Special Topics: Compressible Flow and Gas Turbines ENGR 4390.008  
Department of Engineering  
Fall 2020

A. COURSE INFORMATION

Course number/section: ENGR-4390.008  
Class meeting time: TR 8:00-9:15 AM  
Class location: RFEB 316B  
Course Website: https://bb9.tamucc.edu

B. INSTRUCTOR INFORMATION

Instructor: Dr. David Bridges  
Office location: RFEB 222E  
Office hours: MW 3:00 PM-5:00PM, F 1:00-3:00  
Telephone: 361-825-2181  
Email: david.bridges@tamucc.edu  
Appointments: send an e-mail request for appointment, with proposed time.

C. COURSE DESCRIPTION

Catalog Course Description
(3 sem. hrs. 3:0) Introduction to compressible flows: isentropic flow, normal shocks, oblique shocks, expansion fans, internal flows. Flows with friction and heat addition. Introduction to gas turbine cycle and components. Derivation of thrust equation for turbojet engines.

Extended Course Description
This course is an introduction to the concepts of compressible flow, where Mach number effects become important. Shock waves, expansion fans, and internal flows including inlet and wind tunnel test sections flows are considered. The basic gas turbine thermodynamic cycle with thermodynamic efficiencies is examined and used to derive the thrust equation for turbojet engines, and components of gas turbines, including inlets, compressors, burners, turbines, and nozzles are considered.

D. PREREQUISITES AND COREQUISITES

Prerequisites
1. Prerequisite course required: ENGR 3315 Fluid Mechanics or ENTC 3306 Fluid Mechanics.  
2. Prerequisite course required: ENGR 3316 Thermodynamics or ENTC 3320 Thermodynamics.

Corequisites
None

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES

Optional Textbook(s) or Other References: None
Supplies: None.

F. STUDENT LEARNING OUTCOMES AND ASSESSMENT

By the end of this course, students should be able to:

- Compute quantities associated with compressible isentropic flows.
- Compute quantities associated with normal and oblique shock waves.
- Compute quantities associated with expansion fans.
- Compute quantities associated with compressible flow through converging-diverging ducts, including supersonic wind tunnel flows.
- Compute quantities associated with compressible flows with friction and heat addition.
- Compute quantities associated with gas turbine engines.
- Compute the thrust produced by a turbojet engine.
- Identify gas turbine engine components and component features.

G. INSTRUCTIONAL METHODS AND ACTIVITIES

Course will be based primarily on lectures, assignments, two midterms and final exam. Assignments will be given to review learning progress in general.

H. MAJOR COURSE REQUIREMENTS AND GRADING

Assessment is based on three in-class tests, homework, and a final exam. The final exam is comprehensive. You may examine the final exam within four weeks after the final grades are assigned.

Homework is due at the beginning of class on the classroom desk on the due date. Any time thereafter is considered late and will need to be accepted by instructor. A deduction of points may be given. Leaving it on my inbox does not guarantee it will be accepted. If submitting it early the assignment needs to be labeled clearly on front of it.

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL</th>
<th>Total Score</th>
<th>Tentative Grade</th>
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<tr>
<td>Homeworks/Projects</td>
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<td>A</td>
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<tr>
<td>Test 1</td>
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<td>80 ≤ total &lt; 90</td>
<td>B</td>
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<tr>
<td>Test 2</td>
<td>20</td>
<td>70 ≤ total &lt; 80</td>
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<td>Test 3</td>
<td>20</td>
<td>60 ≤ total &lt; 70</td>
<td>D</td>
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<tr>
<td>Final Exam</td>
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<td>total &lt; 60</td>
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<td>TOTAL</td>
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I. COURSE CONTENT/SCHEDULE

Dates for exams are tentative, subject to change

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<thead>
<tr>
<th>DATE</th>
<th>TOPIC</th>
<th>CHAPTER</th>
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<tr>
<td>20 Aug 2020</td>
<td>First day of class; Introduction</td>
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<tr>
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<td>Equations of Steady One-Dimensional Compressible Flow</td>
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<td>26 Aug 2020</td>
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<td>Fundamental Aspects of Compressible Flow</td>
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<td>One-Dimensional Isentropic Flow</td>
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<td>15 Sept 2020</td>
<td>Test 1</td>
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<td>Normal Shock Waves</td>
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<td>Oblique Shock Waves</td>
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<td>Expansion Waves: Prandtl-Meyer Flow</td>
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<td>15 Oct 2020</td>
<td>Test 2</td>
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<td>Variable Area Flow</td>
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<td>Adiabatic Flow in a Duct with Friction</td>
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<td>5 Nov 2020</td>
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<td>Flow with Heat Addition or Removal</td>
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<td>12 Nov 2020</td>
<td>Test 3</td>
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<td>Gas turbine cycle and thrust equation</td>
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<td>Gast turbine engine components</td>
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Please consult the Academic Calendar for Holidays and class drop deadlines
https://www.tamucc.edu/academics/calendar/fall-2020.html

Note: Changes in this course schedule may be necessary and will be announced to the class by the Instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

J. COURSE POLICIES

COVID-19

Face Coverings—Face coverings (cloth face covering, surgical mask, etc.) must be properly worn in all non-private spaces including classrooms, teaching laboratories, common spaces such as lobbies and hallways, public study spaces, libraries, academic resource and support offices, and outdoor spaces where 6 feet of physical distancing is difficult to reliably maintain. Extra masks will be made available if needed.
Attendance/Tardiness
- Students are expected to be in attendance, punctual, and prepared for class.

Late Work and Make-up Exams
- Late work is not going to be accepted. Make-up Exams are only arranged with 1 week prior notice. No make-up exam will be arranged after each exam.

Cell Phone Use
- Please refrain from the use of electronic devices during class, as it is distracting to not only you, but also to your instructor and peers. Silence your phones and put them away so you are not tempted to stray off task.

Laptop Use
- Laptops will be permitted for particular activities as deemed appropriate.

Food in Class
- No food or drinks are allowed during class.

Missed Exam
- If you have a conflict with an exam date, please let me know as soon as you know about the conflict.

Others
- All work submitted for grading must be the student's own work. Plagiarism will result in a score of 0 (zero) for the work or dismissal from the course and the Dean of Students office will be notified. No copying from another student's work of any type is allowed. It is the student's duty to allow no one to copy his or her work.

K. COLLEGE AND UNIVERSITY POLICIES

• Academic Integrity (University)
  University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

• Classroom/Professional Behavior
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.
• **Statement of Civility**
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

• **Deadline for Dropping a Course with a Grade of W (University)**
  I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. **Please consult with your academic advisor, the Financial Aid Office, and me, before you decide to drop this course.** Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Please consult the Academic Calendar ([http://www.tamucc.edu/academics/calendar/](http://www.tamucc.edu/academics/calendar/)) for the last day to drop a course.

• **Grade Appeals (College of Science and Engineering)**
  As stated in University Procedure 13.02.99.C0.03, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is required to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C0.03, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at [http://academicaffairs.tamucc.edu/rules_procedures/assets/13.02.99.c0.03_student_grade_appeals.pdf](http://academicaffairs.tamucc.edu/rules_procedures/assets/13.02.99.c0.03_student_grade_appeals.pdf). For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

• **Disability Services**
  The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

If you are a returning veteran and are experiencing cognitive and/or physical access
issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816. http://disabilityservices.tamucc.edu/

- **Civil Rights Complaints**
  Texas A&M University–Corpus Christi is committed to fostering a culture of caring and respect that is free from discrimination, relationship violence and sexual misconduct, and ensuring that all affected students have access to services. For information on reporting Civil Rights complaints, options and support resources (including pregnancy support accommodations) or university policies and procedures, please contact the University Title IX Coordinator, Sam Ramirez (Samuel.ramirez@tamucc.edu) or Deputy Title IX Coordinator, Rosie Ruiz (Rosie.Ruiz@tamucc.edu) x5826, or visit website at Title IX/Sexual Assault/Pregnancy.

**Limits to Confidentiality.** Essays, journals, and other materials submitted for this class are generally considered confidential pursuant to the University’s student record policies. However, students should be aware that University employees, including instructors, are not able to maintain confidentiality when it conflicts with their responsibility to report alleged or suspected civil rights discrimination that is observed by or made known to an employee in the course and scope of their employment. As the instructor, I must report allegations of civil rights discrimination, including sexual assault, relationship violence, stalking, or sexual harassment to the Title IX Coordinator if you share it with me.

These reports will trigger contact with you from the Civil Rights/Title IX Compliance office who will inform you of your options and resources regarding the incident that you have shared. If you would like to talk about these incidents in a confidential setting, you are encouraged to make an appointment with counselors in the University Counseling Center.

- **Statement of Academic Continuity**
  In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

L. **OTHER INFORMATION**

- **Academic Advising**
  The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins.
Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

GENERAL DISCLAIMER

I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods, and will post any changes or updates on Blackboard.