p><b>CTE Anchor:</b> Technical Knowledge and Skills: 10.1</p> <p><b>CTE Pathway:</b> C6.3</p>
<p>S. EMPLOYABILITY SKILLS</p> <p>Understand, apply, and evaluate employability skills required in aircraft inspection, operation, and</p>	<ol style="list-style-type: none"> <li>1. Describe the different hiring requirements of the airlines.</li> <li>2. Describe what tests may be given to the job applicant before the interview is given.</li> <li>3. Describe what knowledge is important to have prior to an interview.</li> </ol>	<p><b>Career Ready Practice:</b> 1, 3</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
<p>repair.</p> <p>(3 hours)</p>	<ol style="list-style-type: none"> <li>4. Explain what information is necessary for a security background check.</li> <li>5. Explain how to locate employment in other cities.</li> <li>6. Explain how to locate an airline web site.</li> <li>7. Explain how to prepare for an interview.</li> <li>8. Explain what documents besides extra résumés to take to an interview.</li> <li>9. Describe what technical questions may be directed to an inexperienced technician at an interview.</li> <li>10. Describe the common mistakes that are made on job applications.</li> <li>11. Write your résumé.</li> </ol>	<p><b>CTE Anchor:</b>  Career Planning and Management:  3.1, 3.2, 3.4, 3.7, 3.8, 3.9  Ethics and Legal Responsibilities:  8.3  Technical Knowledge and Skills:  10.1  Demonstration and Application:  11.1, 11.2</p> <p><b>CTE Pathway:</b>  C1.4, C2.6, C3.7, C4.2, C4.4, C5.6, C6.1, C6.4, C7.7</p>

## ***SUGGESTED INSTRUCTIONAL MATERIALS and OTHER RESOURCES***

### **TEXTBOOKS**

Airframe and Powerplant Mechanics: General (FAA-H-8083-30). U.S. Department of Transportation, FAA, 2008.

Airframe and Power Plant Mechanics: Airframe Handbook (AC 65-15A). U.S. Department of Transportation, FAA, 1988.

Airframe and Power Plant Mechanics: Powerplant Handbook (AC 65-12A). U.S. Department of Transportation, FAA, 1985.

Federal Aviation Regulations for Aviation Maintenance Technicians (FAR-AMT). U.S. Department of Transportation, FAA, 2011.

Acceptable Methods, Techniques and Practices: Aircraft Inspections, Repair and Alterations (AC43. 13-1B, AC43. 13-2A). U.S. Department of Transportation, FAA, 1989.

### **RESOURCES**

Employer Advisory Board members

Foundation Standards

<http://www.cde.ca.gov/ci/ct/sf/documents/transportation.pdf>

### **COMPETENCY CHECKLIST**

## **TEACHING STRATEGIES and EVALUATION**

### **METHODS AND PROCEDURES**

- A. Lecture and discussion
- B. Multimedia presentations
- C. Visual aids
- D. Projects
- E. Individualized instruction

### **EVALUATION**

SECTION A – Orientation – Pass the safety test with 100% accuracy.

SECTION B – Theory and Construction of Aircraft Reciprocating Engines – Pass all assignments and exams on theory and construction of aircraft reciprocating engines with a minimum score of 80% or higher.

SECTION C – Engine Induction Systems – Pass all assignments and exams on engine induction systems with a minimum score of 80% or higher.

SECTION D – Engine Fuel Systems – Pass all assignments and exams on engine fuel systems with a minimum score of 80% or higher.

SECTION E – Engine Fuel Metering Systems – Pass all assignments and exams on engine fuel metering systems with a minimum score of 80% or higher.

SECTION F – Engine Ignition Systems – Pass all assignments and exams on engine ignition systems with a minimum score of 80% or higher.

SECTION G – Engine Electrical Systems – Pass all assignments and exams on engine electrical systems with a minimum score of 80% or higher.

SECTION H – Engine Lubrication Systems – Pass all assignments and exams on engine lubrication systems with a minimum score of 80% or higher.

SECTION I – Propellers – Pass all assignments and exams on propellers with a minimum score of 80% or higher.

SECTION J – Engine Removal and Replacement – Pass all assignments and exams on engine removal and replacement with a minimum score of 80% or higher.

SECTION K – Engine Fire Protection Systems – Pass all assignments and exams on engine fire protection systems with a minimum score of 80% or higher.

SECTION L – Engine Inspection – Pass all assignments and exams on engine inspection with a minimum score of 80% or higher.

SECTION M – Engine Starting Systems – Pass all assignments and exams on engine starting systems with a minimum score of 80% or higher.

SECTION N – Engine Maintenance and Operation – Pass all assignments and exams on engine maintenance and operation with a minimum score of 80% or higher.

SECTION O – Engine Cooling Systems – Pass all assignments and exams on engine cooling systems with a minimum score of 80% or higher.

SECTION P – Engine Exhaust Systems – Pass all assignments and exams on engine exhaust systems with a minimum score of 80% or higher.

SECTION Q – Theory and Construction of Aircraft Turbine Engines – Pass all assignments and exams on theory and construction of aircraft turbine engines with a minimum score of 80% or higher.

SECTION R – Engine Instrument Systems – Pass all assignments and exams on engine instrument systems with a minimum score of 80% or higher.

SECTION S –Employability Skills – Pass all assignments and exams on employability skills with a minimum score of 80% or higher.

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### Statement for Civil Rights

All educational and vocational opportunities are offered without regard to race, color, national origin, gender, or physical disability.

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