Chapter 127. Texas Essential Knowledge and Skills for Career Development and Career and Technical Education

Subchapter P. Transportation, Distribution, and Logistics

Statutory Authority: The provisions of this Subchapter P issued Texas Education Code, §§7.102(c)(4); 28.002; and 28.025, unless otherwise noted.

§127.887. Introduction to Aircraft Technology (One Credit), Adopted 2024.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Introduction to Aircraft Technology is designed to teach the theory of operation of aircraft airframes, powerplants, and associated maintenance and repair practices. Maintenance and repair practices include knowledge of the general curriculum subjects, powerplant theory and maintenance, and the function, diagnosis, and service of airframe structures, airframe systems and components, and powerplant systems and components of aircraft. Industry-recognized professional licensures, certifications, and registrations are available for students who meet the requirements set forth by the accrediting organization.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and compare employment opportunities, including entrepreneurship opportunities, and certification requirements for the field of aircraft maintenance and repair;

(B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team;

(C) identify individual ethical and legal behavior standards according to professional and regulatory agencies;

(D) research Federal Aviation Regulations and discuss the impact of the English language proficiency requirements as prescribed by the Federal Aviation Regulations;

(E) identify and explain human factors that may impact health and safety in a worksite and how they are addressed by industry standards;

(F) explain the role of human factors in maintaining health and safety in the workplace and demonstrate personal responsibility to maintain health and safety in the workplace;

(G) identify and explain how employees' personal responsibility and other human factors, including personal attitudes, can affect the success and profitability of a workplace;

(H) apply reasoning skills to a variety of simulated workplace situations to make ethical decisions;

(I) identify industry standards for employee appearance and health habits;

(J) demonstrate appropriate etiquette and behavior;

(K) identify and demonstrate effective written and oral communication skills; and

(L) identify and demonstrate effective listening skills.

(2) The student relates academic skills to the requirements of aircraft maintenance and repair. The student is expected to:

(A) demonstrate effective oral and written communication skills with individuals from various cultures such as fellow workers, management, and customers;

(B) identify requirements of work orders and technical documents for repairs;

(C) locate and interpret documents, including schematics, charts, graphs, drawings, blueprints, wiring diagrams, service-repair manuals, service bulletins, type certificate data sheets, supplemental type certificates, airworthiness directives, federal aviation regulations, and advisory information;

(D) demonstrate proficiency in metric and U.S. customary standard measurement systems;

(E) perform precision measurements using engineering scales, dial calipers, and Vernier micrometers to determine if a component is within tolerance of specifications; and

(F) use critical-thinking and problem-solving skills to identify aircraft maintenance problems and recommend solutions.

(3) The student demonstrates an awareness of aviation history. The student is expected to:

(A) research and discuss the historical interest in flight;

(B) describe early aircraft designs such as lighter-than-air or heavier-than-air designs;

(C) research and describe the contributions of various pioneers in aviation history, including Charles Taylor;

(D) identify driving forces that provide rapid advancements in aircraft design and performance; and

(E) describe the contributions of aviation and aerospace to society.

(4) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for aircraft maintenance and repair, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) identify and locate aviation regulations prescribed by 14 Code of Federal Regulations Chapter I that govern mechanic privileges related to the construction, maintenance, and service of aircraft;

(B) apply the principles of simple machines, basic aerodynamics, aircraft structures, and theory of flight to accomplish an assigned task;

(C) identify aircraft categories such as airplane, rotorcraft, glider, and lighter-than-air in federal aviation regulations;

(D) explain the certification process, ratings, privileges, and limitations of airmen;

(E) identify and compare airframe construction, including wood structures, metal tubular structures, fabric coverings, sheet metal, and composite structures, and basic repair methods and techniques;

(F) identify and explain airframe systems and components, including landing gear, hydraulic power, cabin atmosphere control systems, and electrical systems;

(G) describe aircraft reciprocating and turbine engine operating theory, functions, and basic repair methods and techniques;

(H) identify and explain powerplant systems and components, including engine instruments, electrical systems, lubrication systems, ignition and starting systems, cooling systems, exhaust systems, and propellers;

(I) explain common aircraft terminology and standard practices required to complete maintenance, modifications, and repairs;

(J) identify necessary elements of logbook entries and critique sample logbook entries; and

(K) describe inspections required to maintain compliance with airworthiness, safety, health, and environmental regulations.

(5) The student understands the function and application of the tools, equipment, technologies, and preventative maintenance used in aircraft maintenance and repair. The student is expected to:

(A) identify and demonstrate basic skills in safely using hand tools, power tools, and equipment commonly employed in the maintenance and repair of aircraft;

(B) research and explain the proper handling and disposal of environmentally hazardous materials used in servicing aircraft;

(C) research and describe the impact of new and emerging aircraft technologies; and

(D) identify and examine the need for preventative maintenance procedures and practices.

(6) The student uses regulatory and industry standards and demonstrates technical knowledge and skills of the trade, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) start and ground operate an aircraft or simulated aircraft using a high-fidelity flight simulator with a physical yoke and pedal device;

(B) research and locate appropriate documentation to perform a function in a written work order and complete the required logbook entry;

(C) draw top, side, and front views of various aircraft categories, including airplane, rotorcraft, glider, and lighter-than-air;

(D) perform basic airframe and engine inspections according to a checklist;

(E) use an engine troubleshooting chart to show the results of simple defects on engine performance; and

(F) discuss and describe preventative maintenance plans and systems to keep aircraft systems in operation.

Source: The provisions of this §127.887 adopted to be effective September 9, 2024, 49 TexReg 6994.

§127.888. Aircraft Airframe Technology (Two Credits), Adopted 2024.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 10-12. Prerequisite: Aircraft Maintenance Technology. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Aircraft Airframe Technology is designed to teach the theory of operation of aircraft airframes and associated maintenance and repair practices of Federal Aviation Administration (FAA) airframe curriculum subjects utilizing aircraft, aircraft training devices, or equivalent simulated situations. In this course, the academic and technical skills are separated to reflect the learning outcomes as designed in the FAA Airman Certification Standards. Airframe maintenance and repair practices include knowledge of the theory, function, diagnosis, and service of airframe structures, systems, and components of aircraft. Industry-recognized professional licensures, certifications, and registrations are available for students who meet the requirements set forth by the accrediting organization.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(6) The FAA uses standard terms with specific expectations for performance. The terms are defined as follows.

(A) Check means to verify proper operation.

(B) Inspect means to examine with or without inspection-enhancing tools or equipment.

(C) Overhaul means to disassemble, clean, inspect, repair as necessary, and reassemble.

(D) Repair means to correct a defective condition.

(E) Service means to perform functions that assure continued operation.

(F) Troubleshoot means to analyze and identify malfunctions.

(7) When a student performs an action, such as checking, inspecting, overhauling, repairing, servicing, troubleshooting, and installing in this course, they are to complete all associated tasks. If an action detects a flaw, defect, or discrepancy in an aircraft or component, that finding could trigger another maintenance action. Actions may include documenting findings through logbook entries, maintenance action forms, installation plans, and work orders.

(d) Knowledge and skills.

(1) The student demonstrates professional standards, interpersonal communication, and employability skills as required by business and industry. The student is expected to:

(A) identify and compare employment opportunities, including entrepreneurship opportunities, and certification requirements for the field of aircraft maintenance and repair;

(B) identify and demonstrate ways to contribute and collaborate as an effective member of a team;

(C) identify individual ethical and legal behavior standards according to professional and regulatory agencies;

(D) research and discuss the impact of the English language proficiency requirements as prescribed by the Federal Aviation Regulations;

(E) identify and explain human factors that may impact health and safety in a worksite and how they are addressed by industry standards;

(F) explain the role of human factors in maintaining health and safety in the workplace and demonstrate personal responsibility to maintain health and safety in the workplace;

(G) identify and explain how employees' personal responsibility and other human factors, including personal attitudes, can affect the success and profitability of a workplace;

(H) apply reasoning skills to a variety of simulated workplace situations in order to make ethical decisions;

(I) identify industry standards related to employee appearance and health habits;

(J) identify and practice effective written and oral communication skills;

(K) identify and practice effective listening skills; and

(L) define and apply FAA standard terms that have specific expectations for performance, including check, inspect, overhaul, repair, service, and troubleshoot.

(2) The student relates academic skills to the requirements of metallic structures. The student is expected to:

(A) describe best practices for maintenance safety, including the use of personal protective equipment (PPE), and precautions for sheet metal repairs and fabrication;

(B) identify characteristics and types of metallic structures;

(C) identify types of sheet metal defects and select sheet metal repair materials;

(D) explain inspection and testing processes of metal structures;

(E) explain the selection of rivets, hardware, and fasteners for a sheet metal repair per FAA-approved data;

(F) explain the layout, forming, and drilling of sheet metal components per FAA-approved data; and

(G) explain rivet layout, installation, and removal per FAA-approved data.

(3) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for metallic structures utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) install and remove solid rivets such as universal head, countersink head, and blind rivets;

(B) create a drawing of a repair, including the number of rivets and size of sheet metal required, utilizing a manufacturer's structural repair manual;

(C) design a rivet pattern for a specific repair;

(D) determine the applicability of sheet metal for a repair in a specific application;

(E) design a repair using a manufacturer's structural repair manual;

(F) sketch and build a piece of sheet metal to fit a prepared area; and

(G) determine the extent of damage to a metallic structure and decide if it is repairable.

(4) The student relates academic skills to the requirements of non-metallic structures. The student is expected to:

(A) identify and discuss maintenance safety practices for composite materials, composite structures, and windows;

(B) identify and discuss tools, inspection techniques, and practices for wood structures, including determining acceptable and unacceptable wood defects;

(C) define and explain covering textile terms;

(D) identify and explain commonly used covering methods of attachment, including types of approved aircraft covering material and common stitching seams used with aircraft covering;

(E) describe inspection methods for textile aircraft coverings;

(F) identify and discuss composite repair methods, techniques, fasteners, and practices;

(G) differentiate between composite structure fiber, core, and matrix materials;

(H) identify and discuss types of composite structure defects such as delamination, crush core, and surface gouges;

(I) identify inspection and testing of composite structures such as tap testing and ultrasonics;

(J) research and describe the care and maintenance of windows;

(K) research and describe thermoplastic material inspection and types of thermoplastic material defects;

(L) research and describe temporary and permanent window repairs; and

(M) research and describe inspection of restraints and upholstery.

(5) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for non-metallic structures, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) inspect and repair fiberglass, composite, plastic, or glass-laminated structures;

(B) clean and inspect acrylic-type windshields;

(C) perform a tap test on composite material;

(D) locate and explain repair procedures for elongated bolt holes; and

(E) perform lay up for a repair to a composite panel, including preparation for vacuum bagging, using a manufacturer's repair manual.

(6) The student understands the academic knowledge and skills for flight controls. The student is expected to:

(A) identify and compare types of aircraft control cables and control cable maintenance techniques;

(B) identify and explain the function of cable connectors, cable guides, and control stops;

(C) identify and explain the function of push-pull tubes and torque tubes;

(D) identify bellcranks and explain their function;

(E) explain the purpose of maintaining a calibration schedule for cable tension meters and other rigging equipment;

(F) explain the use and interpretation of cable tensiometer equipment and a cable tension chart;

(G) define and explain flutter and flight control balance;

(H) identify and explain primary aircraft flight controls, stabilizer systems, and flight control rigging; and

(I) identify and explain secondary and auxiliary control surfaces and other aerodynamic wing features.

(7) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for flight controls, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) identify fixed-wing aircraft rigging adjustment locations;

(B) inspect and report findings on primary and secondary flight control surfaces;

(C) inspect and report findings on primary control cables;

(D) adjust and secure a primary flight control cable;

(E) adjust push-pull flight control systems;

(F) check the balance of a flight control surface and balance a control surface;

(G) determine allowable axial play limits for a flight control bearing; and

(H) identify and locate appropriate data to verify aircraft flight control travel limits.

(8) The student understands the academic knowledge and skills for airframe inspection. The student is expected to:

(A) explain the use of inspection requirements under 14 Code of Federal Regulations (CFR) Part 91;

(B) discuss maintenance recordkeeping requirements under 14 CFR Part 43;

(C) research and describe requirements for complying with airworthiness directives, as found in 14 CFR Part 39;

(D) identify and differentiate between FAA-approved data and other data sources such as manufacturer manuals;

(E) explain the need for compliance with service letters, service bulletins, instructions for continued airworthiness, and airworthiness directives;

(F) explain the purpose and methods of visual inspections;

(G) describe the method to select and use checklists and other maintenance publications, including service letters, service bulletins, instructions for continued airworthiness, and airworthiness directives; and

(H) describe the importance of maintenance record documentation.

(9) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for airframe inspection, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) perform a portion of a 100-hour inspection in accordance with 14 CFR Part 43 such as a records check using the appropriate checklist;

(B) enter results of a 100-hour inspection, including airworthy and unairworthy conditions, in a maintenance record; and

(C) analyze and inspect applicable equipment and documents to determine compliance with a specific airworthiness directive.

(10) The student understands the academic knowledge and skills for landing gear. The student is expected to:

(A) identify and discuss safety precautions when using aircraft jacks;

(B) identify and discuss safety precautions when working with high pressure fluids and gases;

(C) identify and discuss safety precautions in the storage and handling of hydraulic fluids;

(D) identify and discuss safety precautions in the operation of retractable landing gear systems around personnel;

(E) identify and discuss safety precautions in landing gear, tire, and wheel maintenance operations;

(F) describe fixed and retractable landing gear systems and components;

(G) explain the necessity of landing gear strut servicing and lubrication;

(H) describe and compare the method of inspection of bungee and spring steel landing gear systems;

(I) describe and compare aircraft steering systems;

(J) explain landing gear position and warning system inspection, check, and servicing;

(K) explain brake assembly servicing and inspection; and

(L) describe and compare brake actuating systems.

(11) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for landing gear, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) inspect and service landing gear such as fixed or retractable systems;

(B) jack an aircraft for a gear retraction check;

(C) inspect wheels, brakes, bearings, and tires;

(D) bleed air from a hydraulic brake system;

(E) inspect a tire for defects;

(F) replace shock strut air valve;

(G) locate and explain the process for checking landing gear alignment;

(H) troubleshoot aircraft steering system issues such as nose-wheel shimmy;

(I) identify landing gear position and warning system components;

(J) troubleshoot landing gear position and warning systems;

(K) inspect a brake for serviceability; and

(L) inspect tube landing gear for damage.

(12) The student understands the academic knowledge and skills for hydraulic and pneumatic systems. The student is expected to:

(A) describe hydraulic system components, including reservoirs, filters, hoses, lines, fittings, valves, actuators, accumulators, and pumps;

(B) explain the function of hydraulic system components, including reservoirs, filters, hoses, lines, fittings, valves, actuators, accumulators, and pumps;

(C) explain hydraulic system operation, inspections, operational checks, servicing, and troubleshooting;

(D) describe pneumatic system components, including reservoirs, filters, hoses, lines, fittings, valves, actuators, accumulators, and pumps;

(E) explain the function of pneumatic system components, including reservoirs, filters, hoses, lines, fittings, valves, actuators, accumulators, and pumps;

(F) explain pneumatic system operation, inspections, operational checks, servicing, and troubleshooting;

(G) identify types of hydraulic seals and hydraulic seal fluid compatibility;

(H) research and identify the risks associated with high pressure gases and fluids;

(I) research and identify the risks of not properly relieving system pressure prior to system servicing;

(J) research and identify the risks associated with storage and handling of hydraulic fluids; and

(K) research and identify the risks of cross-contamination of hydraulic fluids.

(13) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for hydraulic and pneumatic systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) identify different types of hydraulic fluids;

(B) install seals and backup rings in a hydraulic component;

(C) remove, clean, inspect, and install a hydraulic system filter;

(D) service a hydraulic system reservoir;

(E) purge air from a hydraulic system;

(F) inspect a hydraulic system and a pneumatic system for leaks;

(G) troubleshoot a hydraulic system and a pneumatic system for leaks;

(H) locate and explain hydraulic fluid servicing instructions;

(I) identify and select hydraulic fluid for a given aircraft; and

(J) locate installation procedures for a seal, backup ring, or gasket.

(14) The student understands the academic knowledge and skills for environmental systems. The student is expected to:

(A) explain the operation and purpose of pressurization systems and bleed air heating systems;

(B) explain and compare aircraft instrument cooling methods;

(C) differentiate between exhaust heat exchanger system and combustion heater system components, functions, and operations;

(D) differentiate between vapor-cycle system and air-cycle system components, function, and operation;

(E) explain cabin pressurization systems, components, and operation;

(F) differentiate between types of aircraft oxygen systems;

(G) differentiate between types of aircraft oxygen system components;

(H) identify and assess risks associated with oxygen system maintenance;

(I) identify and assess risks associated with the recovery of vapor-cycle refrigerant;

(J) identify and assess risks associated with storage, handling, and use of compressed gas cylinders;

(K) identify and assess risks associated with disregarding manufacturer's recommended refrigerant servicing procedures; and

(L) identify and assess risks associated with maintenance of combustion heaters.

(15) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for environment systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) inspect and service an oxygen system;

(B) clean and inspect emergency oxygen masks and supply hoses;

(C) inspect an oxygen system cylinder for serviceability;

(D) locate and describe the procedures to troubleshoot a combustion heater;

(E) locate and describe the procedures for servicing a refrigerant (vapor-cycle) system;

(F) locate and describe the troubleshooting procedures for an air-cycle system;

(G) inspect a cabin heater system equipped with an exhaust heat exchanger for cracks; and

(H) locate troubleshooting procedures for a pressurization system.

(16) The student understands the academic knowledge and skills for aircraft instrument systems. The student is expected to:

(A) describe annunciator indicating systems and define the meaning of warning, caution, and advisory lights;

(B) differentiate between fuel quantity indicating systems;

(C) differentiate between types of gyroscopic instruments; and

(D) explain the function and operation of:

(i) magnetic compasses and compass swinging procedures;

(ii) pressure and temperature indicating instruments;

(iii) position indication sensors and instruments;

(iv) engine indication and crew alerting systems;

(v) instrument vacuum and pneumatic systems;

(vi) pitot-static systems;

(vii) electronic displays and flight instrument systems;

(viii) transponder and encoder systems;

(ix) angle of attack and stall warning systems; and

(x) takeoff and landing gear configuration warning systems.

(17) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for aircraft instrument systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) remove and install an aircraft instrument;

(B) determine barometric pressure using an altimeter;

(C) verify proper range markings on an instrument for a particular aircraft using approved data;

(D) locate the procedures for troubleshooting a vacuum-operated instrument system;

(E) identify exhaust gas temperature system components;

(F) inspect an aircraft's alternate static air source; and

(G) locate and explain the adjustment procedures for a stall warning system.

(18) The student understands the academic knowledge and skills for aircraft communication and navigation systems. The student is expected to:

(A) describe radio operating principles and radio components;

(B) identify and explain mounting requirements of antennas, static discharge wicks, and avionics components;

(C) identify the components of communication systems, including very high frequency (VHF), high frequency (HF), satellite communications (SATCOM), and Aircraft Communication Addressing and Reporting System (ACARS);

(D) explain the basic operation of communications systems, including VHF, HF, SATCOM, and ACARS;

(E) identify the components of emergency locator transmitters (ELT) and explain the basic operation of ELTs;

(F) identify the components of navigation systems, including distance measuring equipment (DME), instrument landing system (ILS), global positioning system (GPS), automatic direction finder (ADF), and VHF omnidirectional range (VOR);

(G) explain the basic operation of navigation systems, including DME, ILS, GPS, ADF, and VOR;

(H) identify the components of collision avoidance systems, including radio altimeter (RA), automatic dependent surveillance-broadcast (ADS-B), traffic collision avoidance systems (TCAS), and ground proximity warning system (GPWS);

(I) explain the basic operation of collision avoidance systems, including RA, ADS-B, TCAS, and GPWS;

(J) identify the components and explain the basic operation of intercom systems;

(K) identify the components and explain the basic operation of weather radar;

(L) identify the components and explain the basic operation of autopilot and auto-throttle systems;

(M) research and identify the risks of improper ELT testing procedures;

(N) research and identify the risks of performing maintenance on high power/high frequency systems such as weather radar and SATCOM systems; and

(O) research and identify the risks of improper mounting of antennas.

(19) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for aircraft communication and navigation systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) locate and explain autopilot inspection procedures;

(B) identify navigation and communication antennas;

(C) perform an operational check of a VHF communications system;

(D) locate proper testing procedures for an ELT, inspect ELT batteries for expiration date, and perform an operational check of an ELT; and

(E) locate and explain the installation procedures for antennas, including mounting and coaxial connections.

(20) The student understands the academic knowledge and skills for aircraft fuel systems. The student is expected to:

(A) identify fuel system types and fuel system components, including filters and selector valves;

(B) differentiate between types of aircraft fuel tanks and types of fuel cells;

(C) explain fuel flow during fuel transfer, fueling, defueling, and fuel jettisoning;

(D) describe characteristics of fuel types;

(E) describe fuel system maintenance industry best practices;

(F) differentiate between fuel quantity indication methods such as float type, electrical resistance, or visual indicators;

(G) research and identify the risks of improper fuel system maintenance;

(H) research and identify the risks of fuel system contamination and spills;

(I) research and identify the risks of fuel system maintenance requiring fuel tank entry; and

(J) research and identify the risks when defueling aircraft.

(21) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for aircraft fuel systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) inspect a metal, bladder, or integral fuel tank;

(B) inspect a fuel selector valve;

(C) drain a fuel system sump;

(D) service a fuel system strainer; and

(E) identify and locate fuel system operating instructions, inspection procedures, crossfeed procedures, required placards, and defueling procedures.

(22) The student understands the academic knowledge and skills for aircraft electrical systems. The student is expected to:

(A) identify the components of generators, direct current (DC) generation systems, and DC power distribution systems;

(B) explain the basic operation of generators, DC generation systems, and DC power distribution systems;

(C) identify the components of alternators, alternating current (AC) generation systems, and AC power distribution systems;

(D) explain the basic operation of alternators, AC generation systems, and AC power distribution systems;

(E) identify the components and explain the basic operation of voltage regulators, over-volt protection, and overcurrent protection;

(F) identify the components and explain the basic operation of inverter systems;

(G) explain aircraft wiring size and type selection criteria;

(H) explain the purpose of aircraft wiring shielding;

(I) explain the purpose of aircraft bonding and lightning protection;

(J) describe basic electrical system troubleshooting practices;

(K) identify soldering preparation techniques, types of solder, and flux usage;

(L) identify types of aircraft electrical connectors, splices, terminals, and switches;

(M) describe methods of aircraft battery troubleshooting and maintenance;

(N) research and identify the risks of testing electrical systems, including energized and non-energized systems;

(O) research and identify the risks of connecting and disconnecting external power;

(P) research and identify the risks of maintenance in areas containing aircraft wiring;

(Q) research and identify the risks of improperly routing and securing wires and wire bundles;

(R) research and identify the risks of improper selection or installation of wire terminals; and

(S) research and identify the risks of improper soldering practices.

(23) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for aircraft electrical systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) inspect aircraft wiring installation and routing;

(B) perform wire terminating and splicing;

(C) identify components using a wiring circuit diagram;

(D) connect aircraft wires using a solder joint;

(E) troubleshoot a simple airframe electrical circuit;

(F) install bonding jumpers to electrically connect two isolated components;

(G) measure the resistance of an electrical system component;

(H) inspect and test anti-collision, position, and landing lights for proper operation;

(I) identify components in an electrical schematic where AC is rectified to a DC voltage;

(J) perform a continuity test to verify the condition of a conductor; and

(K) perform a test on a conductor for a short to ground.

(24) The student understands the academic knowledge and skills for ice and rain control systems. The student is expected to:

(A) explain causes and effects of aircraft icing;

(B) identify the components of ice detection systems, aircraft anti-ice systems, and de-ice systems;

(C) explain the basic operation of ice detection systems, aircraft anti-ice systems, and de-ice systems;

(D) explain wind screen rain control systems, including wiper blade, chemical, and pneumatic bleed air systems;

(E) research and identify the risks of improper ice and rain control system testing or maintenance;

(F) research and identify the risks of improper storage and handling of deicing fluids; and

(G) research and identify the risks of improper selection and use of cleaning materials for heated windshields.

(25) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for aircraft electrical systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) clean a pneumatic deicer boot;

(B) locate and explain the procedures for inspecting an electrically operated windshield wiper system;

(C) locate and explain the procedures for replacing blades on a windshield wiper system; and

(D) locate and explain the procedures for inspecting a pneumatic rain removal system.

(26) The student understands the academic knowledge and skills for airframe fire protection systems. The student is expected to:

(A) explain types of fires and aircraft fire zones;

(B) identify the components and explain the basic operation of overheat detection and warning systems;

(C) identify the components and explain the basic operation of fire detection and warning systems;

(D) identify the components and explain the basic operation of smoke and carbon monoxide detection systems;

(E) describe types of fire extinguishing systems and extinguishing agents;

(F) research and identify the risks of maintenance on circuits associated with fire bottle squibs;

(G) research and explain the use of PPE when working on or testing fire extinguishing systems; and

(H) explain the risks of exposure to fire extinguishing agents.

(27) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for airframe fire protection systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) evaluate an installed fire extinguisher system for proper container pressure;

(B) locate and explain the procedures for checking a smoke detection system;

(C) locate and explain the procedures for inspecting an overheat detection system; and

(D) inspect fire protection system cylinders and check for hydrostatic test date.

(28) The student understands the academic knowledge and skills for rotorcraft fundamentals. The student is expected to:

(A) explain the characteristics of rotorcraft aerodynamics and flight controls;

(B) identify the components and explain the function of rotorcraft transmissions;

(C) explain the need for rigging requirements for rotary wing aircraft;

(D) identify rotor systems, rotor blade functions, and rotor blade construction;

(E) explain the need for helicopter skid shoe and tube inspections;

(F) explain causes of rotor system and drive system vibrations;

(G) explain the purpose of rotor blade track and balance;

(H) research and identify the risks of working around helicopter blades during ground operations;

(I) research and identify the risks of improper ground-handling procedures;

(J) research and identify the risks of ground operations and functional tests; and

(K) research and identify the risks of improper maintenance of rotorcraft systems and components.

(29) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for rotorcraft fundamentals, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) identify components of a helicopter rotor system;

(B) identify and locate helicopter rotor blade track and balance procedures;

(C) identify and locate procedures needed to rig helicopter controls; and

(D) identify and locate procedures to track and balance a rotor system.

(30) The student understands the academic knowledge and skills for water and waste systems. The student is expected to:

(A) identify the components and explain the basic operation of potable water systems;

(B) identify the components and explain the basic operation of lavatory waste systems;

(C) describe servicing requirements for water and waste systems; and

(D) research and identify the need for PPE to reduce the risks associated with servicing lavatory waste systems.

(31) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for water and waste systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) locate and explain the procedures for servicing a lavatory waste system; and

(B) locate and explain the procedures for servicing a potable water system.

Source: The provisions of this §127.888 adopted to be effective September 9, 2024, 49 TexReg 6994.

§127.889. Aircraft Powerplant Technology (Two Credits), Adopted 2024.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisite: Aircraft Maintenance Technology. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Aircraft Powerplant Technology is designed to teach the theory of operation of aircraft powerplants and associated maintenance and repair practices of the Federal Aviation Administration (FAA) powerplant curriculum subjects utilizing aircraft, aircraft training devices, or equivalent simulated situations. In this course, the academic and technical skills are separated to reflect the learning outcomes as designed in the FAA Airman Certification Standards. Powerplant maintenance and repair practices include knowledge of the theory, function, diagnosis, and service of powerplants, systems, and components of aircraft. Industry-recognized professional licensures, certifications, and registrations are available for students who meet the requirements set forth by the accrediting organization.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(6) The FAA uses standard terms with specific expectations for performance. The terms are defined as follows.

(A) Check means to verify proper operation.

(B) Inspect means to examine with or without inspection enhancing tools or equipment.

(C) Overhaul means to disassemble, clean, inspect, repair as necessary, and reassemble.

(D) Repair means to correct a defective condition.

(E) Service means to perform functions that assure continued operation.

(F) Troubleshoot means to analyze and identify malfunctions.

(7) When a student performs an action, such as checking, inspecting, overhauling, repairing, servicing, troubleshooting, and installing in this course, they are to complete all associated tasks. If an action detects a flaw, defect, or discrepancy in an aircraft or component, that finding could trigger another maintenance action. Actions may include documenting findings through logbook entries, maintenance action forms, installation plans, and work orders.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and compare employment opportunities, including entrepreneurship opportunities, and certification requirements for the field of aircraft maintenance;

(B) identify and demonstrate ways to contribute and collaborate as an effective member of a team;

(C) identify individual ethical and legal behavior standards according to professional and regulatory agencies;

(D) research and discuss the impact of the English language proficiency requirements as prescribed by the Federal Aviation Regulations;

(E) identify and explain human factors that may impact health and safety in a worksite as addressed by industry standards;

(F) explain the role of human factors in maintaining health and safety in the workplace and demonstrate personal responsibility to maintain health and safety in the workplace;

(G) identify and explain how employees' personal responsibility attitudes can affect the success and profitability of a workplace;

(H) apply reasoning skills to a variety of simulated workplace situations in order to make ethical decisions;

(I) identify standards of industry related to employee appearance and health habits;

(J) identify and practice effective written and oral communication skills;

(K) identify and practice effective listening skills; and

(L) define and apply FAA standard terms that have specific expectations for performance, including check, inspect, overhaul, repair, service, and troubleshoot.

(2) The student relates academic skills to the requirements of reciprocating engines. The student is expected to:

(A) identify the components and types of reciprocating internal combustion aircraft engines, including inline, opposed, V-type, and radial engines;

(B) explain the operational theory of reciprocating internal combustion aircraft engines, including inline, opposed, V-type, and radial engines;

(C) explain the purpose and methods of reciprocating engine preservation;

(D) explain the purpose and methods of reciprocating engine maintenance and inspection;

(E) locate and explain the procedures for reciprocating engine ground operations;

(F) identify the components and explain the basic operation of diesel engines;

(G) explain the basic operational theory of diesel engines;

(H) research and identify the risks of maintenance that requires moving the propeller;

(I) research and identify the risks of ground operating a reciprocating engine;

(J) research and identify the actions necessary in the event of a reciprocating engine fire; and

(K) research and identify the risks in not using the manufacturer's procedures during maintenance.

(3) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for reciprocating engines, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) perform and document findings from a cylinder assembly inspection;

(B) operate and troubleshoot a reciprocating engine;

(C) install a wrist pin in a piston;

(D) identify the parts of a cylinder and a crankshaft;

(E) identify and inspect bearings found in reciprocating engines; and

(F) inspect and rig cable and push-pull engine controls.

(4) The student relates academic skills to the requirements of turbine engines. The student is expected to:

(A) identify the components and types of turbine engines;

(B) explain the basic operational theory of turbine engines;

(C) explain the purpose and methods of monitoring turbine engine performance;

(D) explain the purpose and methods of turbine engine troubleshooting, maintenance, and inspection;

(E) research and explain the causes of turbine engine performance loss;

(F) explain the basic operational theory of bleed air systems;

(G) explain the purpose and methods of turbine engine preservation;

(H) explain the theory and application of auxiliary power units;

(I) research and identify the risks of turbine engine operation;

(J) research and identify the risks of performing maintenance on a turbine engine;

(K) research and identify the actions necessary in the event of a turbine engine fire; and

(L) research and identify the risks of foreign object damage (FOD) to turbine engines.

(5) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for turbine engines, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) identify different turbine compressors;

(B) identify different types of turbine engine blades;

(C) identify components of turbine engines;

(D) map airflow direction and pressure changes in turbine engines;

(E) identify and locate the procedures for the adjustment of a fuel control unit;

(F) identify and locate the installation or removal procedures for a turbine engine;

(G) identify damaged turbine engine blades; and

(H) analyze causes for turbine engine performance loss.

(6) The student relates academic skills to the requirements of engine inspection. The student is expected to:

(A) explain the purpose of inspection requirements under 14 Code of Federal Regulations (CFR) Part 43 and 14 CFR Part 91;

(B) explain the purpose and methods of identification of life-limited parts and life-limited parts replacement intervals;

(C) explain the purpose and types of special inspections such as sudden engine stoppage, hard landings, and foreign object debris (FOD) ingestion;

(D) explain the purpose of using FAA-approved data;

(E) explain the importance of compliance with service letters, service bulletins, instructions for continued airworthiness, airworthiness directives (AD), and Type Certificate Data Sheets (TCDS);

(F) explain the purpose of maintenance recordkeeping requirements under 14 CFR Part 43;

(G) explain the purpose of engine component inspection, checking, and servicing;

(H) explain the importance of inspecting engine mounts and mounting hardware;

(I) research and identify the risks of performing a compression test on a reciprocating engine; and

(J) research and identify the risks of performing maintenance on an operating reciprocating engine and a turbine engine.

(7) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for engine inspection, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) evaluate a powerplant for compliance with FAA-approved or manufacturer data;

(B) perform a powerplant records inspection;

(C) inspect a powerplant for compliance with applicable ADs;

(D) determine powerplant installation eligibility in accordance with the TCDS;

(E) inspect engine controls for proper operation and adjustment;

(F) inspect an aircraft engine accessory for serviceability;

(G) inspect engine records for time or cycles on life-limited parts;

(H) perform an engine start and inspect engine operational parameters; and

(I) inspect an engine mount to determine serviceability.

(8) The student relates academic skills to the requirements of engine instrument systems. The student is expected to:

(A) identify the components of engine instrument systems, including fuel flow, temperature, engine speed, pressure, torque meter, engine pressure ratio (EPR), engine indicating and crew alerting system (EICAS), and electronic centralized aircraft monitor (ECAM);

(B) explain the operational theory of engine instrument systems, including fuel flow, temperature, engine speed, pressure, torque meter, EPR, EICAS, and ECAM;

(C) describe the types of annunciator indicators and the functions of annunciator indicating systems;

(D) define the meaning of annunciator indicating system warning, caution, and advisory lights;

(E) identify the components and explain the operational theory of full authority digital engine controls (FADEC);

(F) explain the purpose and methods of marking engine instrument ranges;

(G) research and identify the risks of damaging instrument systems or indicating systems during maintenance; and

(H) research and identify the risks of inaccurate engine instrument calibration or inaccurate instrument readings.

(9) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for engine inspection, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) remove, inspect, and install a fuel-flow transmitter;

(B) remove, inspect, and install a fuel-flow gauge;

(C) identify components of an electric tachometer system;

(D) inspect tachometer markings for accuracy;

(E) locate procedures for troubleshooting a turbine EPR system;

(F) inspect exhaust gas temperature (EGT) probes;

(G) locate and inspect engine low fuel pressure warning system components; and

(H) troubleshoot an EGT indicating system.

(10) The student relates academic skills to the requirements of engine fire protection systems. The student is expected to:

(A) identify types of fires such as electrical, structural, and petroleum-based fires and explain the purpose of engine fire zones;

(B) identify the components and explain the basic operation of fire detection warning systems;

(C) explain the purpose of fire detection system maintenance and inspection requirements;

(D) identify fire extinguishing agents and types of fire extinguishing systems;

(E) explain the purpose and methods of fire extinguishing system maintenance and inspection;

(F) research and identify the risks of container discharge cartridges;

(G) research and identify the risks of extinguishing agents; and

(H) research and identify the risks of maintenance on circuits associated with electrically activated container discharge cartridges.

(11) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for engine fire protection systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) identify fire detection sensing units;

(B) locate troubleshooting procedures for a fire detection system;

(C) inspect fire extinguisher discharge circuit;

(D) check operation of fire warning press-to-test and troubleshoot faults; and

(E) identify continuous-loop fire detection system components.

(12) The student relates academic skills to the requirements of engine electrical systems. The student is expected to:

(A) identify the components of engine electrical systems, including alternating current generators, direct current generators, alternators, starter generators, voltage regulators, overvoltage protection, and overcurrent protection;

(B) explain the operational theory of engine electrical systems, including alternating current generators, direct current generators, alternators, starter generators, voltage regulators, overvoltage protection, and overcurrent protection;

(C) explain the procedure for locating the correct electrical wire size needed to fabricate a wire;

(D) explain the purpose of engine electrical wiring, switches, and protective devices;

(E) research and identify the risks of reversing polarity when performing electrical system maintenance;

(F) research and identify the actions necessary in response to a warning or caution annunciator light;

(G) research and identify the risks of performing maintenance on energized aircraft systems; and

(H) research and identify the risks of improper routing and securing wiring near flammable fluid lines.

(13) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for engine electrical systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) inspect engine electrical wiring, switches, cable, and protective devices;

(B) analyze the suitability of a replacement component by part number;

(C) troubleshoot a direct-drive electric starter system;

(D) select the appropriate wire size for engine electrical system;

(E) repair a broken engine electrical system wire;

(F) troubleshoot an electrical system using a schematic or wiring diagram;

(G) fabricate a bonding jumper; and

(H) inspect engine electrical connectors.

(14) The student relates academic skills to the requirements of engine lubrication systems. The student is expected to:

(A) describe types, grades, and uses of engine oil;

(B) identify the components and explain the basic operation of lubrication systems, including wet-sumps and dry-sumps;

(C) explain the purpose of chip detectors;

(D) explain the purpose and methods of lubrication system maintenance, inspection, servicing, and analysis;

(E) explain the causes of excessive aircraft engine oil consumption;

(F) research and identify the risks of mixing engine oils;

(G) research and identify the risks in not using the manufacturer's recommendations regarding the use of engine lubricants; and

(H) research and identify the risks of improper handling, storage, and disposal of used lubricating oil.

(15) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for engine lubrication systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) inspect an oil cooler or oil lines;

(B) identify the correct type of oil for a specific engine;

(C) identify approved oils for different climatic temperatures;

(D) identify and locate procedures for obtaining oil samples;

(E) inspect an oil filter or screen based on industry standards;

(F) identify oil system components;

(G) replace an oil system component;

(H) identify oil system flow through the engine;

(I) troubleshoot an engine oil pressure malfunction;

(J) troubleshoot an engine oil temperature system; and

(K) identify types of metal found in an oil filter.

(16) The student relates academic skills to the requirements of ignition and starting systems. The student is expected to:

(A) identify the components of ignition systems, including spark plugs, shower of sparks, magnetos, impulse couplings, solid-state ignitions, and FADECs;

(B) explain the operational theory of ignition systems and components, including spark plugs, shower of sparks, magnetos, impulse couplings, solid-state ignitions, and FADECs;

(C) identify the components and explain the basic operation of engine starters;

(D) identify the components and explain the basic operation of turbine engine ignition systems;

(E) research and identify the risks of advanced and retarded ignition timing on piston engines;

(F) research and identify the risks of maintenance on engines with capacitor discharge ignition systems; and

(G) research and identify the risks of working around reciprocating engines with an ungrounded magneto.

(17) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for ignition and starting systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) remove, clean, inspect, and install a spark plug;

(B) inspect an electrical starting system;

(C) troubleshoot an electrical starting system;

(D) troubleshoot an ignition switch circuit;

(E) identify the correct spark plugs used for replacement installation; and

(F) identify the correct igniter plug on a turbine engine.

(18) The student relates academic skills to the requirements of engine fuel and fuel metering systems. The student is expected to:

(A) explain the purpose of proper fuel to air ratios and fuel metering;

(B) identify the components, basic operation, and adjustment of fuel metering systems, including float carburetor, pressure carburetor, continuous-flow fuel injection, FADEC, and hydromechanical fuel control;

(C) explain the purpose and basic operation of fuel heaters, lines, pumps, valves, filters, and drains;

(D) explain the basic operation of fuel nozzles and manifolds;

(E) identify the components and explain the basic operation of turbine engine fuel metering systems;

(F) locate and explain inspection requirements for an engine fuel system;

(G) explain fuel system operation;

(H) research and identify the risks of adjusting turbine engine fuel controls;

(I) research and identify the risks of adjusting reciprocating engine fuel controls;

(J) research and identify the risks of handling fuel metering system components or fuel control units that may contain fuel; and

(K) research and identify the risks of fuel system maintenance.

(19) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for engine fuel and fuel metering systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) identify carburetor components;

(B) identify fuel and air flow through a float-type carburetor;

(C) remove and install a carburetor main metering jet;

(D) inspect the needle, seat, and float level on a float-type carburetor;

(E) adjust carburetor idle speed and mixture;

(F) research and locate procedures for a turbine engine revolutions per minute overspeed inspection;

(G) research and locate procedures for adjusting a hydromechanical fuel control unit;

(H) explain procedures for removing and installing a turbine engine fuel control unit;

(I) identify components of an engine fuel system;

(J) identify fuel selector placards;

(K) inspect engine fuel system fluid lines and components;

(L) locate the procedures for troubleshooting a turbine engine fuel heater system; and

(M) inspect fuel selector valve.

(20) The student relates academic skills to the requirements of reciprocating engine induction and cooling systems. The student is expected to:

(A) identify the components and explain the theory of operation of reciprocating engine induction and cooling systems;

(B) explain the causes and effects of induction system icing;

(C) identify the components and explain the theory of superchargers, supercharger controls, turbochargers, turbocharger controls, and intercoolers;

(D) identify the components and explain the theory of augmenter cooling systems;

(E) identify the components and explain the theory of induction system filtering and carburetor heaters;

(F) research and identify the risks of maintenance on turbochargers;

(G) research and identify the risks of ground operation of aircraft engines;

(H) research and identify the risks of maintenance-related foreign object debris and foreign object damage; and

(I) research and identify the risks of chemicals used in liquid cooling systems.

(21) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for reciprocating engine induction and cooling systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) inspect a carburetor heat system;

(B) inspect an alternate air valve for proper operation;

(C) inspect an induction system drain for proper operation;

(D) service an induction air filter;

(E) inspect an induction system for obstruction;

(F) inspect an air intake manifold for leaks;

(G) locate the proper specifications for coolant used in a liquid-cooled engine;

(H) inspect reciprocating engine cooling ducting and baffle seals for damage;

(I) identify components of a turbocharger induction system;

(J) identify exhaust augmenter-cooled engine components;

(K) inspect and repair a cylinder baffle;

(L) inspect a cowl flap system for normal operation; and

(M) inspect cylinder cooling fins for damage.

(22) The student relates academic skills to the requirements of turbine engine air systems. The student is expected to:

(A) identify the components and explain the operational theory of air cooling systems, turbine engine induction systems, turbine engine bleed air systems and turbine engine anti-ice systems;

(B) explain the purpose and theory of turbine engine cowling air flow and turbine engine internal cooling;

(C) identify the components and purpose of turbine engine baffle and methods of seal installation;

(D) identify and explain the purpose of turbine engine insulation blankets and shrouds;

(E) research and identify the risks of maintenance on compressor bleed air systems; and

(F) research and identify the risks of ground operation of aircraft engines following other than manufacturer's instructions.

(23) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for turbine engine air systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) identify location of turbine engine insulation blankets;

(B) identify turbine engine cooling air flow;

(C) inspect rigid or flexible turbine engine cooling ducting or baffle seals; and

(D) identify turbine engine ice and rain protection system components.

(24) The student relates academic skills to the requirements of engine exhaust and reverser systems. The student is expected to:

(A) identify the components of reciprocating engine exhaust systems, turbine engine exhaust systems, noise suppression systems, and thrust reversers;

(B) explain the operational theory of reciprocating engine exhaust systems, turbine engine exhaust systems, noise suppression systems, and thrust reversers;

(C) research and identify the risks of maintenance and inspection of exhaust system components;

(D) research and identify the risks of operating reciprocating engines with exhaust systems leaks and exhaust system failures; and

(E) research and identify the risks of ground operation of aircraft engines.

(25) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for engine exhaust and reverser systems, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) identify the type of exhaust system on a particular aircraft;

(B) inspect exhaust system;

(C) locate and explain procedures for testing and troubleshooting a turbine thrust reverser system; and

(D) perform a pressure leak check of a reciprocating engine exhaust system.

(26) The student relates academic skills to the requirements of propellers. The student is expected to:

(A) explain the theory and operation of propellers;

(B) identify types of propellers and blade design;

(C) explain the theory and operation of constant speed propellers, pitch control systems, and propeller governors;

(D) explain the theory and operation of turbine engine propeller beta range operation;

(E) explain the purpose and methods of propeller servicing, maintenance, and inspections;

(F) identify and locate procedures for removal and installation of a propeller;

(G) explain the purpose of propeller TCDS;

(H) explain the theory and operation of propeller synchronization systems and propeller ice control systems; and

(I) research and identify the risks of propeller ground operation, maintenance, and inspections.

(27) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for propellers, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) check blade static tracking;

(B) inspect a propeller for condition and airworthiness;

(C) measure propeller blade angle;

(D) locate and explain the procedures for balancing a fixed-pitch propeller;

(E) identify propeller range of operation; and

(F) determine what minor propeller alterations are acceptable using the propeller specifications, TCDS, and listings.

Source: The provisions of this §127.889 adopted to be effective September 9, 2024, 49 TexReg 6994.

§127.890. Aircraft Maintenance Technology (One Credit), Adopted 2024.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 9-12. Recommended prerequisites: Introduction to Aircraft Technology. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Aircraft Maintenance Technology is designed to teach the theory of operation, general maintenance, and repair practices of Federal Aviation Administration (FAA) general curriculum subjects utilizing aircraft, aircraft training devices, or equivalent simulated situations. In this course, the academic and technical skills are separated to reflect the learning outcomes as designed in the FAA airman certification standards. Maintenance and repair practices include knowledge of the function, diagnosis, and service of aircraft and their associated equipment. Industry-recognized professional licensures, certifications, and registrations are available for students who meet the requirements set forth by the accrediting organization.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(6) The FAA uses standard terms with specific expectations for performance. The terms are defined as follows.

(A) Check means to verify proper operation.

(B) Inspect means to examine with or without inspection enhancing tools or equipment.

(C) Overhaul means to disassemble, clean, inspect, repair as necessary, and reassemble.

(D) Repair means to correct a defective condition.

(E) Service means to perform functions that assure continued operation.

(F) Troubleshoot means to analyze and identify malfunctions.

(7) When a student performs an action, such as checking, inspecting, overhauling, repairing, servicing, troubleshooting, and installing in this course, they are to complete all associated tasks. If an action detects a flaw, defect, or discrepancy in an aircraft or component, that finding could trigger another maintenance action. Actions may include documenting findings through logbook entries, maintenance action forms, installation plans, and work orders.

(d) Knowledge and skills.

(1) The student demonstrates professional standards, interpersonal communication, and employability skills as required by business and industry. The student is expected to:

(A) identify employment opportunities, including entrepreneurship opportunities, and certification requirements for the field of aircraft maintenance and repair;

(B) identify and demonstrate ways to contribute and collaborate as an effective member of a team;

(C) identify individual ethical and legal behavior standards according to professional and regulatory agencies;

(D) research and discuss the impact of the English language proficiency requirements as prescribed by the Federal Aviation Regulations;

(E) identify and explain the technical knowledge and skills related to human factors in health and safety in the worksite as addressed by industry standards;

(F) explain the role of human factors in maintaining health and safety in the workplace and demonstrate personal responsibility to maintain health and safety in the worksite;

(G) identify and explain how employees' personal responsibility attitudes can affect the success and profitability of a worksite;

(H) apply reasoning skills to a variety of workplace situations to make ethical decisions;

(I) identify industry standards related to employee appearance and health habits;

(J) practice effective written and oral communication skills;

(K) identify and practice effective listening skills; and

(L) define and apply FAA standard terms that have specific expectations for performance, including check, inspect, overhaul, repair, service, and troubleshoot.

(2) The student relates academic skills to the requirements of human factors. The student is expected to:

(A) describe safety culture and organizational structures in the work environment;

(B) identify and explain types of human error and human factor principles;

(C) identify and discuss the chain-of-events theory, including pre-conditions and conditions for unsafe acts;

(D) identify and discuss the 12 common causes of mistakes in the aviation workplace; and

(E) research and discuss the purpose of safety management systems in the aviation workplace.

(3) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for human factors, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) complete and submit a malfunction and defect report; and

(B) research and report on information regarding human factor errors.

(4) The student relates academic skills to the requirements of aviation mathematics. The student is expected to:

(A) perform algebraic operations involving addition, subtraction, multiplication, and division, using positive and negative numbers;

(B) determine areas and volumes of various geometric shapes;

(C) solve ratio, proportion, and percentage problems; and

(D) extract roots and raise numbers to a given power.

(5) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for aviation mathematics, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) compute the volume of a shape such as a baggage compartment, a fuel tank, or an engine cylinder;

(B) compute the area of an aircraft wing;

(C) convert between fractions and decimals;

(D) compute torque value conversions between inch-pounds and foot-pounds; and

(E) compute the compression ratio of a reciprocating engine cylinder.

(6) The student relates academic skills to the requirements of fundamentals of electricity and electronics. The student is expected to:

(A) explain electron theory, including magnetism, capacitance, induction, direct current electrical circuits, and alternating current electrical circuits;

(B) explain electrical theories and laws, including Ohm's Law, Kirchhoff's Law, Watt's Law, Faraday's Law, Lenz's Law, and right-hand rule;

(C) identify and explain electrical measurement principles and related tools and procedures for measuring voltage, current, resistance, and power;

(D) compare types of batteries; and

(E) compare series circuits and parallel circuits.

(7) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for fundamentals of electricity and electronics, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) use multimeters to perform circuit continuity tests, test a switch and fuse, and measure voltage, current, and resistance;

(B) interpret aircraft electrical circuit diagrams and symbols;

(C) inspect and service an aircraft battery; and

(D) identify faults in circuits by using appropriate troubleshooting techniques.

(8) The student relates academic skills to the requirements of physics for aviation. The student is expected to:

(A) explain the theory of flight, including lift, weight, thrust, and drag, as related to Bernoulli's Principle, Newton's Laws of Motion, and fluid mechanics;

(B) describe the function and operation of aircraft flight controls and additional aerodynamic devices, including vortex generators, wing fences, and stall strips; and

(C) analyze and compare standard atmospheric factors affecting atmospheric conditions, including the relationship between temperature, density, weight, and volume.

(9) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for physics for aviation, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) determine density and pressure altitude;

(B) identify changes to pressure and velocity of a fluid as it passes through a venturi;

(C) calculate force, area, and pressure for a given scenario related to aircraft maintenance; and

(D) calculate the lift of an aircraft and determine if the aircraft will climb, descend, or maintain altitude given its weight.

(10) The student relates academic skills to the requirements of weight and balance. The student is expected to:

(A) describe the purpose of weighing an aircraft and determining the aircraft's center of gravity;

(B) explain the procedures for weighing an aircraft, including the general preparation for weighing, with emphasis on aircraft weighing area considerations;

(C) explain the procedures for calculating center of gravity, including arm, positive and negative moment, center of gravity, and moment index; and

(D) explain adverse loading considerations, proper empty weight configuration, and ballast placement.

(11) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for weight and balance, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) calculate aircraft weight and balance, including equipment changes, empty weight, and empty weight center of gravity; and

(B) locate datum, weight and balance information, placarding, and limitation requirements for an aircraft in an appropriate reference such as the type certificate data sheet.

(12) The student relates academic skills to the requirements of aircraft drawings. The student is expected to:

(A) identify and use aircraft drawing terminology; and

(B) interpret aircraft drawings, blueprints, sketches, charts, graphs, and system schematics related to repairs, alterations, and inspections.

(13) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for aircraft drawings, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) identify and describe the meaning of lines and symbols used in an aircraft drawing;

(B) interpret dimensions used in an aircraft drawing;

(C) identify changes to aircraft drawings; and

(D) identify material requirements indicated by an aircraft drawing.

(14) The student relates academic skills to the requirements of regulations, forms, and publications. The student is expected to:

(A) identify recency of experience requirements, the privileges and limitations of mechanic certificates, and how to reestablish privileges once they are lost;

(B) define maintenance terminology as defined in 14 Code of Federal Regulations (CFR) Part 1, including time in service, maintenance, preventive maintenance, major alteration, major repair, minor alteration, and minor repair;

(C) describe requirements for maintenance record entries for approval for return to service after maintenance, alterations, and inspections;

(D) identify compliance requirements for manufacturer-specified maintenance methods, techniques, practices, and inspection intervals;

(E) explain FAA-approved maintenance data, including maintenance manuals and other methods acceptable by the administrator; and

(F) describe mechanic change of address notification procedures.

(15) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for regulations, forms, and publications, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) evaluate a 100-hour inspection aircraft maintenance record entry for accuracy;

(B) locate applicable FAA aircraft specifications and FAA Type Certificate Data Sheets (TCDS) for an aircraft or component;

(C) determine the conformity of aircraft instrument range markings and placarding;

(D) use a manufacturer's illustrated parts catalog to locate specific part numbers for aircraft parts such as door handles, rudder pedals, or seat latches;

(E) determine whether a given repair or alteration is major or minor; and

(F) explain the difference between approved data such as data required for major repairs or alterations and acceptable data such as data required for minor repairs or alterations.

(16) The student relates academic skills to the requirements of fluid lines and fittings. The student is expected to:

(A) identify rigid tubing and flexible hose materials, applications, sizes, and fittings;

(B) describe rigid tubing and flexible hose fabrication, installation, and inspection techniques;

(C) explain the importance of properly using a torque wrench and torque seal when securing fluid hose and line fittings; and

(D) analyze and describe the risks associated with high-pressure hydraulic system configuration prior to and during maintenance.

(17) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for fluid lines and fittings, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) fabricate and install a rigid line with a flare and a bend;

(B) fabricate and install a flexible hose; and

(C) perform a rigid line and flexible hose inspection.

(18) The student relates academic skills to the requirements of aircraft materials, hardware, and processes. The student is expected to:

(A) identify and describe material markings and hardware markings commonly used in aircraft;

(B) compare suitability and compatibility of materials and hardware used for maintenance;

(C) explain forces placed on aircraft materials, including tension, compression, torsion, bending, strain, and shear;

(D) identify safety wire and safety clip requirements and techniques;

(E) identify cotter pin requirements and techniques;

(F) describe precision measurement tools, principles, and procedures;

(G) explain soldering preparation, types of solder, and flux usage;

(H) analyze torquing tools, principles, and procedures and the relationship between torque and fastener preload; and

(I) differentiate between the characteristics of acceptable and unacceptable welds.

(19) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for aircraft materials, hardware, and processes, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) select aircraft materials and hardware such as bolts, turnbuckles, washers, and rivets based on manufacturer's markings appropriate for a specific scenario;

(B) install safety wire on hardware such as nuts, bolts, and turnbuckles;

(C) install cotter pins on hardware such as nuts and bolts;

(D) check for proper calibration of a precision-measurement tool and record precision measurements with an instrument that has a Vernier scale;

(E) determine required torque values and properly torque aircraft hardware; and

(F) inspect welds and differentiate between acceptable and unacceptable welds.

(20) The student relates academic skills to the requirements of ground operations and servicing. The student is expected to:

(A) describe proper towing and securing procedures for aircraft using approved data;

(B) describe proper aircraft ground servicing, including oil, oxygen, hydraulic, pneumatic, and deicing systems and fueling and defueling procedures;

(C) differentiate between characteristics of aviation gasoline, turbine fuels, and fuel additives;

(D) explain engine starting, ground operation, and aircraft taxiing procedures;

(E) explain airport operation area procedures and air traffic control communications, including runway incursion prevention;

(F) identify the types and classes of fire extinguishers;

(G) analyze the importance of proper tool and hardware use and accountability;

(H) describe the need for proper material handling and parts protection;

(I) identify hazardous materials, locate the appropriate safety data sheet (SDS), and select the indicated personal protection equipment (PPE); and

(J) analyze and describe the potential effects of foreign object damage (FOD) on aircraft.

(21) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for ground operations and servicing, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) perform a foreign object damage (FOD) control procedure;

(B) connect external power to an aircraft;

(C) prepare an aircraft for towing;

(D) use appropriate hand signals for the movement of aircraft;

(E) identify different grades of aviation fuel and select an approved fuel for an aircraft;

(F) prepare an aircraft for fueling and inspect an aircraft fuel system for water and foreign object debris (FOD) contamination;

(G) follow a checklist to start up or shut down an aircraft reciprocating or turbine engine;

(H) identify procedures for extinguishing fires in an engine induction system;

(I) secure an aircraft by locating and following the correct procedures for a turbine-powered aircraft after engine shutdown; and

(J) locate and explain procedures for securing a turbine-powered aircraft after engine shutdown.

(22) The student relates academic skills to the requirements of cleaning and corrosion control. The student is expected to:

(A) explain the need for aircraft cleaning procedures;

(B) explain corrosion theory, including types and effects of corrosion, corrosion-prone areas in aircraft, and corrosion preventive maintenance procedures;

(C) describe corrosion identification and inspection techniques, corrosion removal and treatment procedures, the selection of optimal corrosion preventive compounds (CPC), and the frequency of corrosion treatment;

(D) describe the use of high-pressure application equipment;

(E) identify and discuss the effects of improper use of cleaners on aluminum or composite materials;

(F) explain accelerated corrosion caused by dissimilar metals and the role of protective barriers, including conversion coatings, materials used for protection of airframe structures, and primer materials, to mitigate this risk;

(G) identify topcoat materials and discuss concerns regarding surface preparation for a desired finishing material, effects of ambient conditions on finishing materials, and effects of improper surface preparation on finishing materials; and

(H) identify health concerns when using paints, solvents, and finishing materials and processes, including the use of PPE.

(23) The student uses regulatory and industry standards and demonstrates technical knowledge and skills for cleaning and corrosion control, utilizing aircraft, aircraft training devices, or equivalent simulated situations. The student is expected to:

(A) identify types of protective finishes;

(B) inspect finishes for corrosion and identify, select, and use aircraft corrosion prevention and cleaning materials; and

(C) apply aircraft corrosion prevention and coating materials.

Source: The provisions of this §127.890 adopted to be effective September 9, 2024, 49 TexReg 6994.

§127.920. Advanced Transportation Systems Laboratory (One Credit), Adopted 2024.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 11 and 12 as a corequisite course for students participating in a coherent sequence of career and technical education courses in the Transportation, Distribution, and Logistics Career Cluster. This course provides an enhancement opportunity for students to develop the additional skills necessary to pursue industry certification. Recommended prerequisite: a minimum of one credit from the courses in the Transportation, Distribution, and Logistics Career Cluster. Corequisites: Automotive Technology II: Automotive Service, Diesel Equipment Technology II, Collision Repair, Paint and Refinishing, Aircraft Airframe Technology, Aircraft Maintenance Technology, or Aircraft Powerplant Technology. This course must be taken concurrently with a corequisite course and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with the corequisite course to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Advanced Transportation Systems Laboratory provides the opportunity to extend knowledge of the major transportation systems and the principles of diagnosing and servicing these systems. Topics in this course may include alternative fuels such as hybrid, bio diesel, hydrogen, compressed natural gas (CNG), liquidized natural gas (LNG), propane, and solar; total electric vehicles and power trains; advanced transportation systems such as collision avoidance, telematics, vehicle stability control, navigation, vehicle-to-vehicle communications; and other technologies. This study will allow students to have an increased understanding of science, technology, engineering, and mathematics in all aspects of these systems. This will reinforce, apply, and transfer academic knowledge and skills to a variety of relevant activities, problems, and settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate knowledge of the technical knowledge and skills related to health and safety in the workplace such as safety glasses and other personal protective equipment (PPE) and safety data sheets (SDS);

(B) identify employment opportunities, including entrepreneurship opportunities and internships, and industry-recognized certification requirements in the transportation field of study;

(C) demonstrate the principles of group participation, team concept, and leadership related to citizenship and career preparation;

(D) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation in the transportation industry;

(E) discuss certification opportunities;

(F) discuss response plans to emergency situations;

(G) identify employers' expectations and appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and

(H) develop personal goals, objectives, and strategies as part of a plan for future career and educational opportunities.

(2) The student demonstrates an understanding of the technical knowledge and skills that form the core of knowledge of transportation services. The student is expected to:

(A) extend knowledge of new and emerging transportation technologies related to the corequisite course and its industry such as hybrid, avionics, unmanned aerial systems, collision avoidance, and light duty diesel systems;

(B) demonstrate advanced technical skills related to the corequisite course and its industry;

(C) demonstrate an understanding of the use of advanced tools and equipment; and

(D) demonstrate an understanding of research and development in the transportation industry of the corequisite course.

(3) The student develops an elevated aptitude for the essential knowledge and skills listed for the corequisite course. The student is expected to:

(A) demonstrate deeper understanding of the corequisite course;

(B) develop hands-on skills at an industry-accepted standard; and

(C) exhibit progress toward achieving industry-recognized documentation of specific expertise in a transportation field or skill.

Source: The provisions of this §127.920 adopted to be effective September 9, 2024, 49 TexReg 6994.