

Compressible Flow

EAS 4132 / EML 5714, Fall 2019, M W F, 2nd period, 8:30 AM - 9:20 AM, NEB 0201

Professor

Assistant Professor S. A. E. Miller, Ph.D.
University of Florida Department of Mechanical and Aerospace Engineering
MAE-A 306, Gainesville, FL 32611, PO Box 116250
Preference - please contact through the canvas website <https://ufl.instructure.com>

Office Hours

M & W, 9:30-10:30 AM, MAE-A 306 or via confirmed written appointment

Teaching Assistants

Ms. Li Hsiao-Chi
Email: hcli@ufl.edu
Office Hours: Schedule via email
Location: NEB 109

Course Objectives

This course will introduce students to the theory, physics, and academic solutions of compressible fluid flow phenomena. We will examine the physics of shock waves, expansion waves, Mach waves, isentropic flow through nozzles and inlets, briefly examine Fanno/Rayleigh flow, wind tunnels, transonics, hypersonics, supersonic wings, and additional select topics of the professor's preference. Illustrations, videos, and photographs of the phenomena will be presented. Application of the material will be given in the context of the professor's research, contemporary developments, and historical perspective. The material will be presented during the lecture, through reading, and available on the class website. At the end of the course, the students will possess the foundational knowledge of compressible flow.

Course Description

Course catalogue, "One-dimensional and quasi-one-dimensional compressible fluid flows. Includes Mach waves, normal shocks, oblique shocks, Prandtl-Meyer expansions, isentropic flow with area change, Fanno flow, and Rayleigh flow." (Credits 3)

Course Pre-Requisites / Co-Requisites

EAS 4101 (Aerodynamics) and/or EGN 3353C (Fluid Mechanics), or consent of professor.

Recommended Textbooks and/or Software

- Various handout material provided digitally by professor. No software is required. A scientific calculator is highly recommended.

Supplemental Materials

- John, J. E. and Keith, T. G., 'Gas Dynamics,' Pearson Prentice Hall, ISBN: 9780131206687, 2006.
- Liepmann, H. W. and Roshko, A., 'Elements of Gasdynamics,' Dover Publications, ISBN: 978-0486419633, 2002.
- Anderson, J. D., 'Modern Compressible Flow : With Historical Perspective,' McGraw-Hill Education, ISBN: 978-0072424430, 2002.
- Oosthuizen, P. H. and Carscallen, W. E., 'Introduction to Compressible Fluid Flow,' CRC Press, ISBN: 978-1439877913, 2013.
- Shapiro, A. H., 'The Dynamics and Thermodynamics of Compressible Fluid Flow, Vols. 1 and 2,' John Wiley & Sons, 1953.

Materials and Supply Fees

None.

Important Dates

Final Exam: 12/12/2019 @ 12:30 PM - 2:30 PM

Midterm and homework dates are introduced in class or through the website.

Attendance Policy

- It is expected that students attend class.
- Required statement by the University of Florida: Excused absences are consistent with university policies in the undergraduate catalog and require appropriate documentation.

Class Expectations

- Students are expected to refrain from using cell phones or other distracting devices in class.
- Students are highly encouraged to create their own notes.

Policy on Deadlines

- Late submission of class material is not accepted.
- If a tragedy has occurred then instructor notifications are required. See <https://care.dso.ufl.edu/instructor-notifications> for details. Note that, "Professors have the right to accept or reject the notification."

Evaluation of Grades and Grading Policy

Table 1. Weighting of grades on a percentage basis.

Assignment	EAS 4132	EML 5714
Homework	30%	15%
Term Paper	N/A	15%
Midterm	30%	30%
Final Exam	40%	40%

Homework

Students who turn in fully completed homework will receive 100% credit. Partial solutions of the homework will be posted on the class website after the due date.

Exams

Students are expected to take all exams. If a student is unable to take an exam for unforeseeable reasons, then the other exams will count toward the percentage of the grade that makes up the exams if an appropriate DSO instructor notification is accepted.

Term Paper

Students enrolled in the graduate section are to submit a term paper. The assignment details of the term paper are shown in a document in the files section of the class website. The subject of the term paper must be approved by the professor.

Grade Corrections

Corrections of grades should be submitted promptly within 3 business days of the grade posting in writing with a concise statement of why you believe there has been an error.

Course Grade Evaluation Criteria

The final grade will be assigned on the straight scale: 4.00 (A) → [93.33, 100.00], 3.67 (A-) → [90.00 to 93.33), 3.33 (B+) → [86.67 to 90.00), 3.00 (B) → [83.33 to 86.67), 2.67 (B-) → [80.00 to 83.33), 2.33 (C+) → [76.67 to 80.00), 2.00 (C) → [73.33 to 76.67), 1.67 (C-) → [70.00 to 73.33), 1.33 (D+) → [66.67 to 70.00), 1.00 (D) → [63.33 to 66.67), 0.67 (D-) → [60.00 to 63.33), and 0.00 (E) → [00.00 to 60.00). Final grades are rounded to the nearest hundredths place before assignment. At the professor's discretion, the final course grades will be curved and all students may receive higher grades.

The following pages of the syllabus are required by the university, college, and department

UF Graduate School Policy

Letter grades of C-, D+, D, D- or E are not considered passing at the graduate level. Although the grade points associated with these letter grades are included in grade point average calculations, courses with these grades will not be credited towards graduation. Also, grades of B-, C+ or C count toward a graduate degree if an equal number of credits in courses numbered 5000 or higher have been earned with grades of B+, A- and A, respectively. Further explanation of graduate grading policies can be found at <http://gradcatalog.ufl.edu/content.php?catoid=12&navoid=2750#grades>.

Professional Component (ABET)

This course is designed primarily for students of the mechanical and aerospace disciplines. Students within other engineering majors, mathematics, and physics will benefit from this course. The course content is 100% engineering science.

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	
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	Medium
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	Medium

*Coverage is given as high, medium, or low. An empty box indicates that this outcome significantly addressed by this course.

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure 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/>.

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://www.dso.ufl.edu/sccr/process/student-conduct-honor-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 professor or TAs in this class.

Health and Wellness

- U Matter, We Care: If you or a friend is in distress, please contact umatter@ufl.edu or 352-392-1575 so that a team member can reach out to the student.
- Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 911 for emergencies.
- Sexual Assault Recovery Services (SARS), Student Health Care Center, 392-1161.
- University Police Department at 392-1111 (or 911 for emergencies), or <http://www.police.ufl.edu/>