I. INTRODUCTION

A. The purpose of this course is to increase the student’s knowledge of aircraft propulsion systems and their operating characteristics.

B. This course is required to meet curriculum requirements for the Central Texas College program(s) associate degree in aviation science.

C. This course is occupationally related and serves as preparation for jobs in aviation.

II. OVERALL OR GENERAL OBJECTIVES OF THE COURSE

Upon successful completion of this course, Propulsion Systems, the student will be able to:

A. Demonstrate, through written tests and discussions, an increased knowledge of aircraft power plants and their operation (C5; F1; F2; F3; F5; F6).

B. Be able to explain the accessories attached to aircraft power plants and the purpose of each accessory.

C. Recognize abnormal power plant conditions and how to avoid them (F8, F9, F12).

D. Be able to explain the technology used in aircraft maintenance and how it is used (C18; C19).

III. INSTRUCTIONAL MATERIALS

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

IV. COURSE REQUIREMENTS

A. To attend class regularly.

B. To be prepared to participate in classroom discussions and to take unannounced quizzes relating to lecture material presented and text assignments.

C. To be present for all examinations.

V. EXAMINATIONS

February 2007
A. There will be a minimum of three major examinations:

1. Exam 1
2. Mid-term exam
3. Final exam

B. A student must be present for all examinations. No make-up examinations will be given. Students who know in advance will be absent from an examination due to valid reasons, must arrange to take an early examination. Unexpected absences due to illness or extenuating circumstances will require the student to see the instructor about individual make-up work in lieu of the missed examination.

C. Students without excused absences will be given a zero for the examination missed.

VI. SEMESTER GRADE COMPUTATIONS

<table>
<thead>
<tr>
<th>Description</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams 1</td>
<td>100</td>
</tr>
<tr>
<td>Mid-Term Exam</td>
<td>100</td>
</tr>
<tr>
<td>Final Exam</td>
<td>100</td>
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<tr>
<td>Quizzes/Instructor</td>
<td>100</td>
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<tr>
<td>Evaluation</td>
<td></td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>400</td>
</tr>
</tbody>
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A student must take the final examination to receive a grade for the course.

VII. NOTES AND ADDITIONAL INSTRUCTIONS FROM COURSE INSTRUCTOR

A. **Withdrawal from course:** It is the student’s responsibility to officially drop a class if circumstances prevent attendance. Any student who desires to, or must, officially withdraw from a course after the first scheduled class meeting must file an Application for Withdrawal or an Application for Refund. The withdrawal form must be signed by the students.

Application for Withdrawal will be accepted at any time prior to Friday of the 12th week of classes during the 16 week fall and spring semesters. The deadline for sessions of other lengths is as follows.

- 11 week session: Friday of the 8th week
- 8 week session: Friday of the 6th week
- 5 ½ week session: Friday of the 4th week

The equivalent date (75% of the semester) will be used for session of other lengths. The specific last day to withdraw is published each semester in the Schedule Bulletin.
Students who officially withdraw will be awarded the grade of AW®, provided the student’s attendance and academic performance are satisfactory at the time of official withdrawal. Students must file a withdrawal application with the college before they may be considered for withdrawal.

A student may not withdraw from a class for which the instructor has previously issued the student a grade of “F” or “FN” for nonattendance.

B. **Administrative withdrawal**: An administrative withdrawal may be initiated when the student fails to meet College attendance requirements. The instructor will assign the appropriate grade on the Administrative Withdrawal Form for submission to the registrar.

C. **An Incomplete Grade**: The College catalog states, “An incomplete grade may be given in those cases where the student has completed the majority of the course work but, because of personal illness, death in the immediate family, or military orders, the student is unable to complete the requirements for a course...” Prior approval from the instructor is required before the grade of “I” is recorded. A student who merely fails to show for the final examination will receive a zero for the final and an “F” for the course.

D. **ADA Statement**: 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.

(College policy-procedures statements)

**LESSON ONE**: Course introduction and Power plant classification

**OBJECTIVES**: To establish common ground and to allow the student to develop knowledge of aircraft power plant classification

**CONTENT**:

1. Course requirements and objectives
2. Aircraft power plant development
3. Aircraft power plant classification

**COMPLETION STANDARDS**: This lesson will be complete when the student is able to
indicate increased knowledge, by oral quizzing and discussion, of power plant evolution and the
classification of aircraft power plants

LESSON TWO: Reciprocating Engine Construction and Nomenclature

OBJECTIVES: This is the first of two lessons designed to increase the student’s knowledge of
the construction and naming of major parts found in reciprocating engines

CONTENT:

1. Types of crankcases and their purpose
2. Types of bearings and their purpose
3. Crankshafts

COMPLETION STANDARDS: This lesson will be complete when the student is able to
discuss the major purposes of crankshafts, bearings, and crankcases.

LESSON THREE: Reciprocating Engine, Construction and Nomenclature

OBJECTIVES: This is the second lesson in which the student is expected to develop knowledge
of the construction and naming of major parts found in reciprocating engines

CONTENT:

1. Connecting rod assemblies
2. Pistons and cylinders
3. Valves and associated parts

COMPLETION STANDARDS: This lesson will be complete when the student can explain the
major inner components of the aircraft engine

LESSON FOUR: Accessory section and Propeller reduction Gears

OBJECTIVES: To develop operational knowledge of engine accessory sections and propeller
reduction gears

CONTENT:

1. Accessory section for opposed engines
2. Accessory section for radial engines
3. Propeller reduction gearing mechanisms

COMPLETION STANDARDS: This lesson will be complete when the student is able to
demonstrate through discussion and quizzing, operational knowledge of engine accessory
sections and propeller reduction gears
LESSON FIVE: Internal Combustion Engine Theory

OBJECTIVES: This lesson will be used to allow the student to gain an increased knowledge of operating theories involved with the internal combustion engine

CONTENT:

1. Science fundamentals
2. Engine Operation fundamentals
3. Definitions of terms

COMPLETION STANDARDS: Completion of this lesson will be signified by the student’s ability, through oral and/or written quizzing, to demonstrate knowledge of basic science fundamentals as well as defining the terms necessary to discuss engine operations

LESSON SIX: Engine Performance

OBJECTIVES: This lesson will be used to develop the student’s knowledge of various operating cycles used in the internal combustion engine

CONTENT:

1. Valve timing and engine firing order
2. Two-stroke cycle
3. Rotary and diesel engines

COMPLETION STANDARDS: This lesson is complete when the student can accurately discuss valve timing, firing order, and the advantages and disadvantages of rotary and diesel engines as aircraft power plants

LESSON SEVEN: Power and engine Efficiency

OBJECTIVES: This lesson is designed to allow the student to achieve greater knowledge of factor effecting engine power and efficiency

CONTENT:

1. Concept of power as it applies to aircraft engines
2. Methods of measuring engine power
3. Engine efficiency

COMPLETION STANDARDS: This lesson will be considered complete when the concepts of power and efficiency are adequately explained by the student either orally or written

LESSON EIGHT: Factors affect engine performance
OBJECTIVES: This lesson will be used to enhance the student’s existing knowledge of specific engine performance factors

CONTENT:

1. Elements of manifold pressure
2. Factors causing detonation and preignition
3. Operating ratios and fuel consumption factors

COMPLETION STANDARDS: Completion of this lesson will be completed when the student demonstrates operational knowledge of manifold pressure as well as causes and prevention of detonation and preignition, and operating ratios and the variables affecting them

LESSON NINE: Lubricants

OBJECTIVES: This lesson will be used to introduce types of lubricants used in engine operation and to allow the student to gain knowledge of when each type is used

CONTENT:

1. Sources of lubricants
2. Classification of lubricants
3. Properties of lubricating oils

COMPLETION STANDARDS: This lesson will be complete when the student can verbally explain factors involved with lubricants to include sources, types and properties

LESSON TEN: The need for lubrication and Lubrication Systems

OBJECTIVES: This lesson will increase the student’s knowledge of the reasons for and types of lubricating systems

CONTENT:

1. Need for, requirements of, and functions of lubricants
2. Characteristics and components of lubricating systems
3. Design features of typical lubricating systems

COMPLETION STANDARDS: This lesson is complete when the student demonstrates through oral or written quizzing enhanced knowledge of lubricant requirements and the systems used to provide lubrication to aircraft engines

LESSON ELEVEN: Induction systems and Turbo-charging

OBJECTIVES: To introduce the student to typical induction systems and concepts of turbo-charging
CONTENT:

1. Basic induction system components
2. Principles of super-charging and turbo charging
3. Factors effecting super-charging and turbo charging

COMPLETION STANDARDS: This lesson will be considered complete when the student demonstrates knowledge of basic induction systems and principles involved with super-charging and turbo charging

LESSON TWELVE: The turbocharger

OBJECTIVES: To develop operational knowledge of turbochargers

CONTENT:

1. Components of a turbocharger
2. Operation of a turbocharger
3. Common operating problems with turbochargers

COMPLETION STANDARDS: This lesson is complete when the student can successfully pass either a written or oral quiz over the turbo charger and its operation

LESSON THIRTEEN: Reciprocating Engines Cooling and Exhaust systems

OBJECTIVES: To develop knowledge of systems used in aircraft reciprocating engines to dissipate heat

CONTENT:

1. Adverse effect of heat
2. Cooling systems
3. Exhaust systems

COMPLETION STANDARDS: This lesson will be considered complete after the student is able to accurately explain he need for and methods of dissipating heat from the aircraft engine

LESSON FOURTEEN: Gas Turbine Engine Theory

OBJECTIVES: This lesson will be used to introduce the concept of gas turbine engine theory to the student and have the student acquire knowledge of the history, development and operational theory behind the gas turbine engine

CONTENT

1. Background of jet propulsion
2. Principles of jet propulsion
3. Types of jet propulsion engines

COMPLETION STANDARDS: This lesson will be complete when the student can successfully pass an oral or written quiz on the development and types of jet propulsion engines

LESSON FIFTEEN: Principles, Types, and Theory of Gas-turbine Engines

OBJECTIVES: This lesson is developed to allow the student to gain a working knowledge of the principles, types, and theories of operating a gas-turbine engine

CONTENT

1. Gas-turbine engine operation
2. Identifying characteristics of gas-turbine engines
3. Theory of operation of gas-turbine engines

COMPLETION STANDARDS: This lesson will be complete when the student demonstrates working knowledge of the elements involved with gas-turbine engine operation

LESSON SIXTEEN: Gas Turbine-engine Performance and Efficiency

OBJECTIVES: This lesson will be used to develop knowledge of performance and efficiency factors of the gas-turbine engine

CONTENT:

1. Gas-turbine engine performance
2. Augmenting gas-turbine engine performance
3. Measuring gas-turbine efficiency

COMPLETION STANDARDS: This lesson is complete when the student can, through discussion, demonstrate knowledge of performance factors involved with gas-turbine engine and how efficiency of that type of engine can be achieved

LESSON SEVENTEEN: Principle Parts of the Gas-turbine Engine

OBJECTIVES: This lesson is concerned with educating the student about the principle parts of a gas-turbine engine

CONTENT:

1. Sections of a gas-turbine engine
2. Defining and locating major gas-turbine engine parts
3. Purpose of major parts of the gas-turbine engine
COMPLETION STANDARDS: This lesson is complete when the student, using mock-ups, computer programs, or unmarked diagrams, can locate and explain the purpose of each major part of the gas-turbine engine

LESSON EIGHTEEN: Operational Concerns of Gas-turbine Engines

OBJECTIVES: This lesson will be used to develop the student’s working knowledge of factors affecting operation of the gas-turbine engine

CONTENT:

1. Definitions and explanation of compressor stall
2. Causes and effects of compressor stalls
3. Design features that help prevent compressor stall

COMPLETION STANDARDS: This lesson is complete upon demonstration by the student of operational knowledge of gas-turbine engine operating problems

LESSON NINETEEN: Expanded Discussion on Major parts

OBJECTIVES: This lesson will be designed to allow the student to develop greater knowledge of major parts of the gas-turbine engine

CONTENT:

1. Combustion Chambers
2. Turbine nozzle diaphragm
3. Turbines

COMPLETION STANDARDS: This lesson will be complete when the student demonstrates through oral quizzing and discussion an increased knowledge of major parts of the gas turbine engine

LESSON TWENTY: Exhaust Systems, Turbines, and Accessories of the Gas-turbine Engine

OBJECTIVES: The student will use this lesson to increase knowledge of exhaust systems, turbines and accessories usually associated with gas-turbine engines

CONTENT:

1. Exhaust systems and operation
2. Turbines
3. Engine noise reduction concerns

COMPLETION STANDARDS: This lesson will be considered complete upon the student successfully describing gas-turbine engine systems, turbine and accessories driven by the exhaust
system and how jet engine noise can be reduced with improved systems

LESSON TWENTY-ONE: Propeller Theory

OBJECTIVES: To develop increased knowledge of propeller nomenclature and theory

CONTENT:

1. Propeller nomenclature
2. Propeller theory
3. Propeller pitch

COMPLETION STANDARDS: This lesson will be complete when the student can explain parts of the propeller and the theory of operation

LESSON TWENTY-TWO: Forces acting on a Propeller in Flight

OBJECTIVES: This lesson is designed to allow the student to develop knowledge of the aerodynamic and other forces acting on a propeller in flight

CONTENT:

1. Forces acting on a propeller in flight
2. Propeller load and efficiency
3. Torque and asymmetrical loading

COMPLETION STANDARDS: This lesson is complete when the student exhibits, through oral quizzing, increased knowledge of forces acting on the propeller while in flight

LESSON TWENTY-THREE: Propeller controls, instruments, and classification

OBJECTIVES: This lesson will be used by the instructor to develop the student’s knowledge of the controls, instruments, and classification of propellers

CONTENT:

1. General classification of propellers
2. Fixed pitch propellers
3. Constant speed propellers

COMPLETION STANDARDS: This lesson will be considered complete when the student, through discussion and oral quizzing, can explain the different classifications of propellers

LESSON TWENTY-FOUR: Constant-speed and full-feathering propellers

OBJECTIVES: To develop operational knowledge of constant speed and full-feathering
propellers

CONTENT:

1. Prop governors
2. Feathering mechanisms
3. Accumulators

COMPLETION STANDARDS: This lesson is considered complete when the student is able to explain prop governors, feathering mechanisms, and accumulators

LESSON TWENTY-FIVE: Propeller Systems

OBJECTIVES: This lesson will be used to develop the student’s knowledge of systems associated with propellers

CONTENT:

1. Anti-icing and de-icing systems
2. Prop synchrophaser systems
3. Auto-feathering systems

COMPLETION STANDARDS: This lesson is complete upon the student successfully explaining systems associated with propellers