Updated: 12/15/2025

University of Notre Dame
AME 30331-Section 1, Fluid Mechanics (Fall 2025)

"When I meet God, I am going to ask him two questions: Why relativity? And why turbulence? I really believe he will have an answer for the first."
- Sir Horace Lamb (1932)

GENERAL INFORMATION

PROFESSOR INFORMATION

Instructor: Prof. Jingcheng Ma
Email: jma9@nd.edu
Office Hours: 4 pm – 5 pm, Wednesday (or by appointment), 300B Cushing Hall of Engineering

CLASS TIME and LOCATION

Time: M/W/F 11:30 am – 12:20 pm, 8/25 to 12/10
Location: DeBartolo Hall 129

TA INFORMATION

TA: Amio Ritwik (aritwik@nd.edu), Yamin Mansur (ymansur@nd.edu)
Office Hours: 4 pm – 5 pm, Tuesday, 364 Fitzpatrick Hall of Engineering

COURSE INFORMATION

An introductory course in fluid mechanics. The course includes eight chapters: 1) Fluid Properties, 2) Hydrostatics, 3) Fluid Dynamics including Bernoulli's equation, 4) Fluid Kinematics, 5) Conservation laws in integral form, 6) Conservation laws in differential form, including Navier-Stokes equation, and potential flow, 7) Dimensional analysis, 8) Internal flows, external flows, and turbulence. Upon successful completion of the course, the students will have the fundamental knowledge and problem-solving skills needed to understand, analyze, and design fluid systems.
Credit: 3 graduate hours
Reference textbooks: Andrew L. Gerhart, John I. Hochstein, and Philip M. Gerhart, "Munson, Young and Okiishi's Fundamentals of Fluid Mechanics", Wiley Publishing, 8th Edition.
Prerequisite: AME 20222 (Mechanics II) and 20231 (Thermodynamics) and (MATH 20580, 24580 or 20610).

TENTATIVE SCHEDULES

Week 1	**08/25** (Overview), **08/27** (Chapter 1),**08/29** (Chapter 1)
Week 2 S. Peri	**09/01** (Chapter 1, HM1), **09/03** (Chapter 1), **09/05** (Chapter 2)
Week 3 A. Ritwik	**09/08** (Chapter 2, HM1 Deadline), **09/10** (Chapter 2, HW2), **09/12** (Chapter 2)

Week 4 A. Ritwik	**09/15** (Chapter 3), **09/17**(Chapter 3, HW2D, HM3), **09/19**(Chapter 3)
Week 5 Y. Mansur	**09/22** (Chapter 3), **09/24** (Review for Midterm 1, HM3D), **09/26** (Midterm 1)
Week 6 Y. Mansur	**09/29** (Chapter 4), **10/01** (Chapter 4, HW4), **10/03** (Chapter 4)
Week 7 A. Ritwik	**10/06** (Chapter 5), **10/08** (Chapter 5, HW4D, HW5), **10/10** (Chapter 5)
Week 8 Y. Mansur	**10/13** (Chapter 5), **10/15** (Chapter 6, HW5D), **10/17** (Chapter 6 – NS Equation)
Week 9	Midterm break
Week 10 A. Ritwik	**10/27** (Chapter 6, HW6), **10/29** (Chapter 6), **10/31** (Chapter 6)
Week 11 Y. Mansur	**11/03** (Chapter 6, HW6D), **11/05** (Review for Midterm 2), **11/07** (Midterm 2)
Week 12 A. Ritwik	**11/10** (Computational Methods*), **11/12** (Chapter 7, HW7), **11/14** (Chapter 7)
Week 13 A. Ritwik	**11/17** (Chapter 7), **11/19** (Micro-nano Fluids*, HW7D), **11/21** (Non-Newtonian Fluids*)
Week 14	**11/24** (Class canceled), Thanksgiving holiday
Week 15 Y. Mansur	**12/01** (Chapter 8, HM8), **12/03** (Chapter 8), **12/05** (Chapter 8)
Week 16 Y. Mansur	**12/08** (Review, HM8D), **12/10** (Review)

*Optional contents that will not be included in the HW, Midterms, and Final Exam.
*Homework will be posted 10 A.M., and the deadline is 11:59 P.M.

GRADINGS
1) Homework (30%, from six highest scored HW assignments)
2) Midterm Exam I (20%)
3) Midterm Exam II (20%)
4) Final Exam (30%) – Monday, Dec 15th, 4:15 PM – 6:15 PM. DeBartolo Hall 102.

OTHER POLICIES

Generative AI Policy: You are allowed and encouraged to use generative AI such as ChatGPT for all the assignments, but not the exams.

Midterm and Exam policies: Each exam will cover cumulative materials up to the exam date. However, emphasis will be given to the more recent materials. Midterms and Final Exams will be closed book/note, but you are allowed to bring in a one-page, double-sided cheat sheet. During exam, only scientific calculators will be permitted. Using any other electronics including cell phone, computers is strictly prohibited. Failure to follow these rules will result in exam confiscation.

Homework policies: As solutions will be posted immediately after the deadline, late submission will not be accepted. The two lowest-scored homework assignments do not count into your final homework scores. We use Gradescope for homework submission and grading.

Policy on conflicts or emergencies:

(1) For time conflicts with other events (*e.g.* another scheduled exam), or an official University of Notre Dame activity, please show official documentation about the conflict at least one week before the homework/quiz/exam due date. The due date will be extended if the excuses are legitimate.

(2) If you will not be able to make it to the exam due to serious illness or other emergent personal crisis that are not described in (1), please send an email to the instructor (jma9@nd.edu) at your earliest convenience, and submit a statement from the professionals that are authorized to evaluate your situation (e.g. doctors, police officers). The statement needs to clearly explain that you are not physically capable of attending exams on time. The due date will be extended if the excuses are legitimate.

Honor code: The University's Honor Code reminds our community of our shared purpose both within the institute of academia and as members of a broader humanity; the statement also outlines policy violation procedures. The Honor Code will be strictly applied as described in The Academic Code of Honor Handbook. Students will not give or receive aid on exams. This includes, but is not limited to, viewing the exams of others, sharing answers with others, and using books or notes while taking the exam. *Plagiarism is unacceptable* and will result in a zero grade for all persons involved, and will result in serious academic repercussions.

Disability and accommodation: It is the policy and practice of The University of Notre Dame to provide reasonable accommodations for students with properly documented disabilities. Students who have questions about Sara Bea Disability Services or who have, or think they may have, a disability are invited to contact Sara Bea Disability Services for a confidential discussion in the Sara Bea Center for Students with Disabilities or by phone at 574-631-7157. Additional information about Sara Bea Disability Services and the process for requesting accommodations can be found at sarabeadisabilityservices.nd.edu.

Privacy practices in this course: Course materials (lecture notes, slides, assignments, problem sets, etc.) are for use in this course only. You may not upload them to external sites, share with students outside of this course, or post them for public commentary without my written permission.

HOMEWORK/EXAM FORMAT GUIDELINE

Problem solutions should meet a few professional standards. Each problem solution should better contain the following basic elements:

Find: state briefly the question to be answered and identify what is to be found.

Given: present the given information in concise form. Maybe include a sketch of the system that shows any control volumes to be used in analysis. Label all forces, velocities.

Assume: state all important assumptions. *e.g.*, steady state, irrotational, etc.

Basic laws: given all basic principles, in general form, and show how the simplifying assumption reduce the problem to a solvable form.

Solution: try to carry all solutions out in symbolic form before substituting in numerical values. Check all terms have the same unites in a consistent set (*e.g.* SI).

Problem grading will be done using a ten-point scale.

- 10 points for perfect solution.
- 9 points for good solution, it may contain one minor numerical error.
- 8 points for a fair solution, which is generally okay, but with some numerical errors.
- 6 points for a solution with one major conceptual error
- 2 to 4 points for a solution with two or more major errors.