ENGS 342 – Fluid Mechanics & Dynamics
Spring 2025

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Office Hours: M 1:00-2:00, Tu 10:00-11:00, W 9:30-10:30, or by appointment

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Prerequisites: PHYS 270 OR MATH 331.

Course Materials:
Required Book: A Physical Introduction to Fluid Mechanics (2nd Ed) by Alexander J. Smits, Available for download at: www.efluids.com

Course Overview: This course introduces principles of fluid mechanics for liquids and gases from an engineering perspective. Properties and kinematics of fluid mechanics will be presented through both theoretical frameworks and relevant applications.

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

- Apply the laws of fluid dynamics for streamlined and turbulent flows
- Define Reynolds number for fluids for continuity and boundary value criteria
- Analyze equations of fluid motion and visualize fluid flow, especially in pipes
- Calculate the forces in establishing static, dynamic and stagnation fluid pressure
- Differentiate between hydraulic grade lines (HGL) and energy grade lines (EGL)
- Apply Navier–Stokes theorem for Differential Analysis of Fluid Flow Problems

Expectation: Students are expected to put in a minimum of 12 hours/ week of work in order to successfully complete this course.

Attendance: Students are required to attend every class. Your attendance will be recorded each lecture period. If you show up 10 minutes late, you will be marked absent. Any unexpected absence due to health reasons/emergency situation/participation in a conference or sporting events representing the College should be supported by proper documentation such as doctor's note, court order, and schedule of conference/sports events. You will need to inform me prior to the absence or within 48 hours of such an absence to be considered as excused. It is best to inform me about your absence in person. Emails and phone voice messages are not very reliable. It is your responsibility to make up for the work that you missed. I will not extend the deadline for turning in homework or other work assigned in the class unless you have my prior approval.

Grading: Grades for this course will be based on homework assignments, tests, quizzes, in-class assignments and student participation

Category	Weight
Homework	20%
Exams (2x unit, 1x final)	50%
Final Project	20%
Attendance & Participation	10%

Points	Grade	Points	Grade
<60	F	77-79	C+
60-62	D-	80-82	B-
63-66	D	83-86	B
67-69	D+	87-89	B+
70-72	C-	90-92	A-
73-76	C	≥93	A

Homework: There will be at least approximately one homework set each week, consisting of problems from the lectures given during the week. I will assign homework problems in class. All assigned homework has an associated due date / deadline. Late home-work falls under the Late Work policy below.

Quizzes: There may be occasional quizzes held during lecture time. The quiz may be unannounced. There will be no make-up quizzes – if you are absent, you get zero. Quiz grades will be applied to attendance & participation.

In-Class Problems and Participation: You will also be required to complete problems assigned in class. Participation in class discussions is also an important aspect of learning the material.

Late Work: Assignments submitted late will be penalized 10% per day for the first 5 days. After 5 days, but no later than the associated exam, late work will be accepted for 50% credit. After the unit exam, late work will not be accepted.

MCSP Colloquium Series: You are required to attend at least 2 of the several talks as a part of the MCSP colloquia this semester. You have to write up a paper on your reflections of the talk to get full credit (2 points) The reflection papers are due within one week of the talk. MCSP credits will be factored in while determining the final grade. This particularly helps students who are on the cusp of a letter grade.

Exams: There will be three exams during the semester, including the final. Each exam will cover the material listed on the syllabus or as informed by me in class. See the class schedule at the end of this handout. All exams will be cumulative.

Make-up Exams: Make-up exams will only be allowed as a result of a discussion with me beforehand or a note related to the emergency (death, hospitalization, misdemeanor, etc.) signed by a governing official (medical doctor, parent, law enforcer, etc.).

Academic Integrity: Maintaining academic integrity is a mutual responsibility for all of us. I will be respectful of your time and make sure I am available during my office hours and will communicate with you in a timely manner. I expect the same in terms of your timeliness, honesty

and sustained effort. Roanoke College has policies regarding academic integrity that apply in this course which can be found online (www.roanoke.edu/academicintegrity).

- Collaboration/Group Work: One stark distinctive of 21st century science and engineering is the degree of collaboration within the community. As a part of this class, time will be spent in group collaboration in/outside of class. We will spend some time discussing the difference between collaboration and plagiarism. Collaboration relies on the individual strengths and contributions of each group member to produce deeper understanding.
- Plagiarism: Plagiarism exists when someone takes personal credit for another's creative (usually written) work, which includes your classmates or content produced by generative artificial intelligence (e.g., ChatGPT). Two practical indicators of potential plagiarism: 1) you are not thinking for yourself while completing assigned work; 2) you are not properly recognizing others for their contribution (including your own classmates). Please consult your instructor if this is unclear and/or you have questions.
- Electronic devices: Use of electronic devices (e.g., phone or graphing calculator) is prohibited during quizzes and tests unless I specifically authorize the use.
- Generative Artificial Intelligence: Since a central goal of this course is to help you become independent and critical thinkers, use of generative AI tools to create written reports, presentations, and designs must be limited. You are allowed to use generative AI for brainstorming, research assistance, learning about concepts, and writing support, so long as it enhances your work. It must not inhibit your learning or demonstration of fundamental skills such as critical thinking. As a professional, if you are able to use technology to help you produce better work more efficiently, you will likely be rewarded. If generative AI does your job for you, you will be replaced. Here are some guidelines for generative AI use on assignments in this course:
    - Communicate when and how you use generative AI
    - Be prepared to clearly articulate your contribution to the work
    - You must understand everything in submitted work.
    - You are responsible for the work you submit, so check it thoroughly
    - Copy-and-pasting sentences, paragraphs, or entire documents from generative AI is considered plagiarism

Class Schedule: See attached tentative outline.