I. INTRODUCTION

A. It is extremely important that an aircraft engine be supplied with the proper amount of the correct type fuel. In addition to the fuel, the correct volume of air must be supplied and properly utilized. This course studies the fuel metering and induction systems used on reciprocating and turbine engines including fuel metering systems, carburetors, induction systems, heat exchangers, and cooling systems. Fundamentals of safety will also be addressed in each subject area.

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: successful completion of all required (G) general aviation maintenance courses.

II. LEARNING OUTCOMES

Upon successful completion of this course, Fuel Metering and Induction Systems, the student will:

A. Explain reciprocating and turbine engine fuel grades and properties of each to include additives used to prevent icing, corrosion and micro biological growth. (F1,F5,F10)

B. Discuss typical types of carburetor systems used on aircraft reciprocating engines, fuel injection, supercharger and turbocharger systems. (F1-F5,F10)

C. Discuss turbine engine fuel system component functions, mechanical and electronic fuel metering and control systems. (F1-F5,F10)

III. INSTRUCTIONAL MATERIALS
A. The instructional materials identified for this course are viewable through www.ctcd.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 five written examinations for this course covering all the lecture notes and reading material. Three examinations will be given covering material on reciprocating engine fuel and inductions systems from
chapter 4 and two examinations will be given on turbine engine fuel systems from chapter 12 with a weight of 200 points each totaling 1000 points. Students unable to attend exams will coordinate with the instructor. Failure to prepare for exams is not a valid reason to miss the exam.

B. Practicum:
None

VI. SEMESTER GRADE COMPUTATION

<table>
<thead>
<tr>
<th>EXAMINATIONS</th>
<th>POINTS</th>
<th>POINT TO GRADE RATIO</th>
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<tbody>
<tr>
<td>EXAM 1 Chapter 4</td>
<td>200</td>
<td>900-1000 = A</td>
</tr>
<tr>
<td>EXAM 2 Chapter 4</td>
<td>200</td>
<td>800- 899 = B</td>
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<tr>
<td>EXAM 3 Chapter 4</td>
<td>200</td>
<td>700- 799 = C</td>
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<tr>
<td>EXAM 4 Chapter 12</td>
<td>200</td>
<td>600- 699 = D</td>
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<tr>
<td>EXAM 5 Chapter 12</td>
<td>200</td>
<td>0- 599 = F</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1000</strong></td>
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VII. 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 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](http://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.

VIII. **COURSE OUTLINE**

A. **Module One: Transformation of Energy**

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

   Explain thermal efficiency, fuel consumption, fuel mixture ratio and engine power, detonation and preignition.

2. **Learning Activities:**

   Successfully complete examination 1 covering material presented in this module. (F1,F5,F10,F12)

3. **Module Outline One:** Transformation of Fuel

   a. Thermal Efficiency
   b. Specific Fuel Consumption
   c. Mixture Ratio and Engine Power
   d. Detonation and Preignition

B. **Module Two: Reciprocating Engine Fuels**

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

   a. Identify by color and explain the grades of aviation gasoline.

   b. Explain aviation gasoline characteristics including critical pressure and temperature.

   c. Explain the importance of proper fuel grade use and the destructive consequences of improper use.

2. **Learning Activities:**
Successfully complete examination 2 covering material presented in this Module. (F1,F5,F10)

3. **Module Outline Two: Reciprocating Engine Fuels**

   a. **Aviation Gasoline**
      1. **Gasoline Specifications**
         a) Heat Energy Content
         b) Vapor Pressure
         c) Critical Pressure and Temperature
      2. **Gasoline Additives**
      3. **Gasoline Ratings**
   b. **Automobile Gasoline**
   c. **Importance of Proper Fuel Grade**

C. **Module Three: Reciprocating Engine Fuel Metering and Antidetonation Injection Systems**

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

   a. **Explain the operation of different types of float carburetors,**
      maintenance, run-up and idle adjustments.
   
   b. **Explain operation of pressure carburetors,** maintenance, run-up and idle adjustment.
   
   c. **Discuss Precision Airmotive RSA fuel injection systems,**
      maintenance, run-up and idle adjustment.
   
   d. **Discuss Teledyne-Continental fuel injection systems,**
      maintenance, and adjustment of high and low unmetered fuel pressure.
   
   e. **Explain the operation and purpose of Antidetonation Injection Systems.**

2. **Learning Activities:**

   Successfully complete examination 3 covering material presented in this Module. (F1,F5,F10)

3. **Module Outline Three: Reciprocating Engine Fuel Metering and Antidetonation Injection Systems**
a. Float Carburetors
   1. Main Metering System
      a) Air Bleed
      b) Airflow Regulation
   2. Idling System
   3. Acceleration System
   4. Mixture Control System
   5. Power Enrichment or Economizer System
b. Service and Maintenance of Float Carburetors
   Run-up an Idle Adjustment

b. Service and Maintenance of Float Carburetors
   Run-up an Idle Adjustment

c. Pressure Carburetors
   1. Bendix PS Pressure Carburetors
      a) Main Metering System
      b) Idling System
      c) Acceleration System
      d) Mixture Control System
      e) Power-Enrichment System
   2. Pressure Carburetor Installation and Maintenance
      Run-up and Idle Adjustment

d. Fuel Injection Systems
   1. Precision Airmotive RSA Fuel Injection System
      a) Main Metering System
      b) Idling System
      c) Mixture Control System
      d) Power-Enrichment System
      e) Flow Divider
      f) Nozzles
   2. Installation and Maintenance of RSA Fuel Injection Systems
      Run-up and Idle Adjustment
   3. Teldyne-Continental Fuel Injection System
      a) Injector Pump
      b) Fuel-Air Control Unit
      c) Fuel Manifold Valve
      d) Injector Nozzles
   4. Installation and Maintenance of TCM Fuel Injection Systems
      Adjusting High and Low Unmetered Fuel Pressure
   5. Antidetonation Injection Systems

D. Module Four: Reciprocating Engine Induction Systems

   1. Learning Outcomes: upon successful completion of this module, the Student will:
a. Explain naturally aspirated, supercharger, turbosupercharger and turbocharger induction systems for reciprocating engines.

b. Explain controls associated with turbocharger systems.

2. **Learning Activities:**

   Successfully complete examination 3 covering material presented in this module. (F1,F5,F10)

3. **Module Outline Four: Reciprocating Engine Induction Systems**

   a. Naturally Aspirated Engine Induction Systems
      Alternate Air Systems

   b. Superchargers
      1. Internal Superchargers
      2. Turbosuperchargers and Turbochargers
         Turbocharger Controls
         1) Adjustable Bypass Restrictor
         2) Manually-Controlled Waste Gate
         3) Automatic Turbocharger Control System
         4) Teledyne-Continental Motors (TMC) Systems
         5) Textron-Lycoming Engine Turbocharger Controls

E. **Module Five: Turbine Engine Fuels**

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

   Explain the properties of turbine engine jet fuels, additives and handling precautions.

   2. **Learning Activities:**

   Successfully complete examination 4 covering material presented in this module. (F1,F5,F10)

   3. **Module Outline Five: Turbine Engine Fuels**

      a. Jet Fuel Volatility
      b. Jet Fuel Viscosity
      c. Microbial Growth in Jet Fuel Tanks
d. Fuel Anti-Icing

e. Fuel Handling

F. Module Six: Turbine Engine Fuel Systems

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

   a. Explain the sequential function of fuel system components in turbine engine fuel systems and the purpose and safety features engineered into each component of the system.

   b. Explain the operation of turbine engine fuel controls and perform adjustments.

2. **Learning Activities:**

   Successfully complete examination 5 covering material presented in this module. (F1,F5,F10)

3. **Module Outline Six:** Turbine Engine Fuel Systems

   a. Fuel System Components
      1. Fuel Pumps
      2. Fuel Strainers
      3. Fuel Controls
      4. Fuel Flowmeter
      5. Fuel-Oil Heat Exchanger
      6. Fuel Nozzles
      7. Pressurizing and Dump Valve

   b. Turbine Engine Fuel Control
      Hydromechanical Fuel Control
         a) Emergency Fuel Control
         b) Turboprop Engine Fuel Control

   c. Electronic Engine Control Systems
      1. Supervisory Electronic Engine Control
      2. Full-Authority Digital Electronic Control (FADEC)

   d. Fuel Control Adjustments