

# University of Arkansas, Fayetteville

MEEG 3503/002

Mechanics of Fluids

Fall 2015

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**Location & Time:** BELL2286 & MWF 10:45pm - 11:35pm

**Instructor:** Professor Wenchao Zhou  
Office: MEEG 102B; E-mail: [zhouw@uark.edu](mailto:zhouw@uark.edu)  
Phone: (479) 575-7250  
Office Hours: 1:30pm - 2:30pm MW and by appointment  
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Office Hours: Tuesday 9:00am - 10:00am and by appointment

**Text:** *Fluid Mechanics Fundamentals and Applications*, Cengel & Cimbala, 3rd Ed.

**Catalog Info:** A study of fluids including properties, pressure forces, and field flow utilizing conservation of mass, conservation of energy, and momentum principles.

**Prerequisites:** Differential Equations and Laplace Transform (MATH 2584). Thermodynamics (MEEG 2403).

**Course Objectives:** When you complete this course, you will be able to:

1. Provide intuitive explanation of the fundamental concepts of fluid mechanics;
2. Apply control volume or differential analysis and fundamental principles (conservation of mass, momentum, and energy) to solve fluid statics, kinematics, and dynamics problems;
3. Define and simplify real-world fluid mechanics problems with appropriate assumptions;
4. Apply scaling analysis to provide approximate estimation of the outcome of complex fluid dynamics;
5. Conduct basic experiments at home to observe various interesting fluid phenomena and apply the fundamental principles to explain the phenomena.

**Topics:**

1. Fundamental Concepts (1 week): Reading -- Chapter 1, 2
2. Fluid Statics (1 week): Reading -- Chapter 3
3. Control-volume Analysis (3 weeks): Reading -- Chapter 4, 5, 6
4. Dimensional Analysis & Buckingham Pi (1 week): Reading -- Chapter 7  
Mid-term
5. Differential Analysis of Fluid Motion (4 weeks): Reading -- Chapter 9, 10
6. Pipe Flow (2 weeks): Reading -- Chapter: 8
7. Flow over bodies (2 weeks): Reading -- Chapter 11
8. Compressible flow (2 weeks): Reading -- Chapter 12  
Final Exam

**Grading:**

Homework:	400 pts	26.7%
Quizzes	400 pts	26.7%
Mid-term (Topic 1, 2, 3, 4):	300 pts	20%
Final: (All topics)	300 pts	20%
Instructor Evaluation (class participation)	100 pts	6.6%

**Total** **1500 pts** **100%**

**Raw score to letter grade conversions:**

A	1350 pts	(90% of 3000 pts)
B	1200 pts	(80% of 3000 pts)
C	1050 pts	(70% of 3000 pts)
D	900 pts	(60% of 3000 pts)
F	< 900 pts	(less than 60% of 3000 pts)

**Course Policies:**

1. **Attendance:** Attendance for quizzes and exams is mandatory. Makeup quizzes or exams will be given only if prior arrangements have been made with legitimate reasons. If you are sick, you must have a written physician's note confirming an illness requiring bed rest. If you cannot be present for an exam, for any reason, you must contact the instructor by phone or email 48 hours before the exam begins. Otherwise, a makeup exam will not be considered. Class attendance is recommended, and you are responsible for any announcements, handouts, or assignments made in class if you miss any class.
2. **Homework:** Working together or in a team are strongly encouraged. However, homework assignments are to be completed individually, that is, you **MUST** turn in your own work! Homework assignments need to be turned in on the specified due dates. Electronic submission is preferred but not necessary. Late submission will be penalized at the discretion of the instructor. Delay for more than one week will not be accepted unless prior arrangement has been made with the instructor for legitimate reasons.
3. **Academic honesty and integrity:** all students are required to adhere to the values of academic honesty and integrity and violations will be processed according to [the academic integrity policy at the University of Arkansas](#).
4. **Communication:** Blackboard will be the formal means of communication of this class. All the announcements and assignments will be posted on Blackboard.
5. **Questions:** I will give time to answer questions before each class begins. The whole class will benefit from your questions this way. If the questions are not appropriate for the whole class or there is not enough time in class, please come to see me. My normal office hours are from 1:30pm to 2:30pm on Mondays and Wednesdays, however, you should feel free to stop by whenever I am in office with the door open. You are encouraged to use the discussion forums on Blackboard. I also strongly encourage you to seek help from peer students.
6. **Written submission:** Written communication plays a significant role in engineering. Written submission must be clear, readable, and well-organized. Penalty may be applied due to poor "readability".
7. **Inclement weather policy:** We will not meet if the University is officially closed.

## Tentative Class Schedule

Week	Dates	Topics	Text chapter	Comments
1	08/24 – 08/28	Introduction & fundamental concepts	1, 2	
2	08/31 – 09/04	Fluid statics	3	
3	09/07 – 09/11	Fluid kinematics	4	09/07: Labor day holiday
4	09/14 – 09/18	Bernoulli equations	5	
5	09/21 – 09/25	Momentum analysis	6	
6	09/28 – 10/02	Dimensionless analysis	7	
7	10/05 – 10/09	Differential analysis	9	
8	10/12 – 10/16	Differential analysis	9	Week for mid-term
9	10/19 – 10/23	Approximate solutions of N-S equations	10	10/19 – 20: Fall break
10	10/26 – 10/30	Approximate solutions of N-S equations	10	
11	11/02 – 11/06	Pipe flow	8	
12	11/09 – 11/13	Pipe flow	8	
13	11/16 – 11/20	External flow	11	
14	11/23 – 11/27	External flow	11	11/25, 27: Thanksgiving break
15	11/30 – 12/04	Compressible flow	12	
16	12/07 – 12/11	Compressible flow	12	Dead day: 12/11
17	12/14 – 12/18	Final exam		Final week