# Outcome-based 18/SU Course Syllabus

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| *Course Rubric Number Section:* | AIRP 1343 1001 |
| *Lecture-Lab-Credit:* | 2-2-3 |
| *CIP Code:* | 49.0102 |
| *Course Title:* | Aerodynamics |
| *Course Description:* | Study of the general principles of the physical laws of flight. Topics include physical terms and the four forces of flight: lift, weight, thrust, and drag. Aircraft design, stability control, and high-speed flight characteristics are also included. |
| *Prerequisites:* | |
| *Co-requisites:* | |
| *Course Meets:* | 1ASC N174 LEC MW 10:00AM 10:55AM 1ASC N174 LAB MW 11:00AM 11:55AM |
| *Instructor:* | Edgard A. Viera |
| *Office Phone Number:* | (254) 867-2608 |
| *Email Address:* | eaviera@tstc.edu |
| *Office Fax Number:* | |
| *Building & Office Room Number:* | 1ASC N244 |
| *Office Hours:* | M/W: 9AM to 10AM; T/TH: 2PM to 3PM; Fri: 2PM to 3PM |

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| ***Approved by:*** | Angel Newhart | ***Date:*** | 2018-05-08 |

***Course Outcomes***

**CO1:** Analyze the four forces of flight

**CO2:** Analyze airplane design concepts

**CO3:** Explain aircraft stability and control factors in all flight regimes

***Added Outcomes***

**CO4:** Describe pilot's ability to control lift.

**CO5:** Interpret aircraft performance charts.

**CO6:** Meet industry standards for professionalism with on-time and on-site attendance and performance requirements.

## TSTC Grading Policy

(Grades for courses must be C or better)

| Grade | Percent | Description | Grade Points |
|---|---|---|---|
| A | 90-100 | Excellent/Superior Performance Level | 4 |
| B | 80-89 | Above Required Performance Level | 3 |
| C | 70-79 | Minimum Required Performance Level | 2 |
| D | 60-69 | Below Required Performance Level | 1 |
| F | Below 60 | Failure to meet Performance Requirements | 0 |
| IP | -- | In Progress | |
| W | -- | Withdrawal | 0 |
| CR | -- | Credit | 0 |
| AUD | -- | Audit of Course | 0 |

See College Catalog for complete descriptions

See College Catalog for complete descriptions.

## Competencies Rating Scale

| Rating Scale Key | | | |
|---|---|---|---|
| 6 | 90+ | Proficient | Student consistently performs the task accurately to industry standards without supervision. |
| 5 | 80-89 | Proficient | Student performs the task to industry standards with no supervision. |
| 4 | 70-79 | Proficient | Student performs the task to industry standards with little supervision. This is the minimum performance rating for STAR skill completion. |
| 3 | 60-69 | Exposed/Not Proficient | Student has been introduced to the task and can perform some of the tasks to industry standards. |
| 2 | 50-59 | Exposed/Not Proficient | Student has been introduced to the task, but cannot perform the task to industry standards. |
| 1 | 0-49 | | Student was absent or did not complete assignment. |

## Campus Standard Policies

The Student Handbook contains valuable information on campus policies and procedures.

- Student Code of Conduct
- Student Drug and Alcohol Testing Policy
- Plagiarism
- Student Grievances and Complaints

## Disability Services

Any student who, because of a disability, may require special accommodations in order to meet the course requirements, should contact the Disability Services office, as soon possible, to make necessary arrangements. Please note that instructors are not allowed to provide classroom accommodation to a student until appropriate verification from the Disability Services office has been provided.

Abilene Campus
Susan Hash
Testing and Support Services
Abilene Main Campus Bldg. Rm. 112
325-734-3641

Breckenridge Campus
Lisa Langford
Testing and Advisement located in
The Main Building Rm. 106
254-559-7731

Brownwood Campus
Nicole Whitley
Testing and Advisement
Building 2 Rm. 120

325-641-5955

Fort Bend Campus
Schauna Boynton
Brazos Center Rm. 113
346-239-3394

Harlingen Campus
Corina De La Rosa
Disabilities Services
Student Support Services
Student Services Bldg. Rm. 216
956-364-4521

Marshall Campus
Annette Ellis
Administration and Admissions Rm. 150
909-923-3313

Sweetwater Campus
Misty Walden
Disability Services
Student Support Services
Lance Sears Building Rm. 140
325-236-8292

North Texas Campus
Amanda Warren
Student Services, Room 227
972-617-4724

Waco Campus
Marilyn Harren
Disabilities Services Office
Student Services Center Rm. 198

254-867-3600

Williamson County
Chemese Armstrong
Enrollment Services Rm. B113C
512-759-5907

## Tutoring Statement

The Supplemental Instruction & Tutoring Program at TSTC offers free tutoring and academic support services to help you achieve your academic and career goals. You can access the Tutoring Schedule, as well as *MyTSTC Video Tutor Library,* by visiting: https://portal.tstc.edu/student/Student_Learning/Pages/Tutoring.aspx
*(shortened link: goo.gl/Z9vJvY ).* For more information, please contact Norma A. Salazar@ 956-364-4557.

## Learning Resource Center

The purpose of the TSTC Learning Resource Center is to serve the TSTC Community and support academic, advanced, specialized and emerging programs, contributing to the educational and economic development of the State of Texas. You can access the Learning Resource Center page at https://portal.tstc.edu/employee/Departments/operations/Pages/Learning%20Resource%20Center.aspx

## Aerospace Grading Policy:

Passing any course will require a minimum overall course grade of 70%.The student cannot fail more than one test per course. More than one test score below 60 is a failure of the entire course with a final grade of "D" or "F". The grade difference between "D" and "F" will be based on each individual program policy.

## Aerospace Students reference HB 1508:

For students in this course who may have a criminal background, please be advised that the background could keep you from being licensed by the State of Texas and certifying agency. If you have a question about your background and licensure, please speak with your faculty member or the department chair. You also have the right to request a criminal history evaluation letter from the applicable licensing agency.

## Aerospace Student Dress Code:

The student dress requirements mirror standards seen in our profession and will identify you as an Aviation Program Student. Your image reflects your professional attitude and conduct. How you present yourself is important to companies, airlines, FAA and hopefully to yourself. We expect you to look like a professional in your dress as well as in your conduct.

All APT, AER, AVI, ADT and ATC students are expected to be clean and well groomed. The TSTC aviation blue, steel grey, Baylor aviation shirt, or approved substitute, must be worn when in the classroom. Pants should reflect a professional image and worn at waist level. Ripped or baggy clothing is not acceptable; nor is overly tight or revealing clothing; yoga pants are not acceptable. NO short shorts! Shorts must be no more than 5" above the knee. Jeans that don't detract from a professional image may be worn. Close toed shoes, tennis shoes, or boots are acceptable. Open toed shoes, sandals, and flip flops are not permitted due to safety issues. If heels are worn they must be two inches or less for safety. Hair should be clean and neat.

Jewelry will be kept to a minimum to prevent loss and /or injury. Earrings are acceptable, but should be conservative and not extend beyond the ear. Tattoos covering large parts of the body or reflecting crude taste will limit your chances of being hired, are not recommended, and will be covered to promote an aviation professional image.

The purpose of these appearance standards is to promote a safe and comfortable work environment that is free of unnecessary distraction. The aviation industry as a whole is conservative in dress and appearance, and we hold you to these standards. Crude, provocative, or radical clothing will not be permitted. Students who arrive for class or for a flight inappropriately groomed or attired may be asked to leave and/or make changes. If you have opposition to conforming to conservative dress standards, you should probably consider other career options. Unless a notification is sent out Fridays are considered Relaxed Dress Code days.

Only the Department Chair or Lead instructor can issue waivers to this policy.

By attending our programs, you agree to the standards so described.

Represent TSTC and the Aerospace Department with pride.

**Class Behavior Policy:**

1. Students will be considered tardy past the classroom start time.

2. No tobacco products in class. No food allowed in classrooms. Drinks allowed at instructors discretion.

3. *Appropriate attire is required*. See Student Handbook, Section 3.

4. Attending class sessions, other than the one enrolled in, requires prior written request and permission by both instructors.

5. If an Instructor requests you to leave the class for any reason, leave the room immediately. Do not disrupt the class with appeals or arguments.

6. Vulgar or profane language is not tolerated and is unprofessional.

**Class Participation Policy:**

1. Be in class and seated on time. The definition of "on-time" is to be seated at the start of roll call at the top of the hour. If the class starts at 8AM, be seated by 8AM.

2. It is the **student's responsibility**, not the instructors, to inform the instructor before the end of that class period that he/she is tardy but present.

3. It is the student's responsibility to inform the instructor of any planned absences.

4. Perfect participation will earn a class participation grade of 100, to be averaged with your test grades, if your academic average equals a passing grade.

5. Each unexcused absence will result in a 5-point loss on your participation grade. Each unexcused tardy will result in a 3- point loss on your participation grade.

6. Excessive non-participation will require the student to receive a failing grade.

7. The student will fail the course if unexcused absences exceed 15% of total classes, or any combination of excused or unexcused absences exceed 25 % of classes (or flights). This includes up to the last class meeting, regardless of that student's test grade average. The maximum absence for a class that meets 3 times a week is 6 unexcused and total absences not to exceed 11. For a class that meets 2 times a week is 4 unexcused and 7 total absences. One absence past this limit, results in a failing grade. Any appeal or reconsideration to continue will be with the Department Chair. ***This policy applies to scheduled flight training.***

**Class participation:** means being present in appropriate attire, on time, with all required textbooks and materials, and taking an active part in the classroom lesson. Participation points may be deducted for not meeting the participation requirements, or sleeping in class.

**Grading Procedures:**

1. Every exam may be comprehensive, covering material for that unit and any previous material.

2. Test material may come from the textbook, handouts, lectures, videos, and/or class projects.

3. Unscheduled quizzes may be given at the discretion of the instructor.

4. Missed Exam: One missed exam may be made up for an excused absence.

5. Grades will be the average of tests, homework, quizzes and if applicable, the class participation grade (refer to: **Class Participation Policy #4**). Presentations, projects, or other assignments may also be averaged into the final grade at the discretion of the instructor.

6. Passing this course will require a minimum overall course grade of 70%.

7. The student cannot fail more than one test per course. More than one test score below 70 is a failure of the entire course with a final grade of "D" or "F". The grade difference between "D" and "F" will be based on the average of the test scores. Students with no unexcused absences may retake one failed exam for the semester. Re-examination must be completed prior to the next test with method and type at the Instructor's discretion, and your highest grade will be 70.

8. Flight privileges may be suspended from student pilots who do not maintain a passing grade in any APT ground school course.

9. The instructor reserves the final authority in evaluating students involved in extenuating circumstances concerning class attendance and grading policy.

10.Cheating of any kind will result in immediate referral to the Student Dean and removal from the program.

** Note:* The grade "D" represents performance below the minimal performance level sufficient for related job entry. The grade of "D" cannot count toward credit for graduation, if received in a student's major courses.

**Academic Exams/FAA Writtens and Flight Training:**

1. For each semester with a course of instruction that has a corresponding FAA written exam associated it, the FAA written exam will be the final exam for that course (APT students only). Example: Private Pilot ground will have the Private Pilot FAA written for the final exam. Instrument ground, Commercial ground and CFI ground have the same requirements.

2. Students will present a Laser Scan grade sheet to the instructor from an approved FAA test center. Grades above a 70 are passing. If the student opts to not take their FAA exam, they will not pass the course.

3. FAA written exams require an endorsement by a CFI or AGI/IGI. Check with your instructor in plenty of time to prepare for your exam. Check with your flight instructor or the Chief Pilot to do online test prep for any FAA Written. The APT department provides online test prep

support and services.

4. If a student fails an FAA written, they may retake within the semester the test is required. If a second test is not passed, the student will be placed on academic and/or flight suspension.

## Resources

***Textbooks & Publications:***

| Item | Title | Author | Publisher | Edition | ISBN |
|---|---|---|---|---|---|
| 1 | The Illustrated Guide to Aerodynamics | H.C. "Skip" Smith | TAB Books | | 0-8306-3901-2 |

***Tools, Materials:***

| Item | Resource | Quantity |
|---|---|---|
| 1 | Internet capable (wireless) Laptop/Tablet (for access to Moodle, WebAdvisor, etc) | 1 |

| Grade Scheme | | |
|---|---|---|
| **Category Description** | | **Category Value** |
| Unit Tests | | 72% |
| **Assessment Label:** | **Assessment Description** | **Assessment Value** |
| Unit 1 TEST: | Complete Test 1 | 18.00% |
| Unit 2 TEST: | Complete Test 2 | 18.00% |
| Unit 3 TEST: | Complete Test 3 | 18.00% |
| Unit 4 TEST: | Complete Test 4 | 18.00% |
| **Category Description** | | **Category Value** |
| Final Exam | | 18% |
| **Assessment Label:** | **Assessment Description** | **Assessment Value** |
| FINAL Exam: | Complete Final Exam | 18.00% |
| **Category Description** | | **Category Value** |
| Participation | | 10% |
| **Assessment Label:** | **Assessment Description** | **Assessment Value** |
| PARTICIPATION: | Class Participation | 10.00% |
| | Total Assessment Percent | **100.00%** |
| | Total Category Percent | **100.00%** |
| **A = 100-90** | **B = 89-80** | **C = 79-70** | **D = 69-60** | **F = 59-0** |

| Description of Graded Elements of the Course | | | |
|---|---|---|---|
| **Assessment Label** | **Assessment Description/Course outcomes met** | **Assessment Value in Percent** | **% of Final Grade** |
| Unit 1 TEST | Complete Test 1<br>**Course outcomes met:** CO1, CO4 | 18.00 | 18.00% |
| Unit 2 TEST | Complete Test 2<br>**Course outcomes met:** CO2 | 18.00 | 18.00% |
| Unit 3 TEST | Complete Test 3<br>**Course outcomes met:** CO5 | 18.00 | 18.00% |
| Unit 4 TEST | Complete Test 4<br>**Course outcomes met:** CO1, CO4, CO5 | 18.00 | 18.00% |
| FINAL Exam | Complete Final Exam<br>**Course outcomes met:** CO1, CO3, CO4, CO5, CO2 | 18.00 | 18.00% |
| PARTICIPATION | Class Participation<br>**Course outcomes met:** CO6 | 10.00 | 10.00% |
| | | **100.00** | **100.00%** |

## Course Schedule

| Unit/ Week | Unit Description/Objectives | Assessment Label:Description | Due Date |
|---|---|---|---|
| 1 | Unit 1 - WEEK 1<br><br>By the end of this week, students will be able to: | | |
| | • Define aerodynamics; aerostatics; heavier-than-air flight and their differences<br>• List the historical progression of how manned, heavier-than-air flight came into being<br>• State the impact on aviation science that Cayley, Lilienthal, Chanute, Maxim, and the Wright brothers made<br>• Describe balloon and atmospheric density and how that affects heavier than-air flight | *ASSIGNMENT - 1, Read Ch. 1* | |
| 2 | UNIT 1 - WEEK 2<br><br>By the end of this week, students will be able to: | | |
| | • Describe the four forces of flight.<br>• Describe Bernoulli's principle and how it affects the production of lift.<br>• Describe how lift is generated on an airfoil<br>• List Newton's law of motion that aids in the production of lift.<br>• Describe how a cambered, symmetrical, and inverted airfoil produces lift<br>• Describe the dynamics of a stall, how it is formed and how one recovers from a stall.<br>• List the different wing shapes and how stalls are generated on those wings and how that affects aircraft control.<br>• Write the formula for the coefficient of lift.<br>• Determine the aspect ratio of a wing.<br>• List the benefits of a high or low aspect wing ratio | *ASSIGNMENT - 2: Read Ch. 2*<br>*Worksheet - 2: Complete Ch. 2 Worksheet* | |
| 3 | UNIT 1 - WEEK 3<br><br>By the end of this week, students will be able to: | | |
| | • List the different types of drag devices, their purposes, their general effects, their mechanics (flaps, spoilers).<br>• Define and accurately relate the terms: Pressure drag, Skin friction drag, Profile drag, Form drag, Interference drag and cooling drag<br>• Describe laminar flow.<br>• Draw an airfoil profile and detail the flow of air over the airfoil, denoting the location of laminar and turbulent air flows.<br>• Define Reynolds Number and how it affects the airfoil. | *ASSIGNMENT - 3: Read Ch. 3*<br>*Worksheet - 3: Complete Ch. 3 Worksheet*<br>**Unit 1 TEST:** Complete Test 1 | As Scheduled |
| 4 | Unit 2 - WEEK 4<br><br>By the end of this week, students will be able to: | | |
| | • Describe "wakes and pressure drag".<br>• Write the coefficient of drag formula and describe its components<br>• Detail how induced drag is formed on a lift/drag profile chart<br>• List the factors that increase induced drag.<br>• Show a plot of total drag on a drag chart<br>• Define flat plate area.<br>• Define Ground Effect.<br>• Draw how induced drag is changed while an | *ASSIGNMENT - 4: Continue to read Ch. 3*<br>*Worksheet - 4: Complete Ch. 3 Worksheet* | |

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| | airfoil is in ground effect. | |
| 5 | UNIT 2 - WEEK 5<br><br>By the end of this week, students will be able to: | |
| | • Describe how a propeller overcomes drag with thrust<br>• Describe how drag overcomes thrust with a propeller<br>• List the different types of propulsion systems and their associated efficiencies<br>• Describe how propellers work in theory in relation to air mass moved<br>• Describe how jet engines work in theory in relation to air mass moved<br>• List the different types of turbine engines<br>• Define resultant velocity.<br>• State why variation in rotational velocity is critical to propeller design and the associated factors with this variation | *ASSIGNMENT - 5: Read Ch. 4*<br>*Worksheet - 5: Complete Ch.4 Worksheet* |
| 6 | UNIT 2 - WEEK 6<br><br>By the end of this week, students will be able to: | |
| | • List the different types of propulsion systems and their associated efficiencies<br>• List the different types of turbine engines<br>• Define the effects of weight on takeoff field lengths, angles and rates of climb, cruise speeds, maneuverability and stalls.<br>• Describe the effects of a too far forward C.G on aircraft stalling and handling characteristics<br>• Describe the effects of a too far forward C.G on aircraft stalling and handling characteristics. | *ASSIGNMENT - 6: Read Ch. 4*<br>*Worksheet 6 - complete module Ch. 4 in accordance with lecture and reading materials*<br>**Unit 2 TEST:** Complete Test 2 As Scheduled |
| 7 | Unit 3 - WEEK 7<br><br>By the end of this week, students will be able to: | |
| | • Describe power available verses power required and how it affects climb performance<br>• Describe the best overall glide speed one can achieve and what that will do for an aircraft<br>• Identify the best L/D speed and what that speed does for range, fuel, endurance and glide.<br>• Describe the dynamics and definition of flying on the back side of the power curve.<br>• Write how altitude affects performance<br>• Describe balanced field length for a twin-engine aircraft<br>• Draw the arm and moment of the dynamics associated with the critical engine on a twin engine airplane | *ASSIGNMENT- 7: Read Ch. 5*<br>*Worksheet 7 - Lab complete module Ch. 5 in accordance with lecture and reading materials* |
| 8 | UNIT 3 - WEEK 8<br><br>By the end of this week, students will be able to: | |
| | • Describe methods of increasing range based on fuel efficiencies and aircraft performance (P.O.H on optimum R.P.M and mixture settings).<br>• Define minimum power and how it relates to max range.<br>• Define maximum endurance and how it relates to cruise efficiency<br>• Describe the balance between high and low power settings and how this affects flight performance.<br>• Describe balanced field length and landing. | *ASSIGNMENT - 8: Read Ch. 5*<br>*ASSIGNMENT - 8A: Handouts: Airfoil Testing*<br>*Worksheet 8 - complete module Ch. 5 in accordance with lecture and reading materials. Complete extra-credit exercise in wind-tunnel tested, airfoil design at student's discretion* |

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| | (P.O.H charts)<br>• Define Vc and how it relates to optimum speed ranges | |
| 9 | UNIT 3 - WEEK 9<br><br>By the end of this week, students will be able to: | |
| | • Describe how the total drag on an aircraft degrades aircraft performance<br>• Define Power.<br>• Describe the ratio of horsepower required to various airspeeds<br>• Describe horsepower available for thrust.<br>• Define the front side of the power curve.<br>• List the performance trade-offs for more horsepower that an airplane experiences<br>• Show how rate of climb is determined<br>• Show how angle of climb is determined<br>• Show how with a gain in altitude, power required and power available are changed | *ASSIGNMENT - 9: Read Ch. 5*<br>*Worksheet 9 - complete module Ch. 5 in accordance with lecture and reading materials*<br><br>**Unit 3 TEST:** Complete Test 3 As Scheduled |
| 10 | UNIT 4 - WEEK 10<br><br>By the end of this week, students will be able to: | |
| | • Define Absolute ceiling.<br>• Define Service ceiling<br>• List the load limits for standard and utility aircraft<br>• Explain a velocity-load factor (V-n) diagram | *ASSIGNMENT - 10: Read Ch. 6*<br>*Worksheet 10 - complete module Ch. 6 in accordance with lecture and reading materials.* |
| 11 | UNIT 4 - WEEK 11<br><br>By the end of this week, students will be able to: | |
| | • Describe the Range of CG and how that range affects stability<br>• Detail the movements of the three Stability/Controllability axes and what controls are used to move those axes<br>• List the different stabilities and the ways pilots make changes to those stabilities<br>• Describe Turning performance. | *ASSIGNMENT - 11: Read Ch. 7*<br>*Worksheet 11 - complete module Ch. 7 in accordance with lecture and reading materials* |
| 12 | UNIT 4 - WEEK 12<br><br>By the end of this week, students will be able to: | |
| | • Describe Compressibility.<br>• List the Mach speeds associated with subsonic, transonic, supersonic and hypersonic fight<br>• Detail the difficulties experienced while flying at transonic flight speeds<br>• List the advantages and disadvantages of swept wings at slow and high speed flight<br>• Describe how vortex generators work and their purpose<br>• Define area rule and how it works<br>• Describe Shock layer.<br>• List the interactions between the shock layer and the boundary layer | *ASSIGNMENT - 12: Read Ch. 7*<br>*Worksheet 12* |
| 13 | UNIT 4 - WEEK 13<br><br>By the end of this week, students will be able to: | |
| | • Define the design specification parameters that manufacturers use when designing an aircraft.<br>• Describe the areas that aircraft specifications cover for a specific design<br>• List the FARs that govern aircraft design and certification | *ASSIGNMENT - 13: Read Ch. 8*<br>*Worksheet 13 - complete module Ch. 8 in accordance with lecture and reading materials* |

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| | certification.<br>• List the design phases<br>• Detail the design considerations in:<br><br>1) Fuselage Design<br>2) Wing Design<br>3) Planform selection<br>4) Airfoil selection<br>5) Engine selection<br>6) Landing gear selection<br>7) Tail design and configuration<br>• List the advantages and disadvantages of high and low-wing aircraft<br>• Describe how manufacturers decrease interference drag. | |
| 14 | UNIT 4 - WEEK 14<br><br>By the end of this week, students will be able to: | |
| | • List the five significant aerodynamic developments and their contribution to aviation<br>• Describe how drag cleanup is performed<br>• List the advantages/disadvantages of canards<br>• Define effective aspect ratio.<br>• Detail the overall effects of winglets on total aircraft performance<br>• Define laminar flow airfoil and detail why it is a more complex design than regular airfoils<br>• Name at least five future developments in general aviation. | *ASSIGNMENT - 14: Read Ch. 10*<br>*Worksheet 14 - complete module Ch. 10 in accordance with lecture and reading materials*<br>**Unit 4 TEST:** Complete Test 4 — As Scheduled |
| 15 | FINAL WEEK 15 | |
| | | **FINAL Exam:** Complete Final Exam — As Scheduled<br>**PARTICIPATION:** Class Participation — Throughout course |