I. INTRODUCTION

A. The servicing and ground operation of aircraft is an important function of the aviation maintenance technician. This course will provide basic knowledge in the fundamentals of fire protection, aircraft fuels and refueling procedures, shop and flight line safety, movement of aircraft, aircraft tiedown, aircraft jacking and hoisting, icing protection, aircraft engine operations, aircraft washing and corrosion control.

B. This is a required course of study for the Associate Degree of Applied Science in Aviation Maintenance Technology.

C. This course is occupationally related and serves as preparation for careers in the field of Aviation Maintenance.

D. Prerequisite: None

II. LEARNING OUTCOMES

Upon successful completion of this course the student will:

A. Identify type of fires by class and employ the correct fire extinguishing agents for each. (C18-C20,F1,F5,F10)

B. Identify safety hazards in the shop and on the flight line; comply with safety standards and precautions through the proper use of safety equipment. (C18-C20,F1,F5,F10)

C. Identify the different types of aviation fuels and demonstrate proper refueling and de-fueling procedures. (C18-C20,F1,F5,F10)

D. Demonstrate proper movement of aircraft and helicopters on the ground using ground support equipment and proper hand and arm signals. (C18-C20,F1,F5,F10)
E. Demonstrate proper tie-down of aircraft and helicopters during normal and severe weather conditions. (C18-C20,F1,F5,F10)

F. Perform aircraft jacking and hoisting. (C18-C20,F1,F5,F10)

G. Perform anti-icing and de-icing operations. (C18-C20,F1,F5,F10)

H. Observe proper starting procedures for the different types of reciprocating and turbine engines. (C18-C20,F1,F5,F10)

I. Perform aircraft washes and practice corrosion control. (C18-C20,F1,F5, F10)

III. INSTRUCTIONAL MATERIALS

A. The instructional materials identified for this course are viewable through www.cted.edu/books

B. Supplemental Reading: None


IV. COURSE REQUIREMENTS

The following will be required of each student for successful completion of this course:

A. Reading Assignment: Students are required to complete all reading assignments prior to the class in which the materials will be discussed. Students are subject to announced and unannounced written and oral examinations on assigned reading material.

B. Projects: None

C. Class performance: Students are required to attend all classes and to be in
the classroom on time. The instructor can lower a student’s grade because of excessive tardiness. When absent from class for any reason, it is the student’s responsibility to arrange for and make up assignments missed during the absence.

D. Class Participation: Students will earn a satisfactory grade in the course by attending and regularly participating in class, giving complete attention to class activities, completion of all assigned work and successfully completing the examinations. Students are required to maintain a minimum GPA of 2.0 to receive a passing grade for the class and are encouraged to compute and monitor their GPA as the class progresses.

V. EXAMINATIONS

A. There will be two written examinations for this course covering all the lecture notes and reading material with a weight of 400 points each totaling 800 points.

B. Practicum:
Students will be given ten projects:
1. Identify fire extinguishing equipment for different classes of fire.
2. Correctly identify grades of aviation fuel by color.
3. Properly tie-down aircraft.
4. Give correct hand and arm signals.
5. Use aircraft towing equipment.
6. Select the correct equipment and jack an aircraft.
7. Demonstrate the correct way to clean a transparent plastic cockpit enclosure or windshield.
8. Given samples of corroded aircraft structural materials, identify the type of corrosion and describe the correct procedure for removing the corrosion and treating the damaged area to prevent further corrosion.
9. Select the proper cleaning materials and remove oil that has been spilled on an aircraft tire.
10. Explain how to remove corrosion from a lead-acid battery box and treat the box to prevent further corrosion.

V. SEMESTER GRADE COMPUTATION

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<thead>
<tr>
<th>EXAMINATIONS</th>
<th>POINTS</th>
<th>POINT TO GRADE RATIO</th>
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<tbody>
<tr>
<td>EXAM 1</td>
<td>400</td>
<td>900-1000 = A</td>
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<tr>
<td>EXAM 2</td>
<td>400</td>
<td>800- 899 = B</td>
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<tr>
<td>Practicum: projects: 1-10</td>
<td>200</td>
<td>700- 799 = C</td>
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<td>TOTAL 1000</td>
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<td>600- 699 = D</td>
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AERM 1210
VI. NOTES AND ADDITIONAL INSTRUCTIONS FROM COURSE INSTRUCTOR

A. Course Withdrawal: It is the student’s responsibility to officially drop a class if circumstances prevent attendance. In order to be officially withdrawn from the course, a student must obtain, complete and file an Application for Withdrawal form with the College. The student’s transcript will show “W” or “F”, depending on whether the student was passing or failing at the time of withdrawal.

B. Administrative Withdrawal: Students not meeting course objectives or not making satisfactory progress may be withdrawn from the course at the discretion of the instructor.

C. Cellular Phones and Beepers: Cellular phones and beepers will be turned off while the student is in the classroom or laboratory.

D. American’s with Disabilities Act (ADA): Disability Support Services provide services to students who have appropriate documentation of a disability. Students requiring accommodations for class are responsible for contacting the Office of Disability Support Services (DSS) located on the central campus. This service is available to all students, regardless of location. Explore the website at www.ctcd.edu/disability-support for further information. Reasonable accommodations will be given in accordance with the federal and state laws through the DSS office.

E. Instructor Discretion: The instructor reserves the right of final decision in course requirements.

F. Civility: Individuals are expected to be cognizant of what a constructive educational experience is and respectful of those participating in a learning environment. Failure to do so can result in disciplinary action up to and including expulsion.

VII. COURSE OUTLINE

A. Module One: Fire Protection

1. Learning Outcomes: upon successful completion of this module, the Student will:

   a. Demonstrate correct selection and employ fire extinguishing agents on all classes of fire.
b. Comply with safety measures associated with compressed gas cylinders, employ hearing, eye and respiratory safety equipment in the shop and on the flight line.

c. Identify aviation fuels by color and explain correct refueling and Defueling operations.

e. Perform hand and arm signals and demonstrate correct use of aircraft ground handling equipment while moving aircraft.

f. Demonstrate correct procedures for aircraft tie-down during normal and severe weather conditions.

g. Employ jacks and hoists to support aircraft and subcomponents during maintenance and inspections.

h. Apply anti-icing and deicing measures to aircraft.

i. Explain correct engine starting procedures for multiple types of reciprocating and turbine engines.

j. Perform aircraft washes and practice corrosion control measures.

2. Learning Activities: Fire Protection

   Successfully complete examination 1 covering material presented in this module. (C18,F1-F6,F10,F11)

3. Equipment and Materials:

   Water fire extinguisher, carbon dioxide and dry-powder fire extinguishers.

4. Module Outline One: Fire Protection

   a. Nature of fire
   b. Classification of fires
   c. Extinguishing agents
   d. Fire Extinguishers
      1. Water fire extinguishers
      2. Halon 1211 and 1301 fire extinguishers
      3. Carbon Dioxide fire extinguishers
4. Dry-powder fire extinguishers

B. Module Two: Safety in the Shop and on the Flight Line

1. Learning Outcomes: upon successful completion of this module, the Student will:

   a. Comply with safety precautions associated with compressed gas cylinders.

   b. Employ hearing safety devices religiously.

   c. Practice the use of eye safety devices consistently.

   d. Employ correct respiratory safety equipment when required.

   e. Apply stringent methodical work and shop cleanliness habits and standards; minimizing the potential for accidental injury and damage to aircraft.

2. Learning Activities:

   Successfully complete examination 1 covering material presented in this module. (F1-F6,F10)

3. Equipment and Materials:

   Safety goggles, full cover face shields, assortment of foam, rubber and plastic earplugs, cushioned earphones, disposable paper or cloth masks, pre-filter and chemical filter respirator, airflow type respirator, safety wire, diagonal wire cutters and fire proof oily rag containers.

4. Module Outline Two: Shop and flight line safety

   a. Safety involving compressed gases
   b. Hearing protection
   c. Eye protection
   d. Respiratory protection
   e. Shop and flight line safety summary

C. Module Three: Aviation Fuels
1. **Learning Outcomes**: upon successful completion of this module, the Student will:

   a. Differentiate reciprocating engine fuels by color, performance numbers and point out the importance of aviation gas octane ratings and proper servicing of reciprocating engines. Discuss aviation gas additives and their function.

   d. Describe jet fuels and the function of their additives and differentiate BTU ratings of jet fuel compared to aviation gas.

2. **Learning Activities**:

   Successfully complete examination 1 covering material presented in this module. (F1-F6,F10)

3. **Equipment and Materials**:

   Aviation fuel samples of (80=Red being phased out), 82=Purple, 100=Green, 100LL=Blue and Jet fuel=colorless

4. **Module Outline Three**: Aviation Fuels

   a. Reciprocating-engine fuels
   b. Jet fuels

D. **Module Four**: Aircraft Refueling

1. **Learning Outcomes**: upon successful completion of this module, the Student will:

   a. Identify the correct type and grade of fuel required by any given aircraft.

   b. Point out fuel quality control requirements and proper electrical grounding procedures required during refueling/defueling operations.

   c. Demonstrate correct Over-Wing refueling procedures.

   d. Demonstrate correct Pressure Fueling procedures.

   e. Perform Defueling operations correctly.
2. **Learning Activities:**

   Successfully complete examination 1 covering material presented in this module. (F1-F6,F10)

3. **Equipment and Materials:**

   a. Over-wing refueling nozzle, Bayonet pressure refueling nozzle, grounding cable with grounding jack, fuel sample contaminated with water, aircraft fuel sampling probe and empty fuel sample jar.

   b. Serviceable airframe with Over-Wing or pressure refueling port and cap.

4. **Module Outline Four: Aircraft Refueling**

   a. Preparation for Refueling
   b. Over-Wing Refueling
   c. Pressure Refueling
   d. Defueling

E. **Module Five: Aircraft Movement**

1. **Learning Outcomes:** upon successful completion of this module, the Student will:

   a. Explain and demonstrate correct towing procedures for different landing gear configurations, precautions and sequence.

   b. Describe taxi procedures; demonstrate correct hand and arm signals for day and night and explain communication requirements with tower and correctly interpret light signals from the control tower.

   c. Demonstrate hand and arm signals for helicopters.

2. **Learning Activities:**

   Successfully complete examination 1 covering material presented in this module. (C18-C20,F1-F4,F10)

3. **Equipment and Materials:**
a. Instructor Prepared handouts

b. Scissor type tow bar or tow bar specifically designed for available aircraft, mobile airframe, light wands, chalk blocks two per wheel, power tug or tractor, required for larger airframes.

4. **Module Outline Five: Aircraft Movement**

   a. Towing Aircraft
   b. Taxiing
   c. Helicopter Movement

F. **Module Six: Aircraft Tiedown**

1. **Learning Outcomes:** upon successful completion of this module, the Student will:

   a. Demonstrate normal tiedown procedures and correct knot tying.

   b. Explain preparation for severe weather tiedown and the use of control surface locks or locking devices and spoiler boards.

   c. Explain securing procedures for helicopters during severe weather and specific precautions.

2. **Learning Activities:**

   Successfully complete examination 1 covering material presented in this module. (F1-F6,F10)

3. **Equipment and Materials:**

   Nylon or polypropylene rope, aircraft chain and clip tiedowns, control surface locking devices and spoiler boards if available for local airframe.

4. **Module Outline Six: Aircraft Tiedown**

   a. Normal Tiedown
   b. Preparation for Severe Weather
   c. Securing Helicopters
G. Module Seven: Jacking and Hoisting Aircraft

1. Learning Outcomes: upon successful completion of this module, the Student will:
   
a. Point out precautions associated with jacking aircraft, special equipment required and the importance of following manufacture procedures.
   
b. Explain situations requiring hoisting and necessary special equipment required to safely hoist aircraft.

2. Learning Activities:
   
   Successfully complete examination 1 covering material presented in this module (C18,F1-F6,F10)

3. Equipment and Materials:
   
   Aircraft jacks, jack pads, strut locks or special tools, maintenance manual and weights required to jack an on site aircraft, inside a maintenance facility.

4. Module Outline Seven: Jacking and Hoisting Aircraft
   
a. Aircraft Jacking
   b. Aircraft Hoisting

H. Module 8: Aircraft Icing Protection

1. Learning Outcomes: upon successful completion of this module, the Student will:

   a. Explain the effects of icing on lift and control surfaces.
   
b. Distinguish between Type I and Type II anti-icing and deicing fluids.
   
c. Explain Deicing and Anti-icing procedures.

2. Learning Activities:
Successfully complete examination 1 covering material presented in this module. (F1-F6,F10)

3. **Module Outline Eight:** Aircraft Icing Protection

   Aircraft Icing Protection

I. **Module Nine:** Engine Operation

1. **Learning Outcomes:** upon successful completion of this module, the Student will:
   
a. Describe precautions taken before starting radial or inverted piston engines, pre-start checks, precautions and weather considerations.

b. Outline float carbureted reciprocating engine start procedures.

c. Describe hand cranking procedures for reciprocating engines.

d. Describe turbine engine starting sequences, pre-checks, precautions and immediate actions upon faulty start.

e. Explain possible turbine engine damage resulting from faulty engine starts.

2. **Learning Activities:** Engine Operation

   a. Successfully complete examination 1 covering material presented in this module. (1-F6,F10)

   b. Complete projects: 1-6. (C18,F1-F6,F10)

3. **Equipment and Materials:**

   Provide a serviceable airframe with (reciprocating or turbine engine); operator’s manual and hearing protection.

4. **Module Outline Nine:** Engine Operation

   a. **Reciprocating Engines**
      1. Starting engines equipped with float carburetors
      2. Starting engines equipped with fuel injection systems
3. Hand cranking a reciprocating engine

b. Turbine Engines
   1. Turbine engine starting
   2. Improper starts
      a) No Oil Pressure
      b) Hot Start
      c) Hung Start

J. Module Ten: Cleaning

1. **Learning Outcomes:** upon successful completion of this module, the Student will:

   a. Point out the importance of a clean aircraft.
   
   b. Explain and practice cleaning procedures using a water emulsion type cleaner.
   
   c. Practice nonmetal cleaning techniques.
   
   d. Explain and demonstrate powerplant cleaning procedures and after wash lubrication requirements.
   
   e. Explain paint removal techniques required in the treatment of corrosion under painted surfaces.

2. **Learning Activities:**

   Successfully complete examination 2 covering material presented in this module. (C18,F1,F3,F10)

3. **Equipment and Materials:**

   Emulsion type cleaner meeting MIL-C-43616 specifications, mild soap, water hoses and spray nozzles, 5 gallon buckets, soft bristle brushes, aliphatic naphtha, acetone or dope thinner, chamois or absorbent cotton, plastic window wax, water rinse paint remover (use only products acceptable with local EPA regulations or host nation environmental laws), masking tape, polyethylene sheeting, stiff bristle brushes with nonmetallic bristles, safety goggles, vinyl or latex gloves and shop towels.

4. **Module Outline Ten: Cleaning**
Module Eleven: Corrosion Control

1. Learning Outcomes: upon successful completion of this module, the student will:
   a. Differentiate between the many types of corrosion.
   b. Explain causes of the different types of corrosion.
   c. Point out common areas susceptible to corrosion.
   d. Identify, assess corrosion damage and remove corrosion.
   e. Explain methods of corrosion treatment for common metals found in aircraft structures.

2. Learning Activities:
   a. Successfully complete examination 2 covering material presented in this module. (C18,F1,F4,F5,F10)
   b. Complete projects: 7-10

3. Equipment and Materials:
   a. Samples of different types of corrosion on different types of metals (accumulate these as they become available).
   b. 4X, 6X power magnifying glasses, mirrors, explosion proof flashlights, dye penetrant kits or fluorescent penetrant kits with “black light”
   c. Optional corrosion chemical treatment products: alodine conforming to MIL-C-5541, (chromic acid pickling solution Dow No. 1 conforming to MIL-M-3171A, type I), (Dichromate conversion treatment Dow No. 7 conforming to MIL-M-3171A,
Type IV), Note: these products should be stored and disposed of according to local EPA and environmental laws.

4. **Module Outline Eleven: Corrosion Control**

a. **Corrosion Control**
   1. Chemistry of Corrosion
   2. Types of Corrosion
      a) Oxidation
      b) Surface Corrosion
      c) Intergranular Corrosion
      d) Exfoliation Corrosion
      e) Stress Corrosion
      f) Galvanic Corrosion
      g) Concentration Cell Corrosion
         1) Low Oxygen Concentration Cell Corrosion
         2) High Metal Ion Concentration Cell Corrosion
      h) Fretting Corrosion
      i) Filiform Corrosion

b. **Causes of Corrosion**
   1. Air
   2. Water
   3. Salts
   4. Acids and Alkalis
   5. Mercury
   6. Organic Growths

c. **Locations Susceptible to Corrosion**
   1. External Skin Seams and Lap Joints
   2. Control Surface Recesses
   3. Piano Hinges
   4. Engine Inlet Areas
   5. Engine Mount Structures
   6. Engine Exhaust Area
   7. Landing Gear Boxes
   8. Wheel Wells and Landing Gear
   9. Fuel Tanks
   10. Battery Compartments and Vents
   11. Bilge Areas
   12. Control Cables
   13. Lavatories and Food Service Areas
   14. Welded Areas
d. **Detecting Corrosion**
1. Visual Inspection
2. Penetrant Inspection
3. Ultrasonic Inspection
4. Radiographic Inspection

1. **Removing and Treating Corrosion**
   a. Corrosion Treatment of Aluminum Alloys
      a) Mechanical Corrosion Removal
      b) Chemical Treatment
      c) Protective Coatings
      d) Oxide Film Protection
         1) Electrolytically Formed Oxides
         2) Chemically Formed Oxides
      e) Organic Finishes
   b. Corrosion Treatment of Magnesium Alloys
      a) Mechanical Corrosion Removal
      b) Chemical Treatment
   c. Corrosion Treatment of Ferrous Metals
      a) Mechanical Cleaning
      b) Surface Treatment for Steel
         1) Cadmium Plating
         2) Nickel or Chrome Plating
         3) Galvanizing
         4) Metal Spraying
         5) Organic Finishes

4. Assessment of Corrosion Damage
5. Corrosion Control Summary