Course Syllabus

Course	MECH 3315.001 (3 Semester Credit Hours)
Course Title	Fluid Mechanics
Professor	Kianoosh Yousefi
Term	Spring 2023 January 17, 2023 – May 5, 2023
Meetings	MW 11:30 am – 12:45 pm, ECSW 1.365

Professor's Contact Information

Office Phone	(972) 883-6947
Office Location	ECSW 4.150K
Email Address	kyousefi@utdallas.edu
Office Hours	Wednesdays 12:45 pm – 2:00 pm and by appointment.

TA	Hassan Tajarenejad
Email Address	hassan.tajarenejadabdollahi@utdallas.edu
Office Location	TBD
Office Hours	TBD

General Course Information

Pre-requisites, Co-requisites, & Other Restrictions

- Prerequisite: MECH 2330 (Dynamics), ENGR 3300 (Advanced Engineering Mathematics).
- Prerequisite or Corequisite: MECH 3310 (Thermodynamics).

Course Description

This course provides an introduction to the study of fluids both in motion (fluid dynamics) and at rest (fluid statics) and covers principal concepts of fluid mechanics, including fluid properties, hydrostatics, fluid dynamics, dimensional analysis, internal and external flows, and free-surface flows. The governing equations will be derived by applying the conservation of mass, momentum, and energy to a control volume. The flow behavior will then be studied using the integral form of the governing equations for mechanical engineering applications (e.g., turbines, pumps, and moving bodies). Further, potential theory, the Bernoulli equation, and Stokes theorem will also be discussed, assuming inviscid and irrotational flows. Finally, the engineering applications of incompressible pipe systems and external aerodynamics will be examined.

Learning Outcomes

The overall objective of the MECH 3315 course is to establish a solid understanding of fundamental concepts in fluid mechanics and apply them to complex real-world problems. By the end of the semester, the students who successfully complete the course (by attending classes, being attentive, reading assigned materials, completing homework, and so on) will be able to:

1. Derive the governing equations of fluid mechanics and use the equations to reason about fluid flows.
2. Explain the concept of control volume and apply it to solve fluid mechanics problems in inertial frames.
3. Identify the key non-dimensional parameters for given systems and use such numbers to characterize the systems.
4. Explain the role of fluids in real-life situations.

Required Texts & Materials

- Fox, R. W., McDonald, A. T., & Mitchell, J. W. (2011). *Fox and McDonald's Introduction to Fluid Mechanics* (8th/9th edition). John Wiley & Sons, New York, NY, USA.
- Lecture notes will be posted on the e-Learning portal before each session.

Suggested Texts, Readings, & Materials

- White, F. M. (2016). *Fluid Mechanics* (8th edition). McGraw-Hill Education, New York, NY, USA.
- Batchelor, G. K. (1967). An Introduction to Fluid Dynamics. Cambridge University Press, Cambridge, UK.

Assignments & Academic Calendar

The following outline is tentative, and it is subject to change based on the needs of the class at the discretion of the instructor.

Week	Dates	Description	Book Chapters*
1	Jan 18	Introduction	1
2	Jan 23, Jan 25	Fundamental concepts	2
3	Jan 30, Feb 01	Fluid statics	3
4	Feb 06, Feb 08	Fundamental laws of fluid motion	4, 5
5	Feb 13, Feb 15	Fundamental laws of fluid motion	4, 5
6	Feb 20, **Feb 22**	Fundamental laws of fluid motion, **Midterm 1**†	4, 5
7	Feb 27, Mar 01	Ideal fluid flow	6
8	Mar 06, Mar 08	Dimensional Analysis	7
9	Mar 13, Mar 19	Spring break	—
10	Mar 20, Mar 22	Internal flows	8
11	Mar 27, Mar 29	Internal flows	8
12	**Apr 03**, Apr 05	**Midterm 2**†, External flows	9
13	Apr 10, Apr 12	External flows	9
14	Apr 17, Apr 19	free-surface flows: open-channel flows	11
15	Apr 24, Apr 26	free-surface flows: open-channel flows	11
16	May 01, May 03	free-surface flows: surface waves, Review	—
—	TBD	**Final**‡	—

* The numbers are the chapters in the 8th edition of the textbook.
† Midterm exams are non-cumulative.
‡ The final exam is cumulative; approximately 75% of the questions are from materials covered after midterm 2, and 25% are from materials covered prior to midterm tests 1 and 2.

Course Policies

Class Materials

The instructor may provide class materials that will be made available to all students registered for this class as they are intended to supplement the classroom experience. These materials may be downloaded during the course; however, these materials are for registered students' use only. Classroom materials may not be reproduced or shared with those not in class or uploaded to other online environments except to implement an approved Office of Student Accessibility accommodation. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

Class Attendance and Participation

Regular class attendance and participation are expected, which are primarily the responsibility of the students. This includes engaging in classroom activities that solicit your feedback on homework assignments, readings, or materials covered in the lectures. A portion of the grade for this course is directly tied to your participation in the class. Students who fail to participate in class regularly are inviting scholastic difficulty. Successful participation is defined as consistently adhering to university requirements, as presented in this syllabus. Failure to comply with these requirements is a violation of the Student Code of Conduct.

Class Recordings

Unless the Office of Student Accessibility has approved the student to record the instruction, students are expressly prohibited from recording any part of this course. Recordings may not be published, reproduced, or shared with those not in the class or uploaded to other online environments except to implement an approved Office of Student Accessibility accommodation. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

Grading (Credit) Criteria

Student performance will be measured using quizzes, homework sets, and midterm and final exams. Each component will be weighed in the final grade as described below:

Component	Percentage
Quizzes	10%
Homework	25%
Midterm 1	15%
Midterm 2	15%
Final	35%

Pop quizzes will be used to check your progress and attendance; the final quiz grade is the average of all quizzes. There will be no make-up quizzes, but there is no penalty for an excused absence, given advance notice.

Homework assignments will be due at the beginning of class on **Mondays** unless otherwise specified. Homework will be graded for both content and neatness; sloppy or illegible work will not receive full credit. You must show all the work/steps used to solve the problems in detail. **Late homework will not be accepted** unless the student has

informed the instructor (or TA) in advance. All homework assignments and their solutions will be posted on eLearning. Your lowest homework grade of the semester will be dropped for the final course grade.

Midterm exams will be given in class (or in the testing center when available) on (tentatively) **February 22** and **April 3**. The final exam will be scheduled by the Office of the Registrar. Make-up exams will not be offered except under unusual circumstances (e.g., a scheduling conflict with another UT Dallas academic commitment and car accident) by providing documented evidence (see Undergraduate Catalog and Syllabus Policies & Procedures). Grade disputes are welcome but must be submitted within one week after the assessment item has been returned. Laptops, digital books, and smartphones are not allowed on tests and exams. A **non-programmable calculator** is the only electronic device allowed during the assessment. Note that only the final exam is comprehensive.

Students will be assigned the following letter grade based on the calculation coming from the course assessment section:

Scale	Grade	Description	Points
97 – 100	A+		4.00
94 – 96	A	Excellent	4.00
90 – 93	A–		3.67
87 – 89	B+		3.33
84 – 86	B	Good	3.00
80 – 83	B–		2.67
77 – 79	C+		2.33
74 – 76	C	Fair	2.00
70 – 73	C–		1.67
67 – 69	D+		1.33
64 – 66	D	Poor	1.00
60 – 63	D–		0.67
0 – 59	F	Failure	0.00

Additional Course Considerations

You are expected to check your utdallas.edu e-mail address and eLearning portal regularly for class updates; electronic notices may be used to disseminate information to all class members. The instructor may have intermittent, unavoidable professional travel commitments throughout the semester. For these days, the instructor will provide advance notice, and the TA will administer the class.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

"As a Comet, I pledge honesty, integrity, and service in all that I do."

Academic Support Resources

The information contained in the following link lists the University's academic support resources for all students, https://go.utdallas.edu/academic-support-resources.

UT Dallas Syllabus Policies and Procedures

The University of Texas at Dallas provides a number of policies and procedures designed to provide students with a safe and supportive learning environment. Brief summaries of the policies and procedures are provided for you at https://go.utdallas.edu/syllabus-policies and include information about technical support, field trip policies, off-campus activities, student conduct and discipline, academic integrity, copyright infringement, email use, withdrawal from class, student grievance procedures, incomplete grades, access to Disability Services, and religious holidays. Please review sections regarding the credit/no credit grading option and withdrawal from class.

The University of Texas at Dallas is committed to providing reasonable accommodations for all persons with disabilities. The syllabus is available in alternate formats upon request. If you are seeking classroom accommodations under the Americans with Disabilities Act (2008), you are required to register with the Office of Student Accessibility located in the Administration Building, Suite 2.224. Their phone number is (972) 883-2098, their email address is studentaccess@utdallas.edu, and their website is studentaccess.utdallas.edu. To receive academic accommodations for this class, please obtain the proper Office of Student Accessibility letter of accommodation and meet with me at the beginning of the semester.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.