Course Syllabus and Guidelines [Spring 2024]
ME 304-104 - Fluid Mechanics
Monday 06:00 PM – 8:50 PM
KUPF 107

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It is the responsibility of the student to read and understand this course syllabus. This syllabus is subject to change and may be updated throughout the semester.

Course Description: Fundamental concepts; fluid statics; fluid dynamics; steady and unsteady Bernoulli's equation; control volume analysis; basic flow equations of conservation of mass, momentum, and energy in fixed and moving control volumes; differential analysis of fluid flow; dimensional analysis and similitude.

Credit Hours: 3
Prerequisite: Dynamics II, MECH 236; Thermodynamics, ME 311
Lecture: 1 day per week at 170 minutes

Textbook: Fundamentals of Fluid Mechanics, 8th Edition
Author(s): Munson, Young, and Okiishhi's
Amazon URL: tinyurl.com/me304003
AbeBooks URL: tinyurl.com/me304003abe

Course Outcomes:
At the completion of this course, students will be able to:

1. Identify or predict the flow regime in a given engineering system based on consideration of the governing non-dimensional groups
2. Calculate the hydrostatic forces and moments on planar and curved submerged and floating surfaces
3. Construct an appropriate (fixed, deforming, or moving) control volume for a given engineering system and apply the principles of conservation of mass, momentum, and energy to this control volume
4. Decide when appropriate to use ideal flow concepts and the Bernoulli's equation
5. Present data or governing equations in non-dimensional form, design experiments, and perform model studies

Course Topics:
The following topics will be covered in this course:

1. Fluid properties, fluid forces, and flow regimes.
2. Fluid statics.
3. Flow kinematics.
4. Conservation of mass, momentum, and energy in fixed, deforming, and moving control volumes.
5. The steady and unsteady Bernoulli's equation along and normal to a streamline.
6. Similitude, dimensional analysis, and modeling; important non-dimensional groups in fluid mechanics.
7. Conservation of mass and momentum expressed through differential analysis.

Course Policies:

- Assignments
  - Homework will be assigned weekly and is due a week later before the class starts.
  - *Unless the assignment specifies otherwise, you must work in teams of four or five, handing in one team solution per assignment.* The instructor will designate the teams.
  - *Team Roles*. On each group assignment, your team should designate a coordinator to organize work sessions, make sure everyone knows where and when to meet and understands who is supposed to be doing what. A recorder to prepare and turn in the final solution set, and two or more checkers to check the solution for correctness and verify that everyone in the group understands both the solutions and strategies used to obtain them. The team roles must rotate on every assignment—once a team member has carried out a role, he/she may not do it again until everyone else on the team has done it.
  - Homework format. Each completed homework should be in one person's handwriting (the recorder's). Put the names and roles (coordinator, recorder, checker) of participating group members and the problem set number and date on the outside. *If a student's name appears on a solution set, it certifies that he/she has participated in solving the problems*.
  - Late homework. Completed assignments should be turned in at the beginning of class on the due date. Solution sets will be accepted up to one week after the due date. Late assignments will receive a maximum grade of 50%. *However, once a group hands in several late assignments, they will no longer be accepted.*
  - Posted solutions. *Problem set solutions will not be posted*. The burden is on you to make sure you find out how to solve the problems by getting help before they are due and/or asking about them in class after they have been handed in.
  - Individual effort assessments for team homework. All students will be periodically asked to submit evaluations of how well they and their teammates performed as team members. These evaluations will be incorporated into the assignment of homework grades. *If repeated efforts to improve team functioning (including faculty intervention) fail, a non-participant may be fired by unanimous consent of the rest of the team, similarly a team member essentially doing all the work of the team may quit.* Individuals who quit or are fired must find a team of two or three unanimously willing to accept them; otherwise they will receive zeros for the remainder of the homework.

- Quizzes
  - There will be quizzes every week except week one and the weeks of midterms.
  - The quizzes will be taken from lecture and textbook readings and at the beginning of every class.
  - Quizzes will cover text material from previous weeks.
  - All quizzes will be closed notes and closed book.
  - Only non-programmable calculators are allowed during quizzes. *Mobile phones, smart watches, programmable calculators, and similar electronic devices are expected to remain out of sight — the sight of a mobile phone, smart watch, or programmable calculator* during a quiz results in a grade of F for the class.

- Exams
  - There will be two exams during the semester.
  - All exams are closed book and closed notes, and an equation sheet will also be provided.
  - Only non-programmable calculators are allowed during exams. *Mobile phones, smart watches, programmable calculators, and similar electronic devices are expected to remain out of sight — the sight of a mobile phone, smart watch, or programmable calculator* during an exam results in a grade of F for the class.
  - The exam materials consist of two documents, a question booklet, and an answer sheet. Please note the answer sheet is the only thing that will determine the grade, not what is in the exam booklet.
  - Failure to show for an exam results in a grade of zero, unless the dean of students contacts the instructor, and a decision is made otherwise. Employment is not considered a valid reason for missing an exam, and no makeup exams or finals will be given.

- Journal Clubs
  - There will be a journal club at the end of this semester.
  - Each student will pick an article for individual presentation and group discussion. The articles will cover a wide variety of fluid mechanics topics based on the student interests. The paper discussions will enhance the presentation, problem solving, and critical thinking skills of the student.
  - The students are required to read & review the article and discuss about/interpret the scientific data.
  - Grading will not be based on the publication chosen but will be subjective based on the student presentation (50%) and student discussions (50%).
  - *Students are required to submit the title and a short abstract of their final project by April 1.*

- Attendance and Absences
  - Attendance is expected and will be taken each session.
  - Students are responsible for all missed work, regardless of the reason for absence.
  - In the case that a student is absent (or expects to be absent) for an exam, the following actions are required in order for that exam grade to be non-zero:

1. The student should write an email to the professor indicating that he/she is going to contact the dean of students office about their absence from the exam. Those expecting official travel (i.e., athletes, academic conferences, etc.) must notify the professor and the dean of students office at least 2 weeks prior to the exam. In extreme cases (i.e., unforeseen sickness, death, etc.) the student must notify the professor and dean of students office within 48 hours after the originally scheduled exam time. In the email sent to the dean of students office, students should at a minimum include the following: (i) name; (ii) ID number; (iii) course and section; (iv) professor's name and email; (v) regularly scheduled exam time; (vi) evidence for absence.
2. Upon receiving notice from the dean of students office, the professor will contact the course coordinator and provide the relevant information.
3. Exams missed with certified medical excuse or prior instructor approval will be dealt individually. Since it is likely that multiple students are in a similar situation, the course coordinator will make a decision that is equitable to everyone involved.
4. If you miss an exam without either a certified medical excuse or prior instructor approval, you may take a makeup test at a designated time near the end of the semester. Only one makeup test will be given. *It will be fair but comprehensive and challenging!*

Grade Distribution:

The weights shown in the table will be used in the determination of the final course grade.

Quiz:	15%
Homework:	15%
Journal club:	10%
First Exam:	30%
Second Exam:	30%
Total	100%

Grading will be based on:

A:	90-100%
B+:	80-89%
B:	70-79%
C+:	60-69%
C:	50-59%
F:	0-49%

- **Gray areas between guaranteed letter grades**. There will be a gray area of several points below the specified numerical cutoff grades, within which a ± system will be used. Two people getting the same weighted average grade (say, 89) might therefore get different course grades (A and B+). If you are in one of these gray areas, whether you get the higher or lower grade depends on whether your test performance has been improving (your grade goes up) or declining (it goes down), whether your participation in group work has been good (up) or inadequate (down) and on your attendance.

Note: Any disagreement over grades must be brought to the attention of the instructor no later than the deadline specified by the instructor. Further, final grades are typically not discussed via email, an appointment should be made.

Academic integrity

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found here.

Please note that it is the my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. ***Any student found in violation of the code by cheating, plagiarizing, using any online software inappropriately, or other forms of dishonesty in academics will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.*** If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

Approximate Outline: A lecture period is 170 minutes.

Week	Topic	Reading
1	Introduction and Fundamentals	**Ch.1**: 1.1-1.7
2	Fluid Statics	**Ch.2**: 2.1-2.11.1
3, 4	Fluid Dynamics	**Ch.3**: 3-1-3.8
5	Fluid Kinematics	**Ch.4**: 4.1-4.4
6	1st Exam (March 4th)	**Ch.1 – Ch.4**
7, 8	Control Volume Analysis	**Ch.5**: 5.1-5.3
9, 10, 11	Differential Analysis	**Ch.6**: 6.1-6.3, 6.8-6.9
12, 13	Dimensional Analysis and Modeling	**Ch.7**: 7.1-7.9
14	Journal Club (April 29th)	**Ch.5 – Ch.7**
Final Exam Day	2nd Exam	