

Spring 2022
MECH 3314 Fluid Mechanics (Section 1, CRN: 25206)

Course Description Fluid properties, fluid statics, fluid flow concepts and basic equations, dimensional analysis, viscous effects, fluid resistance, laminar and turbulent boundary layers, flow-through pipes. **Prerequisite is MECH 2311 Intro to Thermal-Fluid Science with a ‘C’ or better.**

Instructor and Office Hours Dr. Joshua T. Green (jtgreen2@utep.edu)
Office hours W 1:30 – 3:00 pm
In person:
Office C107A inside E-Lead Studios of Classroom Bldg.
Virtually:
<https://us.bbcollab.com/guest/a3d1cfe565dd4da3b39b512b24ada834>

Open Discussions on MS Teams:
<https://teams.microsoft.com/l/team/19%3aigRctzh4o37RHncuvdeTsIWTOEAarg1fuqPpDIQprUA1%4cv2/conversations?groupId=dbf08b6d-a413-4fb3-b500-ddce9df2f880&tenantId=857c21d2-1a16-43a4d57f3fab9d2f>

Textbook *Fluid Mechanics: Fundamentals and Applications* Fourth Edition (2018)
Hardcopy Required by Yunus Cengel and John Cimbala
ISBN10: 1259696537
ISBN13: 9781259696534
McGraw Hill

Course Content

1. Review of Basic Concepts
2. Conservation of Mass
3. Bernoulli’s Equation
4. Energy Equation
5. Conservation of Momentum
6. Dimensional Analysis
7. Internal Flows
8. External Flows
9. Compressible Flows
10. Turbomachinery

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|--------------|---|-----|--------------------|---|
| Grade | Assignments and Projects | 40% | Grade Scale | |
| | Exams (4 given – 3 highest scores count) | 60% | 100-90% | A |
| | | | 89-80% | B |
| | | | 79-70% | C |
| | | | 69-60% | D |
| | | | <60% | F |

There will be four exams, class assignments, and projects (one assignment per average class session). There will be no makeups for the tests or assignments. Your lowest five assignments will be dropped.

Major Course Objectives

Upon completion of this course, students should be able to:

1. Articulate the properties that distinguish fluids from other forms of matter, and the broad range of engineering applications which involve fluid mechanics.
2. Apply the concepts of flow physics through the conservation laws.
3. Properly apply Newton's second law to analysis and design involving fluids at rest using integral and differential calculus.
4. Properly apply systems and control volume methods based on mass, and momentum conservation, as appropriate, to the analysis and design of engineering fluids systems.
5. Properly apply mass and momentum conservation to steady internal (pipe) flows, correctly interpret and apply laminar and turbulent flow models, and estimate head loss and power requirements in piping systems.
6. Develop mathematical models through justifiable *approximations*, correctly interpret and apply the "inviscid" approximation and the "Bernoulli" relationships to analysis of fluid systems and estimate levels of approximation in engineering models.
7. Apply basic principles of dimensional homogeneity to engineering analysis and apply dimensional analysis and similitude to the representation of data. Properly interpret the Reynolds number and other fundamental nondimensional parameters.
8. Apply integral methods, and basic empirical and theoretical models, to the analysis of boundary layer flows, and to drag on bodies.
9. Apply fundamental knowledge of fluid mechanics to the analysis of specific sensors and instruments used in fluid-flow experiments.
10. Apply basic software tools (especially spreadsheets) to the analysis of experimental data and mathematical models.
11. Demonstrate professionalism, and respectful interaction with faculty and colleagues.

ABET Program Outcomes Impacted

This class significantly addresses the following ABET objectives:

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (e) an ability to identify, formulate, and solve engineering problems

TENTATIVE CLASS SCHEDULE
MEETING TIME: TR 1:30 - 2:50 pm
MEETING LOCATION: College of Business Admin 332

| CH | DATE | Day of Week | Reading Assignment | Self-Study Problems | Comments |
|-----------|-------------|--------------------|---------------------------|---|------------------------------------|
| 1 | 1/20/2022 | Thu. | 1.1-10 | - | Introduction |
| 2 | 1/25/2022 | Tue. | 2.1-3, 2.5-6 | 2-9, 2-13, 2-14, 2-74, 2-79, 2-80 | - |
| 3 | 1/27/2022 | Thu. | 3.1-4, 3.6 | 3-12, 3-13, 3-18, 3-19, 3-26, 3-32, 3-38, 3-45, 3-47, 3-55, 3-67, 3-69, 3-71, 3-74, 3-77, 3-97, 3-104 | - |
| 5 | 2/1/2022 | Tue. | 5.1-6 | 5-9, 5-12, 5-13, 5-15, 5-17, 5-21, 5-26, 5-42 | - |
| 5 | 2/3/2022 | Thu. | - | 5-52, 5-60, 5-62, 5-63, 5-79, 5-84, 5-87, 5-89 | - |
| | 2/8/2022 | Tue. | - | Review Previous Self-study Problems | Review Day: Practice exam problems |
| | 2/10/2022 | Thu. | - | - | Exam 1 [CH 1,2,3, and 5] |
| 6 | 2/15/2022 | Tue. | 6.1-4 | 6-17, 6-18, 6-21, 6-22, 6-23, 6-27, 6-34, 6-35, 6-48, 6-95 | - |
| 6 | 2/17/2022 | Thu. | - | - | - |
| 7 | 2/22/2022 | Tue. | 7.1-4 | 7-16, 7-21, 7-22, 7-37, 7-39, 7-49, 7-54 | - |
| 7 | 2/24/2022 | Thu. | - | - | - |
| | 3/1/2022 | Tue. | - | Review Previous Self-study Problems | Review Day: Practice exam problems |
| | 3/3/2022 | Thu. | - | - | Exam 2 [CH 6 and 7] |
| 8 | 3/8/2022 | Tue. | 8.1-6, 8.8 | 8-12, 8-33, 8-34, 8-37, 8-39, 8-40, 8-43, 8-46, 8-50, 8-51, 8-55, 8-63, 8-66 | - |
| 8 | 3/10/2022 | Thu. | - | - | - |
| | 3/15/2022 | Tue. | NO CLASS | NO CLASS | SPRING BREAK |
| | 3/17/2022 | Thu. | NO CLASS | NO CLASS | SPRING BREAK |
| 11 | 3/22/2022 | Tue. | 11.1-4 | 11-21, 11-23, 11-24, 11-29, 11-31, 11-33, 11-34, 11-41 | - |
| 11 | 3/24/2022 | Thu. | 11.5-7 | 11-50, 11-51, 11-53, 11-57, 11-59, 11-64 | - |

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| 11 | 3/29/2022 | Tue. | - | 11-66, 11-68, 11-70, 11-72, 11-85, 11-87, 11-89 | - |
| 12 | 3/31/2022 | Thu. | 12.1-3 | 12-4, 12-6, 12-7, 12-10, 12-19, 12-22, 12-23, 12-25 | - |
| | 4/1/2022 | Fri. | - | - | UTEP Drop Deadline |
| | 4/5/2022 | Tue. | - | Review Previous Self-study Problems | Review Day: Practice exam problems |
| | 4/7/2022 | Thu. | - | - | Exam 3 [CH 8 and 11] |
| 12 | 4/12/2022 | Tue. | 12.4 | 12-40, 12- 48, 12-62, 12-64 | - |
| 12 | 4/14/2022 | Thu. | 14.1-2 | 14-28, 14-35, 14-36, 14-39 | - |
| 14 | 4/19/2022 | Tue. | - | 14-43, 14-58, 14-60, 14-62 | - |
| 14 | 4/21/2022 | Thu. | 14.4 | - | - |
| | 4/26/2022 | Tue. | - | - | - |
| | 4/28/2022 | Thu. | - | - | - |
| | 5/3/2022 | Tue. | - | - | Final Project is Due |
| | 5/5/2022 | Thu. | - | Review Previous Self-study Problems | Review Day: Practice exam problems |
| | Finals Week | TBD | - | - | Exam 4 [CH 12 and 14] *Day and time set by UTEP* |

ACES & Tutoring Center

Please note there are tutoring services available in the ACES center. Tutoring is free to you; the Department pays them. If tutors are not used, the Department may stop funding them. Check the schedule of the tutors and make use of the services. For more details visit the

ME Advising Blackboard -> cc mech acadav: MECH Academic Advising -> Tutoring & Resources
At the link you can find tutor schedules, location of the ACES center and the list of tutors available. For more information send email to METutors@utep.edu

Course Communication: How we will stay in contact with each other

There are several ways we can keep communication channels open beyond our time spent in class or in study sessions:

- **Office Hours:** I have office hours during which you can meet with me at my office or meet with me virtually. (see section titled: "Instructor and Office Hours")
- **Email:** UTEP e-mail is the best way to contact me. I will make every attempt to respond to your e-mail within 24-48 hours of receipt. When e-mailing me, be sure to email from your UTEP student account and please put the course number and section in the subject line. In the body of your e-mail, clearly state your question. At the end of your e-mail, be sure to put your first and last name, and your university identification number.
- **Discussion Board:** If you have a question that you believe other students may also have, please post it in Microsoft Teams. Please respond to other students' questions if you have a helpful response. (see section titled: "Instructor and Office Hours")
- **Announcements:** Check the Blackboard announcements frequently for any updates, deadlines, or other important messages.

Technology Requirements

Course content may be delivered via the internet through the Blackboard learning management system. Ensure your UTEP e-mail account is working and that you have access to the Web and a stable web browser. Google Chrome and Mozilla Firefox are the best browsers for Blackboard; other browsers may cause complications. When having technical difficulties, update your browser, clear your cache, or try switching to another browser.

You will need to have access to a computer/laptop, printer, scanner, and a microphone. You will need to download or update the following software: Microsoft Office (including Microsoft Teams), Adobe Acrobat Reader, Windows Media Player, and QuickTime. Check that your computer hardware and software are up-to-date and able to access all parts of the course.

If you do not have word-processing software, you can download Word and other Microsoft Office programs (including Excel, PowerPoint, Outlook and more) for free via UTEP's Microsoft Office Portal.

IMPORTANT: If you encounter technical difficulties beyond your scope of troubleshooting, please contact the UTEP Help Desk as they are trained specifically in assisting with technological needs of students. Please do not contact me for this type of assistance. The Help Desk is much better equipped than I am to assist you!

COVID-19 Precaution Statement

Please stay home if you have been diagnosed with COVID-19 or are experiencing COVID-19 symptoms. If you are feeling unwell, please let me know as soon as possible, so that we can work on appropriate accommodations. If you have tested positive for COVID-19, you are encouraged to report your results to covidaction@utep.edu, so that the Dean of Students Office can provide you with support and help with communication with your professors. The Student Health Center is equipped to provide COVID-19 testing.

The Center for Disease Control and Prevention recommends that people in areas of substantial or high COVID-19 transmission wear face masks when indoors in groups of people. The best way that Miners can take care of Miners is to get the vaccine. If you still need the vaccine, it is widely available in the El Paso area, and will be available at no charge on campus during the first week of classes. For more information about the current rates, testing, and vaccinations, please visit epstrong.org.

Academic Honesty

During exams and quizzes, you are not allowed to use any form of wifi enabled electronic device, including cell phones or other electronic communication devices or methods (wrist watches, earbuds, etc.). No wrist watch or other electronic device may be worn. Calculators and watches may be subject to inspection. You may be asked to temporarily remove glasses to allow for their inspection.

You may not bring backpacks, hats, bulky coats or hoodies into the exam room. Lockers are not available at the exam site so plan and leave your belongings in a secure location. You may NOT sit them in a corner of the exam room.

You must show your work for all problems. You must use the paper provided by the instructor. If no work is shown you may not receive credit. After the exam, the instructor may require you to explain how you solved a problem on the exam. If you refuse to or cannot explain your work you may be subject to disciplinary action.

No electronic version of the book, loose paper print-outs of the book or extra sheets of paper of any kind are allowed unless explicitly mentioned in writing by the instructor. As a part of the zero-tolerance policy, if you have a cellphone or other electronic device capable of communication on your person; or if any proctor sees or hears any electronic device during the exam or if you share your work with someone else, you will be reported to the proper authorities and you may receive a zero on the exam or an F in the class. Other actions including suspension may also be pursued.

No one will be allowed to leave the room during an exam. This includes restroom breaks. University approved recording devices may be located at various locations in the room and may be out of sight of the students. These recordings will be managed according to the UTEP approved regulations for such media. The instructor may create a record of your activity during the exam and may take photographs of your work during the exam.

If you are suspected of scholastic dishonesty you may or may not be directly confronted about

your conduct by the instructor or proctor. You will however, be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) and your exam may not be admissible. Your grade in the class may not be available until OSCCR makes a final ruling, this may adversely impact your ability to enroll in other classes.

If you arrive more than 15 minutes late to an exam, you will not be allowed to take the examination.

There will be no makeup exams administered. If you have a university approved excuse, your instructor will have a process for determining how to handle the missing grade outlined in the syllabus. However, no makeup exams will be given.

If you miss more than one exam, the instructor may choose to administratively drop you from the class. This may adversely impact a visa and financial aid.

No food or drink may be brought into the examination room.

Departmental policy allows for the use of assigned seats. All students must present their UTEP issued ID prior to and during every exam and may be required to sign in. Not having a UTEP issued ID when asked will result in forfeiture of the exam. No other IDs will be accepted. Scholastic dishonesty on homework, lab assignments and all other class assignments will be held to the same standards and requirements of academic honesty as quizzes and exams. Use of Chegg or other 3rd party websites is strictly prohibited for assignments, projects, and exams.

Class Attendance Policy

Attendance is mandatory. A drop for not attending will count toward the State Allowed Six Drop Limit. If you are failing the class at the time of the drop you may also be given a WF designation. Be advised that a drop could adversely impact visa status, financial aid and other programs.

As per UTEP rules, you may be asked to show a UTEP ID at any time during class. Anyone who is present and not registered in the class will be subject to disciplinary action unless the instructor gives prior approval.

Excused Absence for Exams

The UTEP catalog allows Exam Absence to be excused ONLY for University-Recognized Activities and very specific other situations. Medical absence is NOT allowed in the UTEP catalog. For consistency with the catalog, students will NOT be excused from exams due to illness.

Harassment Policy

The University (see Handbook of Operating Procedures 1.2.2.4) has a zero-tolerance policy for harassment. Engagement in any behavior considered harassment will be reported to the proper authorities. In addition to generally understood forms of harassment, the department also treats the following behavior as harassment:

- Repeated emails and/or calls regarding subjects that have already been addressed. Once a decision has been made or a question answered, a student who continues to ask the same

question will be given a warning by the recipient of the email/call. If the student continues, the behavior will be reported. Questions that seek understanding of course material are not harassment; but repeated questions about a grade or an administrative decision are.

- Grades are NOT negotiable, ever. If you believe a grading mistake has been made, you must follow the process described in the UTEP catalog. Any request for a grade elevation that is NOT based on a mistake is considered harassment and will be reported immediately.
- Remaining in an office after the occupant requests you leave is considered harassment and potentially threatening. You will be reported immediately without warning and depending on the severity, may be reported to law enforcement.
- Similar behavior towards department staff, and student advisors will also be treated as harassment, including persistent phone calls, emails, and badgering. Department staff and student advisors are there to help students, and should be treated with due respect.

Course Resources: Where you can go for assistance

UTEP provides a variety of student services and support:

Technology Resources

- [Help Desk](#): Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.

Academic Resources

- [UTEP Library](#): Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- [University Writing Center \(UWC\)](#): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- [Math Tutoring Center \(MaRCS\)](#): Ask a tutor for help and explore other available math resources.
- [History Tutoring Center \(HTC\)](#): Receive assistance with writing history papers, get help from a tutor and explore other history resources.
- [RefWorks](#): A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.

Individual Resources

- [Military Student Success Center](#): Assists personnel in any branch of service to reach their educational goals.
- [Center for Accommodations and Support Services](#): Assists students with ADA-related accommodations for coursework, housing, and internships.
- [Counseling and Psychological Services](#): Provides a variety of counseling services including individual, couples, and group sessions as well as career and disability assessments.

Copyright Statement for Course Materials

All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. They may not be further disseminated.

Class Recordings

The use of recordings may be used to enable access to class lectures, group discussions, and so on. Our use of such technology is governed by the Federal Educational Rights and Privacy Act (FERPA) and UTEP's acceptable-use policy. A recording of class sessions will be kept and stored by UTEP, in accordance with FERPA and UTEP policies. Your instructor will not share the recordings of your class activities outside of course participants, which include your fellow students, teaching assistants, or graduate assistants, and any guest faculty or community-based learning partners with whom we may engage during a class session. You may not share recordings outside of this course. Doing so may result in disciplinary action.

Blackboard Collaborate Sessions

This class may require that you participate in scheduled Blackboard Collaborate sessions. The purpose of these sessions are for you to view live demonstrations of the course material and/or to participate in small discussion groups with your classmates.

Students are expected to participate in these sessions with a microphone. The sessions will be recorded and provided so that they can be reviewed by classmates at a later time. Students should not record the sessions and post them to any sites outside of Blackboard.

Netiquette

As we know, sometimes communication online can be challenging. It's possible to miscommunicate what we mean or to misunderstand what our classmates mean given the lack of body language and immediate feedback. Therefore, please keep these netiquette (network etiquette) guidelines in mind. Failure to observe them may result in disciplinary action.

- Always consider audience. This is a college-level course; therefore, all communication should reflect polite consideration of other's ideas.
- Respect and courtesy must be provided to classmates and to the instructor at all times. No harassment or inappropriate postings will be tolerated.
- When reacting to someone else's message, address the ideas, not the person. Post only what anyone would comfortably state in a face-to-face situation.
- Blackboard is not a public internet venue; all postings to it should be considered private and confidential. Whatever is posted on in these online spaces is intended for classmates and professor only. Do not share documents on a publicly accessible website, blog, or other space.