

Course Outline

Transportation

REVISED: July/2014

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.

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

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; 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. 7-11

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)

Course Outline Components	Location
INSTRUCTIONAL STRATEGIES	p. 13
<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 Older Adults, Programs for Adults with Disabilities.</p>	
UNITS OF STUDY, WITH APPROXIMATE HOURS ALLOTTED FOR EACH UNIT	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>	
EVALUATION PROCEDURES	pp. 13-14
<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>	
REPETITION POLICY THAT PREVENTS PERPETUATION OF STUDENT ENROLLMENT	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 WILLIAM F. GROMAN, TESSIE CASTILLO and FRED PRINZ for developing and editing this curriculum. Acknowledgment is also given to DARLENE NEILSEN for editing this course outline, and to ERICA ROSARIO for designing the original artwork for the course covers. Thanks to ISABEL VÁZQUEZ for the leadership she provided in implementing course sequences.

JUDY DE LA TORRE
Specialist
Career Technical Education

APPROVED:

DONNA BRASHEAR
Executive Director
Division of Adult and Career Education

Transportation 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 Airframe and Powerplant Technician Course

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES
<p>A. ORIENTATION</p> <p>Understand, apply, and evaluate classroom and workplace policies and procedures.</p> <p>(4 hours)</p>	<ol style="list-style-type: none"> 1. Describe the scope and purpose of the course. 2. Describe the requirements for attendance. 3. Explain grading procedures. 4. Describe school safety regulations. 5. Describe the federal licensing requirements. 6. Describe employment opportunities. 7. Describe the safe use of shop equipment and storage areas. 8. Describe the Material Safety Data Sheet (MSDS) as it applies to the aviation industry. 9. Pass the designated safety examination with 100% accuracy.
<p>B. BASIC MATHEMATICS</p> <p>Understand, apply, and evaluate the mathematical operations required for aircraft inspection, operation, and repair.</p> <p>(34 hours)</p>	<ol style="list-style-type: none"> 1. Apply the order of mathematical operations to calculations. 2. Convert fractions to decimals and decimals to fractions. 3. Compute area of common shapes. 4. Compute volume 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.
<p>C. BASIC PHYSICS</p> <p>Understand, apply, and evaluate the concepts and formulas in physics that are required for aircraft inspection, operation, and repair.</p> <p>(48 hours)</p>	<ol style="list-style-type: none"> 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.

<p>D. BASIC ELECTRICITY</p> <p>Understand, apply, and evaluate the regulations and requirements for troubleshooting basic aircraft electrical systems and components.</p> <p>(104 hours)</p>	<ol style="list-style-type: none"> 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. 9. Understand magnetism. 10. Explain electromagnetic induction. 11. Describe transformers. 12. Demonstrate aircraft storage battery inspection and service. 13. Demonstrate basic circuit troubleshooting. 14. Understand alternating current. 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.
<p>E. AIRCRAFT DRAWINGS</p> <p>Understand, apply, and evaluate the techniques for reading and interpreting aircraft mechanical drawings and diagrams.</p> <p>(48 hours)</p>	<ol style="list-style-type: none"> 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.
<p>F. WEIGHT AND BALANCE</p> <p>Understand, apply, and evaluate the techniques for weight and balance calculations.</p> <p>(48 hours)</p>	<ol style="list-style-type: none"> 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.

<p>G. FLUID LINES AND FITTINGS</p> <p>Understand, apply, and evaluate the techniques for fabricating, installing, and inspecting rigid and flexible fluid lines and fittings.</p> <p>(16 hours)</p>	<ol style="list-style-type: none"> 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.
<p>H. MATERIALS AND PROCESSES</p> <p>Understand, apply, and evaluate the techniques for identifying and selecting aircraft hardware, materials, and processes for specific applications.</p> <p>(100 hours)</p>	<ol style="list-style-type: none"> 1. Recognize features of aircraft hardware. 2. Perform hardware identification, selection, and installation. 3. Understand material selection factors. 4. Explain metal-working processes. 5. Explain principles of heat-treatment. 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.
<p>I. GROUND OPERATIONS AND SERVICING</p> <p>Understand, apply, and evaluate the techniques for starting, ground operating, moving, and securing aircraft.</p> <p>(42 hours)</p>	<ol style="list-style-type: none"> 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.

<p>J. CLEANING AND CORROSION CONTROL</p> <p>Understand, apply, and evaluate the techniques for aircraft and engine cleaning, and aircraft corrosion detection and repair.</p> <p>(64 hours)</p>	<ol style="list-style-type: none"> 1. Demonstrate aircraft and engine cleaning procedures. 2. Perform corrosion detection and treatment procedures.
<p>K. MAINTENANCE FORMS, RECORDS, AND PUBLICATIONS</p> <p>Understand, apply, and evaluate the techniques for inspecting aircraft records by using the Federal Aviation Administration (FAA) and manufacturer's <i>publications</i>.</p> <p>(48 hours)</p>	<ol style="list-style-type: none"> 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.
<p>L. MECHANIC PRIVILEGES AND LIMITATIONS</p> <p>Understand, apply, and evaluate the techniques for reading and interpreting aviation regulations.</p> <p>(42 hours)</p>	<ol style="list-style-type: none"> 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.
<p>M. EMPLOYABILITY SKILLS</p> <p>Understand, apply, and evaluate employability skills required in aircraft inspection, operation, and repair.</p>	<ol style="list-style-type: none"> 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.

(2 hours)

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.
-

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 – 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.
