I. INTRODUCTION

A. The purpose of this course is to introduce the student to aviation and give a foundation for studying aviation sciences and operations

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, Aircraft Science, the successful student will be able to:

A. Demonstrate, through written tests and discussions, an increased knowledge of aircraft development and history of design (C5, C6, C7)

B. Perform basic mathematical performance calculations using approved aircraft data (C18; C19; F1 - F6)

C. Communicate ideas through writing technique (F2)

D. Demonstrate knowledge of the Federal Aviation Regulations and related aviation Publications

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.

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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.

D. Develop and submit for grading a semester paper, length, style and subject to be assigned by the instructor.

V. EXAMINATIONS

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></th>
<th>Points</th>
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</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>
</tr>
<tr>
<td>Paper</td>
<td>100</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>400</strong></td>
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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.

<table>
<thead>
<tr>
<th>Session Length</th>
<th>Deadline Date</th>
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<tbody>
<tr>
<td>11 week session</td>
<td>Friday of the 8th week</td>
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<tr>
<td>8 week session</td>
<td>Friday of the 6th week</td>
</tr>
<tr>
<td>52 week session</td>
<td>Friday of the 4th week</td>
</tr>
</tbody>
</table>

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 “W”, 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.
AIRCRAFT SCIENCE

BLOCK ONE

HISTORICAL DEVELOPMENT

OBJECTIVES: To develop an awareness of the development of aircraft from man’s earliest dreams until the space age. This block of instruction will be used to familiarize the student with how aviation developed from cave-drawings and Greek Mythology to the first lighter-than-air aircraft and the first airplanes.

CONTENT: This block will consist of lessons covering mankind’s earliest dreams of flight, through the ideas of Leonardo DaVinci, to the development of lighter-than-air aircraft and the first successful heavier-than-air flights.

COMPLETION STANDARDS: This block will be complete when the student demonstrates through oral quizzing, written quizzing, and informal discussion an increased awareness of the historical development of aircraft.

LESSON ONE: Dreams of flight (Instructor reference - Time-Life AEpic of Flight® series)

OBJECTIVES: To develop a broad picture of how mankind first started dreaming of flight in the earliest years of recorded history.

CONTENT:

1. Cave drawings of winged creatures and mythical flying airmen
2. Greek Mythology
3. Manned kites in Asia

COMPLETION STANDARDS: This lesson will be complete when, through oral quizzing, the student demonstrates an increased knowledge of when mankind first started dreaming of flight.

LESSON TWO: Medieval research until the 19th century

OBJECTIVES: To become familiar with the contributions of Leonardo DaVinci and other scientists in the development of aeronautical principles and design.

CONTENT:

1. DaVinci
2. Montgolfier Brothers
3. Sir George Cayley
COMPLETION STANDARDS: This lesson will be complete when, through oral discussion and quizzing, the student demonstrates the ability to discuss the ideas and devices developed during the Medieval Ages until the 19th Century

LESSON THREE: Gliding flight and first heavier-than-air powered flight experiments

OBJECTIVES: To develop knowledge of the earliest experiments in gliding flight and the natural progression to powered heavier-than-air flight

CONTENT:

1. Octave Chanute
2. Otto Lilienthal
3. Wright Brothers

COMPLETION STANDARDS: This lesson will be complete when the student demonstrates knowledge of how the first powered heavier-than-air flights took place

LESSON FOUR: Lighter-than-air development and demise

OBJECTIVES: To become familiar with the technology of lighter-than-air from the Montgolfier brothers until present day

CONTENT:

1. Montgolfier Brothers
2. Count Zeppelin
3. The 1930's
4. Post-Hindenburg era

COMPLETION STANDARDS: This lesson will be complete when the student can discuss the rise and demise of the airship.

LESSON FIVE: Development of the airplane 1903 - 1918

OBJECTIVES: To familiarize the student with knowledge of airplane development from 1903 until the end of World War I

CONTENT:

1. Early performance records
2. Status of the airplane as a military weapon at the start of World War I
3. Technical advances occurring during the war
COMPLETION STANDARDS: This lesson will be complete when the students demonstrate, through oral quizzing and discussion, increased knowledge of the role of armed conflict in airplane development.

LESSON SIX: Advances occurring in air travel between World War I and World War II

OBJECTIVES: This lesson will be used to allow the students to acquire information on air travel and how it grew during the period from 1918 to 1941.

CONTENT:

1. Barnstormers
2. Flying the mail
3. Rise of the airline industry

COMPLETION STANDARDS: Completion of this lesson is evidenced when the student can explain how the airline industry evolved out of airmail operations and grew with the help of the government.

LESSON SEVEN: Lesson 7 will cover the events effecting airplane development during World War II and the rise of jet travel in the airline industry.

OBJECTIVES: To develop knowledge of increased technology made necessary by World War II and how that technology was applied to civilian operations.

CONTENT:

1. New Technology
   a. Radar
   b. Turbine engines
   c. Pressurized cabins
2. Civilian Applications of military innovations

COMPLETION STANDARDS: This lesson is complete when the student can accurately describe the need for new technology during war and how civilians can benefit from that technology.

LESSON EIGHT: The necessity for modernizing the regulatory aspects of aviation will be the subject of this lesson.

OBJECTIVES: To achieve the knowledge of why the Federal Aviation Act of 1958 was enacted and how it has affected U.S. aviation to this day.
CONTENT:

1. The need for modern rules and regulations
2. The necessity for positive air traffic control
3. The effects of the jet-age on airline travel

COMPLETION STANDARDS: This lesson will be complete when the student demonstrates and increased knowledge of the events leading to the passage of the FAA Act of 1958 and how air travel has been changed with the advent of jet aircraft
OBJECTIVES: To become familiar with basic scientific principles and how they apply to aircraft performance; to develop an understanding of and ability to compute specified aircraft performance functions

CONTENT: This block consists of lessons that allows the students to develop a basic understanding of the aerodynamic principles and factors that effect aircraft performance

COMPLETION STANDARDS: This block of instruction will be complete when the student demonstrates, through oral and written quizzing, the ability to perform basic airplane performance problems and relate airplane performance to elementary scientific principles

REFERENCES: Pilot’s Handbook of Aeronautical Knowledge (FAA); The Airplane Flying Handbook (FAA)

LESSON ONE: Concepts of energy

OBJECTIVES: To develop a greater understanding of basic principles as they apply to the term ENERGY.

CONTENT:

1. Defining energy
2. Forms of energy
3. Examples of forms of energy

COMPLETION STANDARDS: This lesson will be complete upon the successful demonstration, through oral and/or written quizzing, an increased knowledge of concepts of energy

LESSON TWO: Newton’s Laws of Motion

OBJECTIVES: To develop an understanding of Newton’s theories and the role they play in aeronautical physics.

CONTENT:
1. Concept of Force
2. Newton’s Laws
3. Momentum

COMPLETION STANDARDS: This lesson will be complete when the student demonstrates, through discussion, an increased knowledge of Newton’s Laws and how they apply to aeronautics

LESSON THREE: The four forces acting on an aircraft in flight

OBJECTIVES: To develop an insight of the four basic forces acting on an aircraft in flight

CONTENT:

1. The axis of the airplane
2. The four forces
3. Bernoulli’s Principle

COMPLETION STANDARDS: This lesson will be complete when increased knowledge is demonstrated through oral quizzing and discussion. The student will be able to explain the four basic forces acting on an aircraft in flight

LESSON FOUR: The principles of airfoils

OBJECTIVES: This lesson will be used to develop knowledge of how airfoils create lift and are used in the operations of airplanes

CONTENT:

1. Review Bernoulli’s Principle
2. Definition of airfoil
3. Airfoils on the airplane used to maintain control

COMPLETION STANDARDS: This lesson is complete when the student demonstrates knowledge of the airfoils and how they work.

LESSON FIVE: Other forces acting on an aircraft in flight

OBJECTIVES: To increase the student’s knowledge of other forces acting on the airplane while in flight

CONTENT:
1. Adverse yaw  
2. Torque  
3. Propeller forces

**COMPLETION STANDARDS:** This lesson is complete when the student demonstrates through oral discussion, a higher level of understanding of other forces acting on an aircraft in flight.

**LESSON SIX:** Concepts of stability

**OBJECTIVES:** To introduce stability as it applies to aircraft operations

**CONTENT:**

1. Types of stability  
2. Properties of stability  
3. Airplane design

**COMPLETION STANDARDS:** This lesson is complete when the student can explain stability as it applies to aircraft operation and how it effects airplane design.

**LESSON SEVEN:** Weight and balance as it applies to airplane operation

**OBJECTIVES:** To introduce concepts of weight and balance control in airplane operations

**CONTENT:**

1. The importance of a properly balanced airplane while in flight  
2. Definition of terms  
3. Methods of determining c.g. location

**COMPLETION STANDARDS:** This lesson is complete when the student can demonstrate through discussion, and understanding of terms and methods of calculating c.g. limits.

**LESSON EIGHT:** Calculating weight and balance

**OBJECTIVES:** This lesson will be used to allow the student to calculate a fictional weight and balance problem using approved weight and balance information

**CONTENT:**

1. Instructor demonstration of calculating weight and balance  
2. Student practice calculating weight and balance  
3. Review of weight and balance concepts

**COMPLETION STANDARDS:** This lesson is complete when the student can calculate, with
little supervision, a simple weight and balance problem using approved weight and balance information

LESSON NINE: Performance charts

OBJECTIVES: To introduce the concepts of measuring A/C performance through the use of manufacturer’s performance charts

CONTENT:

1. Areas of performance requiring specific knowledge and the appropriate chart
2. Factors effecting performance
3. Legal requirements for determining performance

COMPLETION STANDARDS: This lesson is complete when the student can explain what performance is and how it is determined

LESSON TEN: This lesson will be used to allow the student practice in using an airplane manufacturer’s performance charts to determine specific performance

OBJECTIVES: To develop the ability to determine specific performance by using the appropriate chart

CONTENT:

1. Instructor demonstration of how to use a performance chart
2. Student practice in using performance charts

COMPLETION STANDARDS: This lesson is complete when the student can use the performance chart to determine aircraft performance in various areas
BLOCK THREE

REGULATORY ASPECTS OF AVIATION WITHIN THE UNITED STATES

OBJECTIVES: To develop the knowledge of how aviation in the United States is regulated to include the background of aviation regulation and functions of the Federal Aviation Administration (FAA) and Department of Transportation (DOT)

CONTENT: This block contains lessons that allow the student to develop an awareness of how aviation became regulated, how it is regulated today, and the role of the FAA and DOT in U.S. aviation

COMPLETION STANDARDS: This block of instruction will be complete when the student demonstrates through discussions, oral and written quizzes, increased knowledge of the regulatory nature of U.S. aviation

LESSON ONE: Historical background of U.S. civil aviation

OBJECTIVES: To create an understanding of how aviation regulation came to be and how various acts led to the current form of aviation regulation

CONTENT:

1. Earliest days without regulation
2. Air Commerce Act of 1926
3. First regulations

COMPLETION STANDARDS: This lesson will be complete when, through discussion and oral quizzing, the student demonstrates an increase in knowledge of the earliest days of aviation and the reasons behind the first aviation regulations

LESSON TWO: This lesson will be used to explain various airmail acts and how they led to the passage of the Civil Aeronautics Act of 1938

OBJECTIVES: To develop knowledge of how advances in technology required the need to update aviation regulations to make them compatible with new problems

CONTENT:

1. Airmail Acts of 1930 and 1934
2. Civil Aeronautics Act of 1938
3. Role of the Civil Aeronautics Board

COMPLETION STANDARDS: This lesson will be complete when the student can discuss major provisions of the Airmail Acts of 1930 and 1934 as well as the major reasons the CAA Act
of 1938 was enacted

LESSON THREE: This lesson covers events leading to the passage of the Federal Aviation Act of 1958

OBJECTIVES: To become familiar with the purpose and results of the FAA Act of 1958

CONTENT:

1. Development of long-range aircraft and navigation techniques
2. Lack of positive control leading to many accidents
3. Results of the FAA Act of 1958

COMPLETION STANDARDS: This lesson will be complete when, through oral or written quizzing, the student demonstrates knowledge of reasons for and results of the FAA Act of 1958

LESSON FOUR: National Transportation Act of 1966

OBJECTIVES: This lesson will be used to cover aspects of the National Transportation Act of 1966 in order to allow the student to develop knowledge of the role the DOT plays in aviation regulation

CONTENT:

1. Background on a national transportation system
2. National Transportation Act of 1966
3. Cabinet position of the Secretary of Transportation

COMPLETION STANDARDS: This lesson is complete when the student can discuss aspects of the National Transportation Act of 1966

LESSON FIVE: The Federal Aviation Administration

OBJECTIVE: This lesson will be used to develop the knowledge necessary to discuss the role of the FAA in regulating the U.S. aviation industry

CONTENT:

1. Purpose of the FAA
2. Structure of the FAA
3. Role of the Flight Standards District office

COMPLETION STANDARDS: This lesson is completed when the student demonstrates through oral discussion and/or oral quizzing, increased knowledge of the FAA

LESSON SIX: The FAA’s methods of enhancing aviation safety
OBJECTIVE: To develop an awareness of the safety aspects of the FAA and the means at their disposal to achieve aviation safety

CONTENT:

1. Safety certificates
2. Airmen certificates
3. Aircraft airworthiness certificates

COMPLETION STANDARDS: This lesson will be complete when, through discussion and quizzing, the student demonstrates increased knowledge of the purpose of various certificates issued by the FAA

LESSON SEVEN: Additional safety certificates issued by the FAA

OBJECTIVE: To develop a higher level of understanding of the FAA’s role in aviation safety, this lesson will be used to explain additional FAA safety certificates

CONTENT:

1. Certification of airports and navigation aids
2. Certification of air carriers and air taxi operators
3. Standards required to meet certification

COMPLETION STANDARDS: This lesson will be complete when the student demonstrates increased knowledge of the extent of FAA involvement in certification of entities

LESSON EIGHT: Certification Process - Pilots

OBJECTIVES: To develop an increase of knowledge pertinent to the specific certification of pilots and mechanics

CONTENT:

1. Certificates and levels of safety
2. Ratings added to certificates
3. Certification of mechanics

COMPLETION STANDARDS: This lesson is complete when the student, through oral quizzing and discussion, exhibits increased knowledge of the certification of pilot and mechanics

LESSON NINE: Publications issued by the Federal Aviation Administration

OBJECTIVES: To become familiar with a wide assortment of various publications and charts published by the FAA to enhance training and safety
CONTENT:

1. Federal Aviation Regulations
2. Flight information publications
3. Advisory circulars

COMPLETION STANDARDS: This lesson is complete when knowledge of various aviation publications is evidenced through discussion and oral or written quizzing

LESSON TEN: The role of the federal government in controlling air traffic

OBJECTIVES: To become familiar with various levels of FAA air traffic control facilities and how each level affects air traffic

CONTENT:

1. Air route traffic control centers
2. Classes of air space
3. Types of FAA Towers

COMPLETION STANDARDS: This lesson is complete when the student demonstrates knowledge of the various levels of control within the various types of airspace within the U.S.