Compressible Flow
EAS 4132 / EML 5714, Fall 2021, M W F, Period 2, 8:30 AM - 9:20 AM

Professor
Assistant Professor S. A. E. Miller, Ph.D.
University of Florida Department of Mechanical and Aerospace Engineering
MAE-A 220, Gainesville, FL 32611, PO Box 116250
Contact preference - https://ufl.instructure.com
Zoom - https://ufl.zoom.us/my/saemiller - used on occasion for misc. online interactions

Q&A and Office Hours
M W, 9:30–10:30 AM, or via confirmed written appointment.

Teaching Assistants
Mr. Tianshu Zhang (Graduate Research and Teaching Assistant) zhang.tianshu@ufl.edu
Mr. Noah Burns (Undergraduate Grader) burns.noah@ufl.edu

Course Objectives
This course will introduce students to the theory, physics, and analytical 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, transons, hypersonics, supersonics, and additional select topics. Illustrations 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 through lectures, assigned reading, and 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
- Various handout material provided by professor.

Materials, Software, and Supplies
None.

Important Dates
- All deadlines and important dates are introduced in class or through the class website.
Attendance Policy
- It is expected that students attend class.
- Attendance is measured at the professor’s discretion.
- Required statement by the University of Florida: Excused absences are consistent with university policies in the undergraduate catalog and require appropriate documentation. (https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies)

Class Expectations
- The student is responsible for their education.
- The professor is the guide to their understanding of the field.

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.”

Policy on Ethics and Cheating
- Any kind of cheating, lying, dishonesty, or any other honor code violation results in a failing grade for the entire course. Violations reported without student notification per university policy.
- All submissions must be your own original work. Do not use solution manuals or any other help (examples - forums, chegg, group me, other help) for anything. Violations reported without student notification per university policy.

Evaluation of Grades and Grading Policy
Course Grade Evaluation Criteria
- Undergraduate sections:
  - Graded material will be weighted as 0.15 for homework, 0.25 for midterm one, 0.30 for midterm two, and 0.30 for midterm three.
- Graduate sections:
  - Graded material will be weighted as 0.05 for homework, 0.20 for the term paper, 0.15 for midterm one, 0.30 for midterm two, and 0.30 for midterm three.
  - The term paper assignment must be completed or an incomplete (I) grade will be assigned for the course.
- Homework
  - All homework assignments must be completed (even if late) or an incomplete (I) grade will be assigned for the course.
  - The lowest homework grade will be dropped and will not be accounted for in your grade.
- The final grade will be assigned via 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 discretion of the professor, the final course grades may be curved.

**Homework**
• The purpose of homework is to learn and understand the material. Students are responsible for understanding the homework problems and solutions.
• Students who turn in fully completed homework will receive 100% credit. All original work must be shown. Answers must be boxed with units. Partial solutions of the homework will be posted on the class website after the due date. Students will submit solutions of the homework problems via the course website. Only PDF files are accepted.

**Term Paper**
Students in the graduate section are expected to write a term paper. The details of the assignment, format, and deadline(s) are posted on the class website. The paper must be of AIAA Journal submission quality.

**Grade Corrections**
Corrections of grades must be submitted promptly within 3 business days after grade posting. A statement in writing on why there has been an error must be submitted through Canvas. The message should be directed towards the TA / Graders for homework and to the professor for other assignments.
Required Information by the University, College, and Department

Relation to Program Outcomes (ABET):

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<th>Outcome</th>
<th>Coverage</th>
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<tr>
<td>1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics</td>
<td>High</td>
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<td>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</td>
<td>High</td>
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<td>3. An ability to communicate effectively with a range of audiences</td>
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<td>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</td>
<td>Medium</td>
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<td>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</td>
<td>Medium</td>
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<td>6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions</td>
<td>Low</td>
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<td>7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies</td>
<td>Medium</td>
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Attendance
Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies: https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

Grading
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.bluerca.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

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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 Conduct 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. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment
The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

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
- Jennifer Nappo, Director of Human Resources, 352-392-0904, jpennacc@ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. 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

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<th>U Matter, We Care</th>
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<td>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 <a href="mailto:umatter@ufl.edu">umatter@ufl.edu</a> 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.</td>
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| Counseling and Wellness Center: https://counseling.ufl.edu, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies. |

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<th>Sexual Discrimination, Harassment, Assault, or Violence</th>
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<td>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, <a href="mailto:title-ix@ufl.edu">title-ix@ufl.edu</a></td>
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<th>Sexual Assault Recovery Services (SARS)</th>
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<td>Student Health Care Center, 392-1161.</td>
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| University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/. |

Academic Resources

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<th>E-learning technical support, 352-392-4357 (select option 2) or e-mail to <a href="mailto:Learning-support@ufl.edu">Learning-support@ufl.edu</a>.</th>
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<tr>
<td><a href="https://lss.at.ufl.edu/help.shtml">https://lss.at.ufl.edu/help.shtml</a>.</td>
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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/.

