AREN - CE - 3305 Basic Fluid Mechanics Spring 2019- Syllabus

Instructor: Gautam Raghavendra Eapi

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Office Hours (NH 243-Learning Center/NH 417): Mon & Wed 11:00 am – 12:00 pm and 2:00 pm – 4:00 pm or by Appointment

The office hours listed above are available for the instructor to assist students, and students are highly encouraged to use them. Office hours will be conducted in the CE Learning Center (Room 243 NH)/NH 417. Other times are possible by appointment. I encourage you to come to my office and will see you anytime during working hours as commitments or schedules permit.

Section Information: AREN - CE 3305, Secs 001,101

Time and Place of Class Meetings: Tue -Thurs 3:30 pm - 4:50 pm PKH-321(Pickard Hall)

GTA: Md Arifur Rahman **Email:** mdarifur.rahman@mavs.uta.edu

GTA Hours (tentative): Tue: (11:00 am to 12:00 noon) and (1:00 pm to 3:00 pm) or by appointment (NH 243 Learning Center)

Description of Course Content:
CE 3305. BASIC FLUID MECHANICS (3-0) Fundamentals of fluid statics, kinematics of fluid flow, fluid energy, fluid forces, similitude, and dimensional analysis. Related to steady flow of incompressible fluids in confined and free surface systems.

Prerequisite: CE 2311 or concurrent enrollment; MATH 3319 or concurrent enrollment.

Student Learning Outcomes:
Upon completion of this course, students should be able to demonstrate a basic working understanding of

- Have a working knowledge of hydrostatics to include being able to compute hydrostatic forces for plane objects as well as curved objects.
- Understand and be able to apply Bernoulli equation and energy equations with the continuity equation.
- Understand and be able to apply the application of the linear impulse momentum equation to flowing fluid systems and easily solve basic problems.
- Know and apply Darcy-Weisbach, Hazen Williams, and Manning equations to pipe systems and within their application limits.
- Use the Moody Diagram or alternative Haaland equation appropriately, and be able to use Energy Grade Line and Hydraulic Grade Line appropriately.
- Understand the concept of cavitation and crucial pressure in flowing pipe systems, when it can occur, and be able to determine it's occurrence.
- Have a basic understanding of dimensional analysis and the Bucking ham π theorem, and be able to apply to simple problems.
- Understand basic fundamental open channel problems to include critical flow and its occurrence, and some gradually varied flow concepts and be able to solve basic applications.
- Associate solved problems throughout the course with concepts of design that relate to l application beyond the classroom.
- Student will be able to identify, formulate, and solve engineering problems incorporating the physical principles presented and present the problem solutions in a standardized form.

Required Textbooks and Other Course Materials:
Fluid Mechanics, R . C. Hibbler, 2nd edition, Pearson, 2018

Other reference material and reading materials will also be assigned as necessary.

Descriptions of major assignments and examinations

Three tests (in class or in educational testing center for Distance Learning, 100 points each)
Assistance at CE Learning Laboratory and Office Hours
Homework

Attendance:
At The University of Texas at Arlington, taking attendance is not required. Rather, each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance.

As the instructor of this section, attendance is expected for all class sessions, although it will only be recorded for the first few weeks of the semester as a check of the class roster. Attendance (will / will not) be factored into the grade. For the majority of the semester, attendance will not be taken unless a change in grading policy is indicated during the course.

A seating chart will be established for this class. This is to assist the instructor in knowing each person and to improve class communication.

Grading:

Course Grade Structure:		**Grading Policy:**	
Homework	10%	90-100%	A
Exams (2 at 30% each)	60%	80-89%	B
Final Exam (**NOT** comprehensive)	30%	70-79%	C
Bonus: (FE style) & Attendance	5%	60-69%	D
		60%>	F

The instructor reserves the right to adjust the grade distribution, policy and structure. Any concerns about scores on individual assignments, tests or projects should be brought to the attention of the instructor within 5 days from the day that the score was returned to the student. As notification time becomes longer, it often becomes more difficult in to resolve scoring issues.

Students are expected to keep track of their performance throughout the semester and seek guidance from available sources (including the instructor) if your performance drops below satisfactory levels; see "Student Support Services," below.

The Final Exam is **NOT** comprehensive. Date and time for final exam are based upon pre-determined University schedule. It is currently listed as **Thursday, May 9th, 2019, 2:00 pm – 4:30 pm**, but check the University schedule for any changes.

Other Requirements:
Text and reference material should be read before the class in which it will be discussed.

Homework assignments will be given throughout the semester. The completion of these assignments is an essential means of preparing the student for examinations. Problem sets are due a when indicated on schedule approximately one week later unless otherwise specified. Late problem sets will not be accepted. Solutions are to be done neatly with answers clearly indicated and with all equations used clearly written. Key assumptions must be stated.

Homework must provide units and adhere to three significant figures of as explained by text, tutorials and instructor.

Make-up Exams

If you must miss an examination due to circumstances outside of your control, a makeup may possibly be arranged at the discretion of the instructor (only if you act promptly). Notify the instructor in advance when possible. No unexcused make-up exams will be given.

If you miss an exam, you will receive a zero unless you made arrangement in advance with the instructor or you can demonstrate an emergency existed that you could not circumvent.

The exams and final will not be offered at any times other than that regularly scheduled. Exceptions may be allowed at the instructor's discretion, if accompanied by a medical report from a medical doctor. For consideration of other absences, notify the instructor in advance or as soon as possible.

Expectations for Out-of-Class Study:
A general rule of thumb is this: for every credit hour earned, a student should spend 3 hours per week working outside of class. Hence, a 3-credit course might have a minimum expectation of 12 hours of reading, study, etc.

Grade Grievances:
Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current University Catalog, see http://catalog.uta.edu/academicregulations/grades/#undergraduatetext.

All students are expected to pursue their academic careers with honesty and integrity. Academic dishonesty includes, but is not limited to, cheating on a test or other course work, plagiarism (offering the work of another as one's own) and unauthorized collaboration with another person. Students found responsible for dishonesty in their academic pursuits are subject to penalties that may range from disciplinary probation to suspension to expulsion from the University.

Drop Policy:
Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance**. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (http://wweb.uta.edu/aao/fao/).

Americans with Disabilities Act:
If you require an accommodation based on disability, I would like to meet with you in privacy of my office during the first week of the semester to be sure you are appropriately accommodated. To be able to qualify for assistance under this act, you will need a letter from the UTA office of Counseling and Career Development.

The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding

diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Title IX: The University of Texas at Arlington is committed to upholding U.S. Federal Law "Title IX" such that no member of the UT Arlington community shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity. For more information, visit www.uta.edu/titleIX.

Academic Integrity:
Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code:

> *I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.*
>
> *I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.*

UT Arlington faculty members may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.

Lab Safety Training:
Students registered for this course must complete all required lab safety training prior to entering the lab and undertaking any activities. Once completed, Lab Safety Training is valid for the remainder of the same academic year (i.e., through the following August) and must be completed anew in subsequent years. There are no exceptions to this University policy. Failure to complete the required training will preclude participation in any lab activities, including those for which a grade is assigned. **This class has no lab.**

Electronic Communication:
UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at http://www.uta.edu/oit/cs/email/mavmail.php.

Student Feedback Survey:
At the end of each term, students enrolled in classes categorized as "lecture," "seminar," or "laboratory" shall be directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit http://www.uta.edu/sfs.

Final Review Week:
A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week ***unless specified in the class***

syllabus. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, **instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate**.

Emergency Exit Procedures:
Should we experience an emergency event that requires us to evacuate the building, students should exit the room and move toward the nearest exit, *which is located out the class room door and then turn left and exit down the corridor to building entrance. Exit the building to your left and assemble on the lawn to determine everyone is present.*

Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities. (https://www.uta.edu/policy/procedure/7-6).

Student Support Services:
UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at www.uta.edu/resources.

Writing Center :
The Writing Center, 411 Central Library, offers individual 40 minute sessions to review assignments, *Quick Hits* (5-10 minute quick answers to questions), and workshops on grammar and specific writing projects. Visit https://uta.mywconline.com/ to register and make appointments. For hours, information about the writing workshops we offer, scheduling a classroom visit, and descriptions of the services we offer undergraduates, graduate students, and faculty members, please visit our website at www.uta.edu/owl/.

Librarian to Contact:
The Civil Engineering librarian is Sylvia George-Williams, whose phone number is 817-272-7519, and email is sylvia@uta.edu.

The library links below may be useful in completing work in this course.
Faculty members should feel free to incorporate any of the following information into your course syllabus or other course materials.

Library Home Page	http://www.uta.edu/library
Subject Guides	http://libguides.uta.edu
Subject Librarians.....	http://www.uta.edu/library/help/subject-librarians.php
Database List	http://www.uta.edu/library/databases/index.php
Course Reserves.....	http://pulse.uta.edu/vwebv/enterCourseReserve.do
Library Tutorials	http://www.uta.edu/library/help/tutorials.php
Connecting from Off- Campus	http://libguides.uta.edu/offcampus
Ask A Librarian	http://ask.uta.edu

The following URL houses a page where we have gathered many commonly used resources needed by students in online courses: http://www.uta.edu/library/services/distance.php.

CE 3305 Basic Fluid Mechanics Course Schedule Spring 2019

Chapter	Text Section	Text Problems	Homework Problems
Chapter 1	Fundamental Concept		
	1.1 Introduction 1.2 Matter 1.3 Units 1.4 Calculations 1.5 Problem Solving 1.6 Fluid Properties		
	1.7 Viscosity 1.8 Viscosity Measurement		
	1.9 Vapor Pressure 1.10 Surface Tension and Capillarity		
Chapter 2	Fluid Statics		
	2.1 Pressure 2.2 Absolute and Gage pressure 2.3 Static Pressure Variations 2.4 Pressure Variations for Incompressible Fluids 2.5 Pressure Variations for Compressible Fluids		
	2.6 Static Pressure Measurement		
	2.7 Hydrostatic Force on a Plane Surface -Formula Method		
	2.8 Hydrostatic Force on a Plane Surface - Geometrical Method 2.9 Hydrostatic Force on a Plane Surface -Integration Method		
	2.10 Hydrostatic Force on an Inclined Plane on Curved Surface Determined by Projection		
	2.11 Buoyancy 2.12 Stability		
	2.13 Constant Translational Acceleration of a Liquid 2.14 Steady Rotation of a Liquid		
	Conceptual Problems		
Chapter 3	Kinematics of Fluid Motion		
	3.1 Fluid Flow Descriptions 3.2 Type of Fluid Flows 3.3 Graphical Descriptions of Fluid Flow		
	3.4 Fluid Acceleration		
	3.5 Streamlined Coordinates		
Chapter 4	Conservation of Mass		
	4.1 Final Control Volumes 4.2 Reynolds Transport Theorem		

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Chapter	Text Section	Text Problems	Homework Problems
	4.3 Volumetric Flow, Mass Flow, and Average Velocity		
	4.4 Conservation of Mass		
	Conceptual Problems		
Chapter 5	Work and Energy of Moving Fluids		
	Fundamental Problems		
	5.1 Euler's Equations of Motion 5.2 The Bernoulli Equation 5.3 Application of the Bernoulli Equation		
	5.4 Energy and Hydraulic Grade Lines 5.5 The Energy Equation		
	Conceptual Problems		
Chapter 6	Fluid Momentum		
	Fundamental Problems		
	6.1 The Linear Momentum Equation 6.2 Applications to Bodies at Rest		
	6.3 Applications to Bodies Having Constant Velocity		
	6.4 The Angular Momentum Equation		
	Conceptual Problems		
Chapter 8	Dimensional Analysis and Similitude		
	8.1 Dimensional Analysis 8.2 Important Dimensionless Numbers 8.3 Buckingham Pie Theorem 8.4 Some General Considerations Related to Dimensional Analysis		
	8.5 Similitude		
Chapter 9	Viscous Flow within Enclosed Surfaces		
	9.1 Steady Laminar Flow Between Parallel Plates		
	9.3 Steady Laminar Flow within a Smooth Pipe 9.4 Navier-Stokes Solution for Steady Laminar Flow within a Smooth Pipe 9.5 The Reynolds Number		
	9.6 Fully Develop Flow from an Entrance 9.7 Laminar and Turbulent Shear Stress within a Smooth Pipe 9.8 Turbo Flow within a Smooth Pipe		
Chapter 10	Analysis and Design of Pipe Flow		
	10.1 Resistance to Flow in Rough Pipes		
	10.2 Losses Occurring from Pipe Fittings and Transitions		

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Chapter	Text Section	Text Problems	Homework Problems
	10.3 Single-Pipeline Flow		
	10.4 Pipe Systems		
Chapter 11	Viscous Flow over External Surfaces		
	11.1 The Concept of Boundary Layer 11.2 Laminar Boundary Layers 11.3 The Momentum Integral Equation 11.4 Turbulent Boundary Layers 11.5 Laminar and Turbulent Boundary Layers 11.6 Drag and Lift 11.7 Pressure Gradient Effects 11.8 The Drag Coefficient 11.9 Drag Coefficients for Bodies Having Various Shapes		
	Conceptual Problems		
Chapter 12	Open-Channel Flow		
	12.1 Types of Flows and Open Channels 12.2 Open-Channel Flow Classification` 12.3 Specific Energy 12.4 Open-Channel Flow over a Rise or Bump 12.5 Open-Channel Flow under Sluice Gate		
	12.7 Gradual Flow with varying depth 12.8 The Hydraulic Jump 12.9 Weirs		
Chapter 14	Turbomachines		
	14.1 Types of Turbomachines 14.2 Axial-Flow Pumps		
	14.6 Pump Performance 14.7 Cavitation and the Net Positive Suction Head 14.8 Pump Selection Related to the Flow System 14.9 Turbomachine Similitude		
	Final Exam		

"*As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course. – Gautam R.Eapi."*

Adjustments to this Schedule will be announced in class and posted on class Blackboard as soon as possible after any change.

Emergency Phone Numbers: In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone).
Health Services at **817-272-2771** You may also dial **911**.