HYDRAULIC/PNEUMATIC/LAND GEAR
Course Syllabus

Course Number: TRAM-2103
OCAS Code: None
Course Length: 105 Hours
Career Cluster: Transportation, Distribution & Logistics
Career Pathway: Aviation Maintenance Technology
Career Major(s): Airframe Mechanic

Pre-requisite(s):
Course Description:
Students will identify all parts of hydraulic and pneumatic systems, calculate pressure, force, area, and volume using appropriate formulas. Students will service, inspect, remove, clean, disassemble and repair hydraulic and pneumatic parts and troubleshoot systems. Landing gear structure and components will be discussed. Aircraft brakes, wheels, and tires are inspected, removed, repaired, and installed.

Textbooks:
Dale Crane, Dictionary of Aviation Terms, Aviation Supplies and Academics, 1997
FAA, FAR Handbook for Aviation Maintenance Technicians, Jeppesen, Sanders, Inc.. 2001
FAA, Standards for Aviation Maintenance Handbook, Jeppesen, Sanders, Inc.. 1985
DOT, Aircraft Inspection and Repair, Jeppesen, Sanders, Inc., 1998

Course Objectives:

A. Lesson: FUNDAMENTALS AND SAFETY OF HYDRAULIC SYSTEMS
1. Define terms related to aircraft hydraulic system components.
2. Discuss FAR's related to hydraulics.
3. List advantages of using hydraulic systems.
4. Discuss Pascal's law and Bernoulli's principle.
5. Explain the basic principles of hydraulics.
6. § Calculate pressure, force, area, and volume for basic hydraulic systems using appropriate formulas.
7. Discuss the selection and identification of aircraft hydraulic fluids.
8. State methods for the safe handling of hydraulic fluids according to MSDS.
9. § Select and identify aircraft hydraulic fluids. (Level 3) (App. C,II,B,31) (AF-L1)
10. Discuss aircraft hydraulic systems' seals and their correct usage. (Gen-E20)
11. § Fabricate and inspect lines and fittings.
12. § Install "O" rings on components using proper procedure. (Level 2) (App. C,II,B,30) (AF-L2,L3)
13. Describe the operation and construction of hydraulic pressure gauges.
14. List possible causes of hydraulic fluid contamination, and preventive measures that can be taken to avoid them.
15. Discuss procedures for flushing aircraft hydraulic systems.
16. Identify and discuss the operation of basic hydraulic system components; hydraulic valves, reservoirs, filters, actuators, hand pumps, and constant volume pumps.
17. Compare the construction and operation of open center hydraulic systems and closed center hydraulic systems.
18. Describe the construction and function of selector valves.

B. Lesson: BASIC HYDRAULIC SYSTEM MAINTENANCE PROCEDURES
   1. § Service a hydraulic reservoir. (Level 3) (App. C,II,B,32)(AF-L8)
   2. § Remove, clean, disassemble, inspect, repair, reinstall, and test hydraulic system filters. (Level 3) (App. C,II,B,32)(AF-L6)
   3. § Determine system pressure and adjust pressure relief valve in hydraulic system. (Level 3) (App. C,II,B,32) (AF-L12)
   4. Discuss the construction and operation of closed-center pressure-control devices; variable volume pumps and pressure regulators.
   5. Describe the construction, operation, and servicing of accumulators.
   6. Discuss the purpose and operation of pressurized reservoirs.
   7. Describe the purpose and operation of an aircraft hydraulic flap system.
   8. § Operate a pressure regulator and check for leakage. (Level 3) (App. C,II,B,32) (AF-L5)
   9. § Operate hydraulic selector valves and check for leakage. (Level 3) (App. C,II,B,32)
   10. § Disassemble, clean, and reassemble hydraulic system components. (Level 3) (App. C,II,B,30)(AF-L4)
   11. § Service a hydraulic system accumulator. (Level 3) (App. C,II,B,32) (AF-L7)
   12. § Operate and check a hydraulically-operated system. (Level 3) (App. C,II,B,32)

C. Lesson: FUNDAMENTALS AND SAFETY OF PNEUMATIC SYSTEMS
   1. Define terms related to aircraft pneumatic system components.
   2. Discuss FAR's related to aircraft pneumatics.
   3. List components and describe the operation and usages of aircraft pneumatic systems.
   4. Compare high, medium, and low pressure pneumatic systems.
   5. Discuss advantages of pneumatic systems over hydraulic or electrical systems.
   6. Identify various types and designs of air compressors, and match them with their components.
   7. Describe the principles of operation for a typical pneumatic system and components.
   8. § Service a pneumatic system filter. (Level 3) (App. C,II,B,32)
   9. § Inspect, check, service, troubleshoot, and repair, as required, a pneumatic power system. (Level 3) (App. C,II,B,32) (AF-L16,L17,L18,L19,L20)

D. Lesson: LANDING GEAR SAFETY AND TERMINOLOGY
   1. Discuss the evolution of aircraft landing gear.
   2. Identify various configurations of landing gear and give advantages.
   3. State the type of landing gear arrangement used on modern aircraft.
   4. Define terms related to aircraft landing gear.
   5. Discuss safety relating to aircraft landing gear.

E. Lesson: LANDING GEAR SYSTEM COMPONENTS
   1. Compare small and large aircraft landing gear, load absorbing components and operation of retraction systems.
   2. Discuss the attachment of the main landing gear to the aircraft structure and landing gear maintenance and inspection procedures.
   3. Discuss types and purposes of shimmy dampers.
   4. Explain how shimmy dampers are serviced.
   5. § Service nose gear shimmy damper. (Level 3) (App. C,II,A,29) (AF-K15)
   6. § Remove, clean, disassemble, inspect, repair, reassemble, test, and reinstall air-oleo shock strut. (Level 3) (App. C,II,A,29) (AF-K1, K13, K14, K18)
   7. Discuss the purpose and operation of the nose wheel steering system.
   8. § Operate and check retractable landing gear, and position indicating and warning
F. Lesson: AIRCRAFT BRAKE THEORY
1. List types and construction of aircraft brakes.
2. Discuss the operation and inspection of aircraft brakes.
3. List causes for brake malfunction.
4. Describe how to repair and bleed brakes on small and large aircraft.
5. Discuss the operating principles of hydraulic brake antiskid systems.

G. Lesson: AIRCRAFT WHEELS, TIRES, AND TUBES
1. Describe types of aircraft wheels and their construction.
2. List methods of repair and inspection of aircraft wheels.
3. Classify types of tires and their design features.
4. Explain the procedure for removing, balancing, and installing tires and tubes.
5. Discuss repair, retreading, and storage of aircraft tires.
6. Explain repair and storage of tubes. (AF-K10)

H. Lesson: AIRCRAFT BRAKE AND WHEEL MAINTENANCE
2. § Remove and install tubes and tires. (Level 3) (App. C,I,F,27;II,A,29) (AF-K5,K6,K8,K9,K11)
4. § Inspect and adjust as required multiple-disc brakes. (Level 3) (App. C,II,A,29)
5. § Troubleshoot and repair brake system. (Level 3) (App. C,II,A,29) (AF-K2, K3, R5,R6)
6. § Demonstrate the operation of an anti-skid system. (Level 2) (App. C,II,H,51)

Teaching Methods:
The class will primarily be taught by the lecture and demonstration method and supported by various media materials to address various learning styles. There will be question and answer sessions over material covered in lecture and media presentations. Supervised lab time is provided for students to complete required projects.

Grading Procedures:
1. Students are graded on theory and shop practice and performance.
2. Each course must be passed with seventy (70%) percent or better.
3. Grading scale: A=90-100%, B=80-89%, C=70-79%, F=0-69%.

Description of Classroom, Laboratories, and Equipment:
Tulsa Technology Center campuses are owned and operated by Tulsa Technology Center School District No. 18. All programs provide students the opportunity to work with professionally certified instructors in modern, well-equipped facilities.

Available Certifications/College Credit:
The student may be eligible to take state, national or industry exam after completion of the program. College credit may be issued from Oklahoma State University-Okmulgee or Tulsa Community College. See program counselor for additional information.
College Credit
Eligibility: The student must maintain a grade point average of 2.0 or better.