Course Outline

Transportation

REVISED: August/2017

Job Title
Airframe and 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

79-70-50

Airframe and Powerplant Technician

Credits: 40 Hours: 600

Course Description:
This competency-based course includes instruction in general subjects related to both airframe and powerplant, including basic mathematics, basic physics, basic electricity, aircraft drawings, weight and balance, fluid lines and fittings, materials and processes, ground operation and servicing, cleaning and corrosion control, maintenance forms, records and publications, and mechanic privileges and limitations. It prepares students to pass parts of the Federal Aviation Administration (FAA) airframe and powerplant mechanic examinations. 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.

NOTE: For Perkins purposes this course has been designated as an introductory 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; SCCR 10508 [b]; Adult Education Handbook for California [1977], Section 100)

COURSE OUTLINE COMPONENTS

GOALS AND PURPOSES

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

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 COMPONENTS

INSTRUCTIONAL STRATEGIES

Instructional techniques or methods could include laboratory techniques, lecture method, small-group discussion, grouping plans, and other strategies used in the classroom.

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.

UNITS OF STUDY, WITH APPROXIMATE HOURS ALLOTTED FOR EACH UNIT

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.

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.

EVALUATION PROCEDURES

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.

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.

REPETITION POLICY THAT PREVENTS PERPETUATION OF STUDENT ENROLLMENT

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.
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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Career Technical Education

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APPROVED:

JOE STARK
Executive Director
Division of Adult and Career Education
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.
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 Airframe and Powerplant Technician Course*

<table>
<thead>
<tr>
<th>COMPETENCY AREAS AND STATEMENTS</th>
<th>MINIMAL COMPETENCIES</th>
<th>STANDARDS</th>
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</thead>
<tbody>
<tr>
<td><strong>A. ORIENTATION</strong></td>
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<tr>
<td></td>
<td>1. Describe the scope and purpose of the course.</td>
<td><strong>Career Ready Practice:</strong> 1, 3, 5, 9, 12</td>
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<tr>
<td></td>
<td>2. Describe the requirements for attendance.</td>
<td><strong>CTE Anchor:</strong> Career Planning and Management: 3.1, 3.4, 3.9</td>
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<tr>
<td></td>
<td>3. Explain grading procedures.</td>
<td>Problem Solving and Critical Thinking: 5.2, 5.3, 5.4</td>
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<td>5. Describe the federal licensing requirements.</td>
<td>Responsibility and Flexibility: 7.2, 7.8</td>
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<td></td>
<td>6. Describe employment opportunities.</td>
<td>Ethics and Legal Responsibilities: 8.1, 8.2</td>
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<td></td>
<td>7. Describe the safe use of shop equipment and storage areas.</td>
<td>Technical Knowledge and Skills: 10.1</td>
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<td>8. Describe the Material Safety Data Sheet (MSDS) as it applies to the aviation industry.</td>
<td>Demonstration and Application: 11.1, 11.2</td>
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<td>9. Pass the designated safety examination with 100% accuracy.</td>
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<td>STANDARDS</td>
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<td>(4 hours)</td>
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<tr>
<td>B. BASIC MATHEMATICS</td>
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<tr>
<td>Understand, apply, and</td>
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<tr>
<td>evaluate the mathematical</td>
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<tr>
<td>operations required for</td>
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<tr>
<td>aircraft inspection, operation,</td>
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<tr>
<td>and repair.</td>
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<tr>
<td>(34 hours)</td>
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<tr>
<td>C. BASIC PHYSICS</td>
<td></td>
<td></td>
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<tr>
<td>Understand, apply, and</td>
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<tr>
<td>evaluate the concepts and</td>
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<tr>
<td>formulas in physics that are</td>
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<tr>
<td>required for aircraft</td>
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<tr>
<td>inspection, operation, and</td>
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<tr>
<td>repair.</td>
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<tr>
<td>(48 hours)</td>
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</tbody>
</table>

|                      | 1. Apply the order of mathematical operations to calculations. |
|                      | 2. Convert fractions to decimals and decimals to fractions. |
|                      | 3. Compute area of common shapes. |
|                      | 5. Apply principles of ratio, proportion, and percentage. |
|                      | 6. Perform addition, subtraction, multiplication, and division of positive and negative numbers. |
|                      | 7. Demonstrate calculations using powers and roots. |
|                      | 8. Interpret charts and graphs. |

Career Ready Practice: 1

CTE Anchor: Technical Knowledge and Skills: 10.1

CTE Pathway: C6.3

|                      | 1. Explain properties of matter and energy. |
|                      | 2. Understand the theory of flight. |
|                      | 3. Apply the principles of simple machines. |
|                      | 4. Explain the laws of motion. |
|                      | 5. Understand the principles of sound. |
|                      | 6. Describe aircraft structural principles. |

Career Ready Practice: 1

CTE Anchor: Technical Knowledge and Skills: 10.1

CTE Pathway: C6.3
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| **D. BASIC ELECTRICITY**        | 1. Describe electron theory.  
                                      2. Explain voltage, current, and resistance.  
                                      3. Describe static electricity.  
                                      4. Name circuit components and symbols.  
                                      5. Name circuit protection devices and switches.  
                                      6. Measure voltage, current, resistance, and continuity.  
                                      7. Explain relationships of voltage, current, and resistance in circuits.  
                                      8. Understand power and efficiency.  
                                      10. Explain electromagnetic induction.  
                                         11. Describe transformers.  
                                         12. Demonstrate aircraft storage battery inspection and service.  
                                         13. Demonstrate basic circuit troubleshooting.  
                                         15. Explain inductors and inductance.  
                                         16. Explain capacitors and capacitance.  
                                         17. Describe diodes.  
                                         18. Describe transistors.  
                                         19. Explain rectifiers.  
                                         20. Describe DC generator theory.  
                                         21. Demonstrate DC generator maintenance.  
                                         22. Describe regulation of generator voltage.  
                                         23. Describe alternators.  
                                         24. Demonstrate alternator maintenance.  
                                         25. Describe single and multi-engine electrical power systems.  
                                         26. Describe motors. | **Career Ready Practice:**  
                                         1  
                                         **CTE Anchor:**  
                                         Technical Knowledge and Skills:  
                                         10.1  
                                         **CTE Pathway:**  
                                         C7.1, C7.3 |
| (104 hours)                     |                      |           |
| **E. AIRCRAFT DRAWINGS**        | 1. Describe working drawings.  
                                      2. Explain methods of illustration.  
                                      3. Demonstrate using aircraft drawings and blueprints.  
                                      4. Interpret system schematic and installation drawings.  
                                      5. Demonstrate care of drafting instruments.  
                                      6. Make sketches of repairs.  
                                      7. Demonstrate care of drawings.  
                                      8. Describe microfilm and CD-ROM discs.  
                                      9. Demonstrate use of graphs and charts. | **Career Ready Practice:**  
                                         1  
                                         **CTE Anchor:**  
                                         Technical Knowledge and Skills:  
                                         10.1  
                                         **CTE Pathway:**  
                                         C6.3 |
<p>| (48 hours)                      |                      |           |</p>
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| F. WEIGHT AND BALANCE           | 1. Understand the theory of weight and balance.  
                                 | 2. Explain the need for reweighing.  
                                 | 3. List weight and balance terminology.  
                                 | 4. Record weight and balance data.  
                                 | 5. Perform aircraft weighing procedure.  
                                 | 6. Compute weight and balance extreme conditions.  
                                 | 7. Interpret load graphs and center-of-gravity (cg) envelopes.  
                                 | 8. Compute ballast.  
                                 | 9. Explain helicopter weight and balance. | Career Ready Practice:  
                                 | CTE Anchor: Technical Knowledge and Skills:  
                                 | CTE Pathway: |
|                                 | (48 hours)           | 1         |
|                                 |                      | C6.3      |
| G. FLUID LINES AND FITTINGS     | 1. Perform fabrication and installation of rigid lines.  
                                 | 2. Perform fabrication and installation of flexible hoses.  
                                 | 3. Recognize fittings.  
                                 | 4. Understand plumbing assembly precautions.  
                                 | 5. Perform inspection of tube installations.  
                                 | 6. Perform inspection of hose installations. | Career Ready Practice:  
                                 | CTE Anchor: Technical Knowledge and Skills:  
                                 | CTE Pathway: |
|                                 | (16 hours)           | 1         |
|                                 |                      | C6.3      |
| H. MATERIALS AND PROCESSES      | 1. Recognize features of aircraft hardware.  
                                 | 2. Perform hardware identification, selection, and installation.  
                                 | 3. Understand material selection factors.  
                                 | 4. Explain metal-working processes.  
                                 | 6. Recognize features of ferrous aircraft metals.  
                                 | 7. Recognize features of non-ferrous aircraft metals.  
                                 | 8. Perform non-destructive testing.  
                                 | 9. Demonstrate inspection fundamentals.  
                                 | 10. Demonstrate use of wrenches.  
                                 | 11. Demonstrate use of cutting and shaping tools.  
                                 | 12. Select drills, counter-bores, and countersinks.  
                                 | 13. Select threads, taps, and dies. | Career Ready Practice:  
                                 | CTE Anchor: Technical Knowledge and Skills:  
<pre><code>                             | CTE Pathway: |
</code></pre>
<p>|                                 | (100 hours)          | 1         |
|                                 |                      | C2.2, C6.1 |</p>
<table>
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| I. GROUND OPERATIONS AND SERVICING | 1. Demonstrate starting reciprocating engines.  
2. Demonstrate starting turbine engines.  
3. Perform ground operation of aircraft.  
4. Demonstrate securing aircraft.  
5. Explain ground operation hazards.  
6. Describe ground support equipment.  
7. Perform aircraft servicing. | Career Ready Practice:  
CTE Anchor: Technical Knowledge and Skills: 10.1  
CTE Pathway: C6.4 |
|                                 | (42 hours)           |           |
| J. CLEANING AND CORROSION CONTROL | 1. Demonstrate aircraft and engine cleaning procedures.  
2. Perform corrosion detection and treatment procedures. | Career Ready Practice:  
CTE Anchor: Technical Knowledge and Skills: 10.1  
CTE Pathway: C6.3 |
|                                 | (64 hours)           |           |
| K. MAINTENANCE FORMS, RECORDS, AND PUBLICATIONS | 1. Inspect the aircraft record file.  
2. Demonstrate use of aircraft maintenance forms.  
3. Read, comprehend, and apply information in FAA publications.  
4. Read, comprehend, and apply information in manufacturer’s publications. | Career Ready Practice:  
CTE Anchor: Technical Knowledge and Skills: 10.1  
CTE Pathway: C4.2, C4.3 |
|                                 | (48 hours)           |           |
| COMPETENCY AREAS AND STATEMENTS | MINIMAL COMPETENCIES                                                                                                                                                                                                 | STANDARDS                                                                                           |
|--------------------------------|
| L. MECHANIC PRIVILEGES AND LIMITATIONS | 1. Describe the history, development, and interpretation of federal aviation regulations.  
2. Classify types of aircraft repairs.  
3. Summarize mechanic privileges and limitations.  
4. Explain legal and ethical responsibilities. | Career Ready Practice:  
1, 8  
CTE Anchor: Ethics and Legal Responsibilities:  
8.2, 8.3  
Technical Knowledge and Skills:  
10.1  
CTE Pathway: C4.3 |
|                               | (42 hours)                                                                                                                                                                                                                                                                                  |                                                                                                    |
| M. EMPLOYABILITY SKILLS       | 1. Describe the different hiring requirements of the airlines.  
2. Describe what tests may be given to the job applicant before the interview is given.  
3. Describe what knowledge is important to have prior to an interview.  
4. Explain what information is necessary for a security background check.  
5. Explain how to locate employment in other cities.  
6. Explain how to locate an airline web site.  
7. Explain how to prepare for an interview.  
8. Explain what documents besides extra résumés to take to an interview.  
9. Describe what technical questions may be directed to an inexperienced technician at an interview.  
10. Describe the common mistakes that are made on job applications.  
11. Write your résumé. | Career Ready Practice:  
1, 3  
CTE Anchor: 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  
CTE Pathway: C1.4, C2.6, C3.7, C4.2, C4.4, C5.6, C6.4, C7.7 |
SUGGESTED INSTRUCTIONAL MATERIALS and OTHER RESOURCES

**TEXTBOOKS**


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


**RESOURCES**

Employer Advisory Board members

Foundation Standards


**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 – Basic Mathematics – Pass all assignments and exams on basic mathematics with a minimum score of 80% or higher.

SECTION C – Basic Physics – Pass all assignments and exams on basic physics with a minimum score of 80% or higher.

SECTION D – Basic Electricity – Pass all assignments and exams on basic electricity with a minimum score of 80% or higher.

SECTION E – Aircraft Drawings – Pass all assignments and exams on fundamentals of aircraft drawings with a minimum score of 80% or higher.

SECTION F – Weight and Balance – Pass all assignments and exams on weight and balance with a minimum score of 80% or higher.

SECTION G – Fluid Lines and Fittings – Pass all assignments and exams on fluid lines and fittings with a minimum score of 80% or higher.

SECTION H – Materials and Processes – Pass all assignments and exams on materials and processes with a minimum score of 80% or higher.

SECTION I – Ground Operations and Servicing – Pass all assignments and exams on ground operations and servicing with a minimum score of 80% or higher.

SECTION J – Cleaning and Corrosion Control – Pass all assignments and exams on cleaning and corrosion control with a minimum score of 80% or higher.
SECTION K – Maintenance Forms, Records, and Publications – Pass all assignments and exams on maintenance forms, records, and publications with a minimum score of 80% or higher.

SECTION L – Mechanic Privileges and Limitations – Pass all assignments and exams on mechanic privileges and limitations with a minimum score of 80% or higher.

SECTION M – Employability Skills – Pass all assignments and exams on employability skills with a minimum score of 80% or higher.
Statement for Civil Rights

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