

Instructor: Hamid Sadat
Office: NTDP F115S
Email: hamid.sadat@unt.edu
Lecture Time: Tu/Th 8:30-9:50 am
Instructor Office Hours: Tu/Th 2:30-3:30 pm or by appointment

TA: Raad Haque (raadhaque@my.unt.edu)

Course Description:

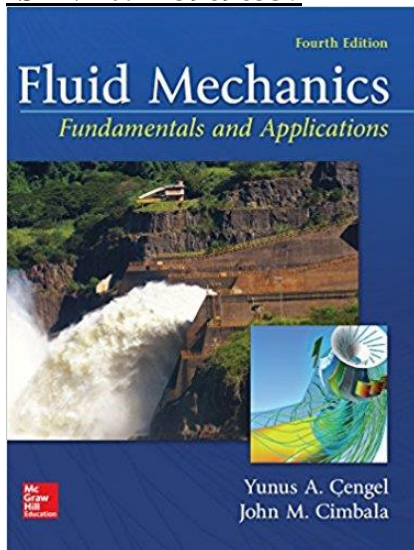
This course introduces basic concepts in fluid statics, kinematics, and dynamics. Control-volume and differential equation and dimensional analysis methods are derived and used to demonstrate applications to simple external- and internal-flow fluids engineering systems to determine variables of interest (pressure; shear stress; velocity distributions; flow rates; forces; energy losses; power requirements; etc).

Prerequisite(s): MATH 2730 and MATH 3410

Required Textbook: Yunus A. Cengel, John M. Cimbala, Fluid Mechanics Fundamentals and Applications, 4th Edition

ISBN-13: 978-1259696534

ISBN-10: 1259696537



Course Learning Outcomes:

Upon successful completion of this course, students will be able to:

1. Identify engineering problems and use the basic laws of fluid mechanics to solve these problems.
2. Evaluate the pressure distribution and resultant force exerted by fluids at rest on submerged surfaces.
3. Use the control volume analysis and apply the conservation of mass, momentum, and energy to solve fluid mechanics problems.
4. Understand Bernoulli's equation and its limitations.
5. Use differential equations to solve fluid mechanics problems.
6. Determine dimensionless groups from a list of variables using the Buckingham Pi theorem.
7. Use the Moody diagram to find the frictional head loss in the circular and non-circular pipe flow.
8. Understand the boundary layer, drag, and lift concepts in an external flow.

ABET Criteria:

MEEN 3120 addresses the following ABET program outcomes:

1. Ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

Homework

1. All assignments will be posted on Canvas.
2. Homework submissions are due by 8:30 am on their respective due dates, prior to class. Late submissions will not be accepted, unless a valid reason is provided before the due date. Valid reasons include personal/family emergencies, religious holidays/duties, jury duty, etc. Lack of a textbook is not considered a valid excuse for not completing homework.
3. Homework can be submitted by a friend or classmate on your behalf.
4. In certain cases, homework can be submitted in an electronic format due to legitimate reasons.
5. Students are responsible for obtaining the required textbook for assignments.
6. Homework should be securely stapled; neither the instructor nor the TA will be held responsible for misplaced assignments.
7. Homework placed in the instructor's department mailbox will not be collected.
8. Homework problems will be assessed by the TA, who will have regular office hours for consultation regarding challenging problems or grading inquiries.
9. Solutions will be posted on Canvas shortly after the grading process. Students are encouraged to refer to these solutions to learn from their mistakes.
10. Homework constitutes 15% of the final grade.

Examinations

The course will feature two in-semester exams and one final examination, scheduled as indicated on the Class Schedule.

1. The exams might encompass a variety of question types, including standard problems, multiple-choice, short answer, and true/false questions.
2. All exams will be open-book and open-notes.
3. The use of calculators will be permitted.
4. No electronic devices capable of storing information or connecting to the Internet will be allowed during the exams (e.g., cell phones).
5. Requests for makeup exams will only be considered with a valid reason provided before the class.
6. Each in-semester exam contributes 20% to the final grade, while the final exam accounts for 25%.

Quizzes

Quizzes are scheduled on the dates specified in the class schedule.

1. All quizzes will be conducted in an open-book and open-notes format.
2. You are allowed to use a calculator during the quizzes.
3. Electronic devices capable of storing information or accessing the Internet, such as cell phones, are prohibited during the quizzes.
4. Makeup quizzes will only be accommodated if a valid reason is provided before the class.
5. Quizzes contribute 20% to the final grade.

Attendance Policy

Students are required to attend the sessions. Attendance will be monitored on a random basis. Students who accumulate more than three unexcused absences will be assigned a final grade of F for the course.

Grading

The final course grade will be based on the total points earned during the semester. The distribution of points is as follows:

Two in-semester exams, 20% each	= 40
Final examination	= 25
Quizzes	= 20
Homework problems	= 15

	TOTAL 100 points
90-100%	A
80-89.9%	B
70-79.9%	C
60-69.9%	D
< 60%	F

Note: Grades will not be curved. Grades are based solely on your performance. Extra credit will not be given at the end of the semester for individual students. Please do not request extra work at the end of the semester to boost your grade – the answer will always be no.

Canvas

1. Announcements regarding test dates, quizzes, and homework will be posted on Canvas.
2. All grades will be available on Canvas.
3. Each student is responsible for checking Canvas on a routine basis.

Disability Accommodations

If special accommodations are required, the student must first meet with the staff of the Office of Disability Accommodation (ODA), (940) 565-4323. You must have document which verifies the disability and makes you eligible for accommodations. After meeting with that office, please contact me to discuss what accommodations will be necessary. For more information, see <http://www.unt.edu/oda>.

Academic Misconduct

There is a zero-tolerance policy for academic dishonesty. Cheating of whatsoever will result in an automatic F in this course and the matter will be turned over to the appropriate student disciplinary committee.

IMPORTANT EXAM DATES

Midterm Exam #1 (Tentative)

February 29th, 2024, Thursday 8:30 am

Midterm Exam #2 (Tentative)

April 12th, 2024, Thursday 8:30 am

Final exam:

May 7th, 2024, Tuesday 8:00 am

Schedule Overview (Subject to change)

		Date	Topics	HW
Week #1	Lecture 1	01/16	Definition of a fluid, Classification of fluid flows, System and control volume	No HW
	Lecture 2	01/18	Dimensions, fluid properties, Viscosity	
Week #2	Lecture 3	01/23	Surface tension, Cavitation, Statics of Fluids	HW 1 due 01/30
	Lecture 4	01/25	Pressure, Pressure gradient, Manometer, Hydrostatic force on flat plates	
Week #3	Lecture 5	01/30	Hydrodynamic force on curved surfaces, Buoyancy, Stability	HW 2 due 02/06
	Lecture 6	02/01	Quiz 1, Pressure distribution in rigid body motion	
Week #4	Lecture 7	02/06	Lagrangian and Eulerian, Flow patterns, Types of deformation, Vorticity	HW 3 due 02/13
	Lecture 8	02/08	Quiz 2, Reynolds Transport theorem, Mass conservation	
Week #5	Lecture 9	02/13	Bernoulli and limitations	HW 4 due 02/20
	Lecture 10	02/15	Quiz 3, Mechanical Energy and Efficiency, Energy Conservation	
Week #6	Lecture 11	02/20	Linear momentum Conservation 1	HW 5 due 02/27
	Lecture 12	02/22	Quiz 4, Linear momentum Conservation 2	
Week #7	Lecture 13	02/27	Angular Momentum Conservation, <u>Review Session</u>	No HW
	Midterm 1	02/29	Chapters 1-5	
Week #8	Lecture 14	03/05	Units, Dimensional Homogeneity, Non-dimensional Equations, Similarity	HW 6 due 03/19
	Lecture 15	03/07	Quiz 5, Pi Theorem, Modeling and common non-dimensionalized variables	
Week #9		03/12	Spring Break	No HW
		03/14	Spring Break	
Week #10	Lecture 16	03/19	Pipe flow regime, entry length, Laminar pipe flow, Frictional loss for laminar pipe flow	HW 7 due 03/26
	Lecture 17	03/21	Quiz 6, Non-circular pipe, Turbulent pipe flow, Moody chart	
Week #11	Lecture 18	03/26	Types of Moody chart problems, Minor losses, Pipe system	HW 8 due 04/02
	Lecture 19	03/28	Quiz 7, Differential Analysis, Continuity, Stream function	
Week #12	Lecture 20	04/02	Differential linear momentum Eq., Navier Stokes (NS) Eq.	HW 9 due 04/09
	Lecture 21	04/04	Quiz 8, NS Exact Solutions 1	
Week #13	Lecture 22	04/09	NS Exact Solutions 2, <u>Review Session</u>	No HW
	Midterm 2	04/12	Chapters 6-8	
Week #14	Lecture 23	04/16	External flow: Laminar flat plate boundary layer, Displacement and momentum thicknesses	HW 10 due 04/23
	Lecture 24	04/18	Quiz 9, Turbulent flat plate flow boundary layer, Momentum Integral	
Week #15	Lecture 25	04/23	Drag of streamlined body	HW 11 due 04/30
	Lecture 26	04/25	Quiz 10, Drag of bluff body. Friction and pressure drag, Drag coefficients	
Week #16	Lecture 27	04/30	Drags of cylinders/spheres, lift (airfoil, spinning body)	HW 12 due 05/07
	Lecture 28	05/02	Quiz 11, Intro to CFD, Course Review	
Week #17	Final Exam	05/07	All Chapters	