August 26, 2025

AE433
Aerospace Propulsion
Fall 2025

SUMMARY of Important E-Platforms for this Course

- Gradescope - https://www.gradescope.com/ - for downloading and uploading homework and exams, post-class quizzes, and tracking your grades and performance in the course. Entry Code: PGB3YX
- CANVAS - https://canvas.illinois.edu/ - for announcements and course handouts
- Media Space – https://mediaspace.illinois.edu/channel/channelid/379674422 - lecture videos

Pre-Requisite: AE 312 and Phys 212
Credit: 3 undergraduate hours. 4 graduate hours
Instructor: J.L. Rovey, 302B Talbot Lab, Phone: 217-300-7092, email: rovey@illinois.edu
Class Time and Location: TTh, 11:00-12:20 p.m., 1320 Digital Computer Laboratory (DCL)
Office hours: Tues. 9:30-10:30am in my office and on ZOOM, and by appointment

Meeting URL: https://illinois.zoom.us/j/87031345017?pwd=OlnAaOl6V1m3MkhNm0qbhhmRp8iAdO.1
Meeting ID: 870 3134 5017
Password: 410706

Teaching Assistants (all office hours on zoom, some also in-person):
Rohan Puri rohanp5@illinois.edu - lead for grading

- Office Hours: MW 4-6pm Nuclear Eng. Lab, 103 S. Goodwin, Rm105 and ZOOM

Chinmay Upadhye upadhye3@illinois.edu - lead for CANVAS discussion boards

- Office Hours: T 5-7pm Transportation Bldg Rm 203 and ZOOM, Th 5-7pm Zoom-only

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Course Assistants: Israel Sanchez & Matt Devor - grading assistance

Course Description: Fundamentals of airbreathing jet propulsion devices; prediction of thrust, combustion reactions, specific fuel consumption, and operating performance; ramjets; turbojets; turbofans; turboprops; aerothermodynamics of inlets, combustors, and nozzles; compressors, turbines; component matching.

Course Objectives:
The purpose of this course is to develop a mastery of the fundamental concepts of the mechanics and thermodynamics of propulsion devices, specifically the analysis of air-breathing engines.

This is a Note-Intensive Class!
All Lecture Notes are provided as a PDF in CANVAS on the first day of class.
Much of the material is given only in lecture notes.
YOU are responsible for attending class and taking notes.
The text is important but only supplementary to the notes.

Recommended Text: Mechanics and Thermodynamics of Propulsion, Philip Hill & Carl Peterson

Other Useful References: Mattingly, Elements of Propulsion: Gas Turbines and Rockets, AIAA Education Series, Modern Compressible Flow, 3rd Edition, John D. Anderson, Rocket Propulsion Elements, George P. Sutton & Oscar Biblarz, Aerothermodynamics of Gas Turbine and Rocket Propulsion, 3rd Edition, Gordon Oates.

Grading:

Letter Grade	Score
A	93 and above
A-	90-93
B+	87-90
B	83-87
B-	80-83
C+	77-80
C	73-77
C-	70-73
D	60-70
F	<60

Weighting:

Exam 1	20%
Exam 2	20%
Homework (~11assignments+GasTurb project)	25%
Final Exam	35%

There are NO make-up exams. The final exam is cumulative (it covers everything). Homework will be due at 5pm on Fridays. Late Homework will NOT be accepted. If I cannot read it, I will not grade it. This applies to both homework & exams. Homework is available on and turned in through Gradescope.

Course Schedule:

WEEK	TOPIC	READING:*
	FUNDAMENTALS	
24-Aug	Introduction, Thermodynamics Review	N Ch 1&2, O Ch. 1&2, M Ch. 1&2, A 1.4
31-Aug	Conservation Equations	N Ch 3, O Ch. 2, M Ch. 2, A Ch. 2
7-Sep	Compressible Flow Review – ***YIKES!***	N Ch 4, O Ch. 2, M Ch. 2, A Ch. 3, 4, 5, HP Ch. 3
14-Sep	Compressible Flow, Combustion	N Ch 4&5, M Ch. 2.11, HP Ch. 2.4
21-Sep	Combustion – CEA	N Ch 5, M Ch. 2.11, HP Ch. 2.4
	EXAM 1 – Fundamentals Tues. 10/7	HW 1-5
	AIRBREATHING	
28-Sep	Thrust, Efficiency, Brayton Cycle	N Ch 6, O Ch. 5, M Ch. 4, HP Ch. 5.2
5-Oct	Direct Computation, Ideal Cycle Analysis	N Ch 6&7, O Ch. 5, M Ch. 5, HP Ch. 5.3, 5.4, 5.5
12-Oct	Ideal Cycle Analysis	N Ch 7, O Ch. 5, M Ch. 5, HP Ch. 5.3, 5.4, 5.5
19-Oct	Inlet, Burner	N Ch 8, O Ch. 6, M Ch 6, HP Ch 6, 7, & 8
26-Oct	Burner, Nozzle	N Ch 8, O Ch. 6, M Ch 6, HP Ch 6, 7, & 8
2-Nov	Compressor	N Ch 8, O Ch. 6, M Ch 6, HP Ch 6, 7, & 8
	EXAM 2 – Airbreathing Tues. 11/18	HW 6-11
	GASTURB SOFTWARE	
9-Nov	GasTurb Software	
16-Nov	GasTurb Software	
22-Nov	FALL BREAK WEEK	REVIEW FOR THE UPCOMING FINAL EXAM
30-Nov	Compressor, Turbine	N Ch 8, O Ch. 6, M Ch 6, HP Ch 6, 7, & 8
7-Dec	Turbine	N Ch 8, O Ch. 5, M Ch. 5, HP Ch. 5.3, 5.4, 5.5
	FINAL EXAM Monday 12/17 8-11AM – Location TBD	

Exams:

Exams will be in-person on the dates given in the course outline. The exam location may not be the same as the course lecture location (exact location(s) TBD). Exams 1&2 are 50 minutes each and the final exam is max 3 hours. Exams are entirely closed book. Typically the first section is multiple choice and only a pencil is allowed (no calculator, nothing). Then the second section has free-response problems (like homework) and a calculator and 8.5x11" notes sheet(s) are allowed. Each subsequent exam you can use an

* N = Notes, O = Oates, M = Mattingly, A = Anderson, HP = Hill & Peterson, S = Sutton, Ch = chapter

additional notes sheet. Specifically, exam 1 is one 8.5x11" paper front and back, exam 2 is two sheets, and final exam is three sheets. There is no lecture class on exam days. Final Exam is cumulative, covers the entire course.

Post-class Quizzes (Extra Credit):
The post-class quiz is designed to help you raise your grade. After each lecture, I will post a short (usually 1 question) quiz on GradeScope. Each quiz will be worth 3 points. Each quiz becomes available to you immediately after class and must be completed within 24hrs. Since there are roughly 27 lectures (29 class days – 2 exam days = 27 lectures), you can obtain a maximum of 81 pts with the quizzes. At the end of the semester, I add these points to your earned homework points (numerator) without adjusting the total possible points (denominator). It is therefore possible to have >100% on homework. What does this mean in terms of your final grade? Let's assume you have a 75% on every assignment and exam throughout the semester. If you got all 81 pts from the quizzes, your final course grade is not 75% = C, it's 82% = B-.

Identification of Errors in the Notes (Extra Credit):
Students who identify and report to me an error that I judge to indeed be an error will receive 6 extra credit points. These points are applied to the homework score in the same way as Post-Class Quizzes. Again, because of this extra credit, it is possible to have >100% on homework.

4 Credit Hour Students:
Some of you may be enrolled for 4 credit hours. Students enrolled in 4 credit hours will complete 2 additional homework assignments (in addition to the ~11 assignments + GasTurb project a 3 credit hour student will complete). Your score on these additional homeworks is added to your overall earned homework points (numerator). The total possible points for these additional homeworks is also added to your total possible homework points (denominator). Therefore 4-credit and 3-credit hour students have different total possible homework points available.

Communication:
Please check your email daily. I also plan to use CANVAS to post HW, handouts, announcements, etc.
https://canvas.illinois.edu/

Academic Dishonesty: Violations of academic integrity are unacceptable. Review the University of Illinois student code section on Academic Integrity and Procedure for more information.
https://studentcode.illinois.edu/

Emergency Response:
Emergency response recommendations are provided by the University of Illinois Police Department. Review those procedures at: http://police.illinois.edu/safe

- http://police.illinois.edu/safe for more information on how to prepare for emergencies, including how to run, hide or fight and building floor plans that can show you safe areas.
- http://emergency.illinois.edu to sign up for Illini-Alert text messages.
- Follow the University of Illinois Police Department on Twitter and Facebook to get regular updates about campus safety