AE 4080 Syllabus

Aerothermodynamics, Section A, 3 Credits

Fall 2026

Instructor Information

Instructor: Dr. John Dec

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General Course Information

Description

AE4080 is an undergraduate level options course which introduces students to hypersonic flow. The course content includes inviscid hypersonic flow theory, hypersonic aerodynamics, introduction to viscous hypersonic flow, aerothermodynamic heating, the fundamentals of heat transfer and the design of thermal protection systems. Throughout the course, comparisons are made between the calorically perfect gas assumption and the effects of a high temperature, chemically reacting gas.

Course Learning Outcomes

Upon successful completion of the course, you should be able to:

- Understand the governing equations for hypersonic flows.
- Approximate the hypersonic pressure distribution around a vehicle
- Approximate the aerodynamic coefficients for a hypersonic vehicle
- Calculate an approximate value for the stagnation point aerodynamic heating and at any location along a hypersonic vehicle.
- Understand the fundamentals of heat transfer.
- Approximate the thickness of a thermal protection system (TPS).

Required Course Materials

Required Text

Bertin, John J., *Hypersonic Aerothermodynamics,* AIAA Education Series, 1994.

Recommended Texts

Anderson, John D., *Hypersonic and High Temperature Gas Dynamics*, 3rd Edition, AIAA Education Series, 2019

Bergman, T.L., Lavine, A.S., Incropera, F.P., DeWitt, D.P., *Fundamentals of Heat and Mass Transfer,* 8th Edition, Wiley 2019

Liberty, J., *Sam's Teach Yourself C++ in 21 days,* 5th edition

Grading Policy:

10% Homework
20% Midterm
15% Computer Project Phase 1
15% Computer Project Phase 2
20% Computer Project Phase 3, with final report
20% Final Exam

A 90-100; B: 80-90; C: 70-80; D: 60-70

Description of Graded Components

The midterm and final are closed book, closed note exams. You are allowed one 8.5 x 11 equation sheet. The midterm will be given during the normal class period, the final at the designated time dictated by the registrar. The project for the course is split into three phases where each phase builds upon the previous phase. Students will be given a MATLAB (or C++) library which computes the equilibrium flow properties of a chemically reacting gas which they must incorporate into their own computer program. The third phase of the project includes a final report and as such is more heavily weighted.

Course Policies

Attendance and/or Participation

This will be an active classroom, where you will be expected to participate. I have noticed a drastic difference in the exam performance between students who regularly attend class and those who don't.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Core IMPACTS

Not applicable

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Pre- &/or Co-Requisites

AE 3030 Aerodynamics (really you need AE 2010)

Collaboration, Group Work, and Use of Generative AI

Generative AI-based assistance, such as, but not limited to ChatGPT and Copilot, is comparable to collaboration with other people – for an individual assignment, directly using the output from AI is a violation of the Honor Code, ie asking it to solve a homework problem, or write your computer project code.

This course is designed to teach you how to think analytically and develop your engineering intuition, so all work you submit must be your own. You should never include in your assignment anything that was not written/calculated directly by you without proper citation (including quotation marks and in-line citation for direct quotes).

Inclusion of anything you did not write/calculate on your own in your assignments without proper citation will be treated as academic misconduct case. If you are unsure if you have gone too far consider these two simple guidelines: (1) avoid hitting ”copy” in a conversation with an AI assistant; (2) do not have both your assignment and the AI agent open at the same time. Avoid using tools that directly add content to your submission. Use of spell and grammar checkers are acceptable (and encouraged) for all assignments

Extensions, Late Assignments, & Re-Scheduled/Missed Exams

- Homework assignments are due at 11:59pm the day they are due. Late homework assignments will incur a -10% per day for being “reasonably” late. The 10% penalty is prorated meaning if an assignment is 6 hours late, the penalty would be 2.5% taken off. Reasonably late is defined as **no more than 3 days**, assignments submitted after that time or after solutions are posted will not be accepted and receive a grade of 0%. If you have technical issues with Canvas around the submission deadline, you should immediately e-mail the TA’s and copy me with the assignment attached and a brief explanation of the issues.
- Each student will be allotted 6, 24-hour late passes. You may use up to 3 at a time. These passes are binary, meaning if you are 6 hours late it counts as one pass. No free weekend passes. If an assignment is due on Friday at midnight, if you turn it in sometime on Monday that would require 3 passes. Passes may not be used when homework solutions need to be posted immediately after it is due, this typically happens on HW due before the midterm. The late passes may also be used for the computer project phases. **Late pass use must be declared at the time you submit the assignment by adding a comment in Canvas to your submission.**
- Extensions MAY be granted in cases where extenuating circumstances prevented the student from reasonably completing an assignment on time.

Examples include Illness (with a Dr's note via Office of Student Life), emergencies, family situations, and institute excused absences. In these cases, late passes do not need to be used.
- Extensions WILL NOT be granted for workload/time management issues and or normal stress encountered as an engineering student

The Office Student Life can assist you with documented emergencies and illnesses by contacting me on your behalf. Do not send me medical diagnoses or notes from Stamps, you can request assistance here and the Office of Student Life will notify me

Inclement Weather and Digital Learning Days

In the event of inclement weather or other unforeseen event preventing us from meeting in-person, we will pivot to digital learning. A Zoom meeting will be created and posted on Canvas.

Campus Resources for Students

Georgia Tech and the School of Aerospace Engineering understand that many students experience stress through a variety of academic, financial and personal experiences. We value you and want to make you aware of resources available to you should you need them. Your well-being and mental health are important, and we are here for you.

Undergraduate Student Academic Success Resources:

- Academic Support: Academic Success and Advising (a unit in the Office of Undergraduate Education & Student Success) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To explore what options work best for you, please visit us online at success.gatech.edu/tutoring, email us at tutoring@gatech.edu, or come see us at Clough Undergraduate Learning Commons, Suite 283.
- Center for Assessment, Referral and Education (CARE) https://care.gatech.edu/
- Campus Police (any emergency): 404-894-2500 http://www.police.gatech.edu/
- Counseling Center: 404-894-2575 https://counseling.gatech.edu/
- Dean of Students Office: 404- 894-6367 https://studentlife.gatech.edu/
- Georgia Crisis and Access Line: 800-715-4225
- National Suicide Prevention Lifeline: 800-273-TALK (8255) https://suicidepreventionlifeline.org/
- Crisis Text Line: Text HOME to 741741

- VOICE: Victims Survivor Support: (404) 385-4464 (or 4451)
  http://healthinitiatives.gatech.edu/well-being/voice
- Stamps Health Services https://health.gatech.edu/contact