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 2017

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
Website: http://faculty.utrgv.edu/constantine.tarawneh/

Textbook:

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

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>TOPIC</th>
<th>SECTIONS COVERED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>All</td>
</tr>
<tr>
<td>2</td>
<td>Fundamental Concepts</td>
<td>All</td>
</tr>
<tr>
<td>3</td>
<td>Fluid Statics</td>
<td>All except 3-7</td>
</tr>
<tr>
<td>4</td>
<td>Basic Equations in Integral Form for a Control Volume</td>
<td>All except 4-6 and 4-7</td>
</tr>
<tr>
<td>5</td>
<td>Introduction to Differential Analysis of Fluid Motion</td>
<td>All except 5-5</td>
</tr>
<tr>
<td>6</td>
<td>Incompressible Inviscid Flow</td>
<td>All except 6-6 and 6-7</td>
</tr>
<tr>
<td>7</td>
<td>Dimensional Analysis and Similitude</td>
<td>All</td>
</tr>
<tr>
<td>8</td>
<td>Internal Incompressible Viscous Flow</td>
<td>All</td>
</tr>
<tr>
<td>9</td>
<td>External Incompressible Viscous Flow</td>
<td>9-1, 9-2, 9-7, and 9-8</td>
</tr>
</tbody>
</table>

**EXAM 1** *(Tuesday 10/24/2017 from 6 – 8 p.m.)*

**EXAM 2** *(Tuesday 11/21/2017 from 6 – 8 p.m.)*

**FINAL EXAM**

*Tuesday 12/12/2017 at 8:00 – 9:45 a.m.*
**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 2017 include:

- August 28: First day of classes
- August 31: Last day to add a course or register for fall 2017
- September 4: Labor Day – NO classes
- November 15: Last day to drop a course; will count toward the 6-drop rule
- November 23 – 26: Thanksgiving Holiday – NO classes
- December 6: Last day of classes
- December 7: Study Day – NO class
- December 8 -14: Fall 2017 Final Exams (Schedule)
- December 15-16: 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, 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. 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. 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.

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, 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 in an environment 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 2017 Module 1 Oct. 5 – Oct. 11
- Fall 2017 Module 2 Nov. 29 – Dec. 5
- Fall 2017 (full semester) Nov. 15 – Dec. 6
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