

**Aerospace Propulsion**  
**EAS4300 Section#07E7 (Class#18216)**

**Lecture Location and Time:** FLG0220  
**Class Periods:** MWF 8 (3:00 pm to 3:50 pm)  
**Academic Term:** Fall 2023

*It may become necessary to modify this syllabus during the semester.  
In this event, students will be notified, and the revised syllabus will be posted on the course web site.*

**Instructor:**

Bruce Carroll  
Room 218 MAE-A  
[bfc@ufl.edu](mailto:bfc@ufl.edu)  
352-392-4943 (office)  
Office Hours: MWF 1:30 to 2:30 (held via Zoom.) You can always contact the instructor to arrange Zoom meetings at other times.

**Teaching Assistants:**

TBD

**Course Description**

Basics of air-breathing and rocket engines used in flight systems. Credits: 3

**Course Pre-Requisites / Co-Requisites**

*EAS4132 Compressible Flow*

**Materials and Supply Fees**

None

**Course Objectives**

The objective of the course is to introduce students to air-breathing and rocket propulsion systems used for flight. The objective will be achieved through:

- Class lectures and examples
- Student completion of homework
- Student preparation for and completion of exams

**Professional Component (ABET):**

This course prepares graduates to have a knowledge of aerodynamics and to have design competence that integrates aeronautical topics.

**Relation to Program Outcomes (ABET):**

Outcome	Coverage*
1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Low
3) an ability to communicate effectively with a range of audiences	
4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Low
5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	
6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Low

\*Coverage is given as high, medium, or low. An empty box indicates outcome not significantly addressed by this course.

**Required Textbooks and Software**

*Mechanics and Thermodynamics of Propulsion*, P. Hill and C. Peterson, Addison-Wesley, 1991, ISBN 0201146592

**Additional Recommended Materials**

- None

**Required Computer:**

It is important that you have your own computer. Details are provided on both the department and college websites:

- <https://www.eng.ufl.edu/students/resources/computer-requirements/>
- <https://mae.ufl.edu/academics/prospective/undergraduate/computer-requirements/>

**Course Schedule**

- See table at end of syllabus.

**Attendance Policy, Class Expectations, and Make-Up Policy**

Regular class attendance is expected and will be monitored through occasional roll calls. Late HW and makeup exams are only allowed for students with documented circumstances consistent with UF policy. Students must contact the instructor as soon as possible to provide documentation and request a make-up exam. Excused absences must be consistent with university policies in the undergraduate catalog and require appropriate documentation. For more information on UF policies see

<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

**Evaluation of Grades**

- Homework: Homework will be assigned periodically during the semester. Students must submit HW online by the due date to receive credit.
- Attendance: Regular attendance is necessary to do well in the course. To help encourage attendance, roll will be taken from time to time and will count 5% of the total grade.
- During Term Exams: Two exams will be given during regular class time.
- Final Exam: The final exam is at the time slot scheduled by the UF Registrar

Assignment	Percentage of Final Grade
Homework	5%
Attendance	5%
During Class Exams (2)	60%
No Final Exam	30%
	100%

### **Grading Policy**

<b>Percent</b>	<b>Grade</b>	<b>Grade Points</b>
94 to 100	A	4.00
<94 to 90	A-	3.67
<90 to 87	B+	3.33
<87 to 84	B	3.00
<84 to 80	B-	2.67
<80 to 77	C+	2.33
<77 to 74	C	2.00
<74 to 70	C-	1.67
<70 to 67	D+	1.33
<67 to 64	D	1.00
<64 to 61	D-	0.67
<61 to 0	E	0.00

More information on UF grading policy may be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### **Students Requiring Accommodations**

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

### **Course Evaluation**

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.ua.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.ufl.edu/public-results/>.

### **In-Class Recording**

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

### **University Honesty Policy**

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://sccr.dso.ufl.edu/process/student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor in this class.

A violation of the honor code will result in academic sanctions (typically a failing grade of E assigned for the course) and further disciplinary action.

### ***Commitment to a Safe and Inclusive Learning Environment***

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- HWCOC Human Resources, 352-392-0904, [student-support-hr@eng.ufl.edu](mailto:student-support-hr@eng.ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### ***Software Use and Copyrighted Material***

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use and the use of copyrighted material. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### ***Student Privacy***

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

### ***Campus Resources:***

#### *Health and Wellness*

##### **U Matter, We Care:**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Counseling and Wellness Center:** <https://counseling.ufl.edu>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

##### **Sexual Discrimination, Harassment, Assault, or Violence**

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the [Office of Title IX Compliance](#), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

##### **Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

#### *Academic Resources*

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu).  
<https://lss.at.ufl.edu/help.shtml>.

**Career Connections Center**, Reitz Union, 392-1601. Career assistance and counseling; <https://career.ufl.edu>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus**: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

**On-Line Students Complaints**: <https://distance.ufl.edu/getting-help/>; <https://distance.ufl.edu/state-authorization-status/#student-complaint>.

<b>EAS4300 Aerospace Propulsion Schedule Fall 2023 (Tentative)</b>			
1	W	8/23	Intro
	F	8/25	Jet Propulsion Principle (Chapter 1), Fluid Momentum & Reaction Force, Rockets
	M	8/28	Propellers, Turbojets, Turbofans, Ramjets
	W	8/30	Thermodynamics Review Concepts (Chapter 2) – Ideal Gases
	F	9/1	Example Problems
	M	9/4	Holiday
	W	9/6	Thermodynamics Review – Combustion Thermodynamics
	F	9/8	Thermodynamics Review – Combustion Thermodynamics
	M	9/11	Example Problems
	W	9/13	Compressible Flow Review Concepts (Chapter 3) – General 1-D Flow Concepts
	F	9/15	Frictionless Constant-Area Flow with Stagnation Temperature Change
	M	9/18	Normal and Oblique Shocks
	W	9/20	Centered Expansions
	F	9/22	<b>Exam 1</b>
	M	9/25	Boundary Layer Mechanics and Heat Transfer (Chapter 4)
	W	9/27	Boundary Layer Equations
	F	9/29	Laminar BL Calculations
	M	10/2	Turbulent BL Calculations
	W	10/4	BL Heat Transfer
	F	10/6	Homecoming (No Class)
	M	10/9	Thermodynamics of Aircraft Jet Engines (Chapter 5) – Intro, Thrust and Efficiency
	W	10/11	Ramjet, Turbojet
	F	10/13	Turbofan
	M	10/16	Turboprop and Turboshift, Typical Engine Performance
	W	10/18	Engine-Aircraft Matching, Example Problems
	F	10/20	Aerothermodynamics of Inlets, Combustors, and Nozzles (Chapter 6)
	M	10/23	Subsonic Inlets
	W	10/25	Supersonic Inlets
	F	10/27	Gas Turbine Combustors
	M	10/30	Afterburners, Ramjet Combustors
	W	11/1	Exhaust Nozzles
	F	11/3	<b>Exam 2</b>
	M	11/6	Axial Compressors (Chapter 7)
	W	11/8	Angular Momentum, Work and Compression
	F	11/10	Holiday
	M	11/13	Single Axial Compressor Stage Performance
	W	11/15	Multistage Axial Compressor Performance
	F	11/17	Boundary Layer Limitations, Compressor Efficiency, Design Considerations
	M	11/20	No Class
	W	11/22	Holiday
	F	11/24	Holiday
	M	11/27	Performance of Rocket Vehicles (Chapter 10) – Static Performance, Vehicle Acceleration
	W	11/29	Chemical Rocket Thrust Chambers (Chapter 11)
	F	12/1	Chemical Rocket Thrust Chambers (Chapter 11)
	M	12/4	Chemical Rocket Propellants (Chapter 12)
	W	12/6	Chemical Rocket Propellants (Chapter 12)
		12/11	<b>Final Exam 10:00 AM - Noon</b>