

THE UNIVERSITY OF TEXAS RIO GRANDE VALLEY  
College of Engineering and Computer Science  
Department of Mechanical Engineering

**MECE 3315-02 Fluid Mechanics – 3 Credits – Fall 2018**

**Room:** ENGR 1.236

**Time:** TR 8:00 – 9:15 a.m.

**Instructor:** Dr. Constantine Tarawneh      **Office:** ENGR 1.294D      **Phone:** (956) 665-2607

**Office Hours:** MTWR 1:10 - 2:25 pm **Strict**, or by Appointment

**Email:** [constantine.tarawneh@utrgv.edu](mailto:constantine.tarawneh@utrgv.edu)

**Website:** <http://faculty.utrgv.edu/constantine.tarawneh/>

**Textbook:**

Fox, R. W., Pritchard, P. J., McDonald, A. T., **Introduction to Fluid Mechanics**, 8<sup>th</sup> Edition, John Wiley, 2011. [ISBN-13 978-0470-54755-7]

**Prerequisites:**

A grade of “C” or better in MECE 2335 Thermodynamics I & MECE 3450 Engineering Analysis II.

**Prerequisite Knowledge:**

- Calculus (integration and differentiation) and Linear Algebra (systems of equations)
- Vector Analysis (understanding of vector representations and operations)
- Statics (free body diagrams and equilibrium analysis)

**Course Description:**

This is an introductory course in fluid mechanics. The topics covered include fluid properties, fluid statics, conservation laws, dimensional analysis and similitude, inviscid and viscous incompressible flow, and flow in confined streams and around objects.

**Course Outcomes & Assessment:**

At the conclusion of this course, students will be able to:

1. Understand the fundamental concepts of velocity field, stress field, and viscosity (H, Q, T).
2. Apply the basic equations of fluid statics to manometers and hydraulic systems (H, Q, T).
3. Determine the hydraulic force on submerged surfaces (H, Q, T).
4. Apply the basic equations in integral form for a control volume (H, Q, T).
5. Understand the differential analysis of fluid motion (H, Q, T).
6. Apply the dimensional analysis and similitude (H, Q, T).
7. Understand the fundamentals of internal and external incompressible viscous flow (H, Q, T).

Key: H - Homework, Q - Quiz, T - Test

**Grading Policy:**

There will be weekly homework assignments (15%) and quizzes (5%), two in-class midterm exams (26.5% each), and a final exam (27%). Exams will be **closed-book and notes** but you will be provided with formula sheets that contain all pertinent information. **Only** simple (nonprogrammable) scientific calculators will be allowed in the exams. [A ≥ 88%, 88% > B ≥ 78%, 78% > C ≥ 68%, 68% > D ≥ 58%, F < 58%].

## **Homework:**

A homework will be assigned every week. The homework problems will be posted on the Instructor's Web Site and/or Blackboard. To ensure that students do their own work, one of the problems, from each homework, will be chosen for a ten-minute quiz that will be administered the day the homework is due. The student's performance on the quiz will be used in grading the homework assignment. Any discrepancy between the student's performance on the quiz and the homework assignment may result in loss of credit in the total homework grade. After the homework is graded and returned, solutions will be made available in a folder put outside the Instructor's office.

In solving the homework assignment, the following four steps should be followed very carefully:

1. Briefly summarize the problem statement.
2. Provide a schematic diagram of the problem.
3. Solve the problem showing your work in detail by stating your assumptions and providing the equations you used and the numerical values you obtained.
4. Write a sentence or two discussing your findings and conclusions.

Failure to follow the aforementioned four steps will result in points deducted from your homework assignment.

## **Topics Covered:**

- Fluid properties and definitions
- Velocity field, stress field, and viscosity
- Fluid statics
- Basic equations in integral forms for a control volume
- Bernoulli equation
- Introduction to differential analysis of fluid motion
- Dimensional analysis and similitude
- Internal incompressible viscous flow
- External incompressible viscous flow

<b><u>CHAPTER</u></b>	<b><u>TOPIC</u></b>	<b><u>SECTIONS COVERED</u></b>
1	<i>Introduction</i>	All
2	<i>Fundamental Concepts</i>	All
3	<i>Fluid Statics</i>	All except 3-7
4	<i>Basic Equations in Integral Form for a Control Volume</i> <b><i>EXAM 1 (Tuesday 10/23/2018 from 6 – 8 p.m.)</i></b>	All except 4-6 and 4-7
5	<i>Introduction to Differential Analysis of Fluid Motion</i>	All except 5-5
6	<i>Incompressible Inviscid Flow</i>	All except 6-6 and 6-7
7	<i>Dimensional Analysis and Similitude</i> <b><i>EXAM 2 (Tuesday 11/27/2018 from 6 – 8 p.m.)</i></b>	All
8	<i>Internal Incompressible Viscous Flow</i>	All
9	<i>External Incompressible Viscous Flow</i>	9-1, 9-2, 9-7, and 9-8
	<b><i>FINAL EXAM</i></b> <b><i>Tuesday 12/11/2018 at 8:00 – 9:45 a.m.</i></b>	

### **Attendance Policy:**

1. Attendance will be taken every time the class meets. Any student arriving to class **5 minutes** after the class has started will not be allowed in class. Students will be allowed a **maximum** of *three* absences for the whole semester for classes meeting twice a week, *two* absences for classes meeting once a week, and *one* absence for laboratory courses. **Two points** will be deducted from the total (100%) for each absence exceeding the maximum allowable unless proper documentation justifying that absence is provided.
2. Students **will not** be permitted to leave the classroom during lectures and exams except for **extreme emergencies**.

### **Homework and Exam Policy:**

1. **Absolutely no late** assignments will be accepted.
2. **Absolutely no** cell phones, laptops, iPads, iPods, smart watches, or any other smart technology devices are allowed in exams.
3. Make-ups for in-class exams for **documented emergencies** will be scheduled during the last week of class.

### **Calendar of Activities:**

The UTRGV academic calendar and final exam schedule can be found at <https://my.utrgv.edu/home> at the bottom of the screen, *prior to login*. Some important dates for Fall 2018 include:

August 27	First day of classes
August 30	Last day to add a course or register for fall 2018
September 3	Labor Day – NO classes
November 14	Last day to drop a course; will count toward the 6-drop rule
November 22 – 24	Thanksgiving Holiday – NO classes
December 6	Study Day – NO class
December 7 -13	Fall 2018 Final Exams ( <a href="#">Schedule</a> )
December 14-15	Commencement Ceremonies

### **Scholastic Integrity:**

As members of a community dedicated to Honesty, Integrity and Respect, students are reminded that those who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and expulsion from the University. Scholastic dishonesty includes but is not limited to: cheating, plagiarism (including self-plagiarism), and collusion; submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts. Since scholastic dishonesty harms the individual, all students and the integrity of the University, policies on scholastic dishonesty will be strictly enforced (Board of Regents Rules and Regulations and UTRGV Academic Integrity Guidelines). All scholastic dishonesty incidents will be reported to the Dean of Students.

### **Course Drops:**

According to UTRGV policy, students may drop any class without penalty earning a grade of DR until the official drop date. Following that date, students must be assigned a letter grade and can no longer drop the class. Students considering dropping the class should be aware of the “3-peat rule” and the “6-drop” rule so they can recognize how dropped classes may affect their academic success. The 6-drop rule refers to Texas law that dictates that undergraduate students may not drop more than six courses during their undergraduate career. Courses dropped at other Texas public higher education institutions will count toward the six-course drop limit. The 3-peat rule refers to additional fees charged to students who take the same class for the third time.

### **Students with Disabilities:**

Students with a documented disability (physical, psychological, learning, or other disability which affects academic performance) who would like to receive academic accommodations should contact **Student Accessibility Services (SAS)** as soon as possible to schedule an appointment to initiate services. Accommodations can be arranged through SAS at any time, but are not retroactive. Students who

suffer a broken bone, severe injury or undergo surgery during the semester are eligible for temporary services.

**Pregnancy, Pregnancy-related, and Parenting Accommodations**

Title IX of the Education Amendments of 1972 prohibits sex discrimination, which includes discrimination based on pregnancy, marital status, or parental status. Students seeking accommodations related to pregnancy, pregnancy-related condition, or parenting (reasonably immediate postpartum period) are encouraged to contact Student Accessibility Services for additional information and to request accommodations.

**Student Accessibility Services:**

**Brownsville Campus:** Student Accessibility Services is located in Cortez Hall Room 129 and can be contacted by phone at (956) 882-7374 (Voice) or via email at [ability@utrgv.edu](mailto:ability@utrgv.edu). **Edinburg Campus:** Student Accessibility Services is located in 108 University Center and can be contacted by phone at (956) 665-7005 (Voice), (956) 665-3840 (Fax), or via email at [ability@utrgv.edu](mailto:ability@utrgv.edu).

**Sexual Harassment, Discrimination, and Violence:**

In accordance with UT System regulations, your instructor is a “Responsible Employee” for reporting purposes under Title IX regulations and so must report any instance, occurring during a student’s time in college, of sexual assault, stalking, dating violence, domestic violence, or sexual harassment about which she/he becomes aware during this course through writing, discussion, or personal disclosure. More information can be found at [www.utrgv.edu/equity](http://www.utrgv.edu/equity), including confidential resources available on campus. The faculty and staff of UTRGV actively strive to provide a learning, working, and living environment that promotes personal integrity, civility, and mutual respect that is free from sexual misconduct and discrimination.

**Mandatory Course Evaluation Period:**

Students are required to complete an ONLINE evaluation of this course, accessed through your UTRGV account (<http://my.utrgv.edu>); you will be contacted through email with further instructions. Students who complete their evaluations will have priority access to their grades. Online evaluations will be available:

Fall 2018 Module 1	Oct. 4 – Oct. 10
Fall 2018 Module 2	Nov. 29 – Dec. 5
Fall 2018 (Full Semester)	Nov. 15 – Dec. 5

**Student Services:**

Students who demonstrate financial need have a variety of options when it comes to paying for college costs, such as scholarships, grants, loans and work-study. Students should visit the Students Services Center (U Central) for additional information. U Central is located in BMAIN 1.100 (Brownsville) or ESSBL 1.145 (Edinburg) or can be reached by email ([ucentral@utrgv.edu](mailto:ucentral@utrgv.edu)) or telephone: (888) 882-4026. In addition to financial aid, U Central can assist students with registration and admissions.

Students seeking academic help in their studies can use university resources in addition to an instructor’s office hours. University Resources include the Learning Center, Writing Center, Advising Center and Career Center. The centers provide services such as tutoring, writing help, critical thinking, study skills, degree planning, and student employment. Locations are:

- Learning center: BSTUN 2.10 (Brownsville) or ELCTR 100 (Edinburg)
- Writing center: BLIBR 3.206 (Brownsville) or ESTAC 3.119 (Edinburg)
- Advising center: BMAIN 1.400 (Brownsville) or ESWKH 101 (Edinburg)
- Career center: BCRTZ 129 (Brownsville) or ESSBL 2.101 (Edinburg)

**ACKNOWLEDGEMENT OF RECEIPT OF SYLLABUS**

By signing below, I hereby affirm that I have received a copy of the syllabus for **MECE 3315 Fluid Mechanics** and have been informed by the **Instructor** that it is my responsibility to **carefully** read and understand this document and abide by all its content. I also agree to prepare and submit to the **Instructor**, at the end of the semester, a folder that contains **all** my homework assignments, quizzes, exams, projects, reports and/or literature review (if applicable).

\_\_\_\_\_  
Student ID Number

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date