

Fluid Mechanics 1

EMG 6812

Class Periods: T 5-6 (11:45 am -1:40 pm) and R 6 (12:50 – 1:40 pm)

Location: NEB 102

Academic Term: Fall 2025

Instructor:

Name: Kamran Mohseni

Email: Mohseni@ufl.edu Please allow at least 48 hours for a response.

Office Phone Number: 352-273-1834

Office Hours: Thursdays 10:30am-12:30pm in room NEB 141 or via zoom. I am also available immediately after the lectures in the classroom.

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

TBD

Course Description

This course is focused on basics of fluid dynamics, flow kinematics, conservation laws, vorticity transport, and ideal flows.

Course Pre-Requisites / Co-Requisites

Undergraduate level fluid mechanics. Students need to have a strong background in calculus and differential equations.

Course Objectives

The objectives of this course are to provide a fundamental understanding of the kinematics and dynamics of fluids, conservation laws, constitutive relationships (with a focus on Newtonian fluids), dimensional analysis, vorticity dynamics, inviscid flows, and some applications.

Required Textbooks and Software

There is no required textbook for this course. If you want to purchase a book, I suggest getting the book by Kundu. The course lectures should provide enough coverage of the required materials. However, you are required to read the related materials from at least one of the following references. Here are some recommended books

- P.K. Kundu, Cohen, and Rowling, Fluid Mechanics, 6th Ed.
- I.G. Currie, Fundamental Mechanics of Fluids
- G.K. Batchelor, Introduction to Fluid Mechanics
- R. L. Panton, Incompressible Flow
- F.M. White, Viscous Fluid Flow

Familiarity with MATLAB is recommended.

Required Computer

Recommended Computer Specifications: [https://it.ufl.edu/get-help/student-computer-recommendations/HWCOE Computer Requirements](https://it.ufl.edu/get-help/student-computer-recommendations/HWCOE%20Computer%20Requirements): <https://www.eng.ufl.edu/students/advising/fall-semester-checklist/computer-requirements/>

Course Schedule

Tentative course schedule includes:

- Introductory materials, definitions, continuum concepts, terminology. 1 week
- Mathematical background: vector calculus, Cartesian 1-2 weeks

- Flow Kinematics: Lagrangian & Eulerian views, streamlines, streaklines, pathlines, smokelines, material derivatives, fluid acceleration. 1-2 weeks
- Integral Form of Conservation Laws: Reynolds transport theorem, conservation of mass, momentum and energy in integral form. 2-3 weeks
- Differential Form of Conservation Laws: Navier Stokes Equations, boundary conditions: 2 weeks
- Dimensional Analysis: Nondimensionalization, geometric, kinematic, and dynamic similarity. 1 week
- Vorticity Dynamics: Circulation, vorticity equation, Kelvin's theorem, Bernoulli equation: 1-2-weeks
- Ideal Flow: Bernoulli equation, potential flow 2 weeks week.

Important Dates (These are tentative dates/times)

- Exam I: On October 14, 2025 at 11:45am in your classroom in NEB 202.
- Exam II: On December 2, 2025 at 11:45am in your classroom in NEB 202.

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance at all lectures are required in this course. No cell phone use is allowed in the classroom. Excused absences must be consistent with university policies in the Graduate Catalog (<https://catalog.ufl.edu/graduate/regulations>) and require appropriate documentation. Additional information can be found here: <https://gradcatalog.ufl.edu/graduate/regulations/>

Evaluation of Grades

Midterm exam-I 40%, Exam-II 40%, Homework 20%. Please pay attention to instructions about HW and assignment due dates. Note that HW sets will be collected and a random number of HW problems in each set will be graded. No late assignments will be accepted.

Exam-I is scheduled on 10/24 in the classroom

Exam-II is scheduled on 12/5 in the classroom

There will be no makeup-exam for people who miss the exam.

Please note that I cannot do HW solutions over the email. This is a topic that requires a lot of equations not easily communicated over an email. For questions requiring equation writing, please attend the office hours or ask me during the lecture times.

If a student feels that an exam or homework is graded unfairly, or if there is an error in the grading, it should be brought to my attention within two weeks after the graded material is handed back. Scores will not be reconsidered beyond two weeks after they are handed back.

There will be an opportunity to do a voluntary (not required) project for the course to receive an extra 5 points to be added to your total grade (that is a total grade of 105 out of 100). If you are interested in that please follow the instructions at the beginning of the lectures and select your project. This need to be done in the first 4 weeks of the lectures. The project report is due by the last day of classes.

Grading Policy

The following is given as an example only.

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33

73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

Academic Policies & Resources

To support consistent and accessible communication of university-wide student resources, instructors must include this link to academic policies and campus resources: <https://go.ufl.edu/syllabuspolicies>. Instructor-specific guidelines for courses must accommodate these policies.

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.aa.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.aa.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 or TAs in this class.

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.

Commitment to a Positive 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.

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 Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu

Notes on Homework Sets and Their Solutions

Policies/Procedures:

1. Homework assignments are posted on the course website
2. Homework assignments are due at 11:55pm on Wednesday one week after assignment.
3. You are expected to return solutions to all requested problems. However, grading might be conducted only on selected problems.
4. Students are encouraged to discuss the general principles involved in the homework sets with one another, but the solution of each problem must be completed individually.
5. You are expected to scan your answers to the HW and upload them on the course website before the deadline.
6. Please do NOT leave uploading your answers to the last minutes. Give yourself plenty of time so your uploading is not affected by unexpected events (power loss, computer crash, internet loss, etc). The system will close at 11:55pm and will not accept uploading after that. **No late HW will be accepted.**

Format

1. Use 8.5" x 11" paper and write on one side.
2. Write down your name on the 1st page and on every subsequent pages. The naming format should be:
First Name Last Name
3. Do not use pages torn from a spiral notebook.
4. Start each problem on a new page.
5. Put the problems in numerical order.
6. Attach a listing of any computer program(s) used in the solution.
7. Use good penmanship, as illegible writing cannot be graded.

HW Feedback

On top of the first page of your HW set please write:

- How many hours it took you to read and do the HW of that week.