UTRGV COURSE SYLLABUS

CIVE 331502 Fluid Mechanics and Hydraulics  Dr. Jungseok Ho, Ph.D., P.E.
Fall 2018  (956) 665-3104, jungseok.ho@utrgv.edu
TR 17:55-19:10 at EENGR 1.268  R 16:30-17:45, F 09:25-10:40 at EACSB 1.201

Textbook and/or Resource Material

Course Description and Prerequisites
This is an introductory course of fluid mechanics in formation of three credit lecture. The course covers topics of fluid mechanics fundamentals, fluid properties, flow classification, dimensions and unit, fluid statics, conservation of mass, momentum equation and its application, dimensional analysis, model similitude, and internal and external incompressible viscous flow including pipe flow and boundary layer. Prerequisites: MECE 2301 Statics and MATH 2415 Calculus III or MECE 3449 Engineering Analysis I

Learning Objectives/Outcomes for the Course
Course Outcomes & Assessment: H - Homework; Q – Quiz; T – Test; F – Field trip; and P – Team project
1. Understand the fundamental concepts of velocity, stress field, and viscosity [H, Q, T]
2. Understand classification of fluid motions and dimension, and unit system [H, Q, T]
3. Demonstrate knowledge of the basic equation of fluid statics [H, Q, T]
4. Apply the basic equations for inertial control volume [H, Q, T]
5. Understand the differential analysis of fluid motion [H, Q, T]
6. Apply momentum equations for incompressible inviscid flow [H, Q, T]
7. Demonstrate knowledge of dimensional analysis and similitude [H, Q, T]
8. Understand the fundamentals of internal and external incompressible viscous flow [H, Q, T]

Learning Objectives for Core Curriculum Requirements
Texas Higher Education Coordinating Board (THECB) Outcomes associated with Civil Engineering Department Student Outcomes
- Critical Thinking Skills - an ability to identify, formulate, and solve engineering problems;
- Empirical and Quantitative Skills - an ability to apply knowledge of mathematics, science, and engineering; a knowledge of contemporary issues; an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
- Social Responsibility - an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

Grading Policies
Homework 20%  100  A > 90
Quizzes 20%  89 >  B > 80
Midterm Exams (3) 45% (15% each)  79 >  C > 70
Final Exam 15%  69 >  D > 60

Calendar of Activities
Include in this section a table or list that provides information for students regarding important dates, assignments or activities. The UTRGV academic calendar 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 classes

December 7 - 13  
Final Exams

December 14 – 15  
Commencement Exercises

<table>
<thead>
<tr>
<th>Wk</th>
<th>Date</th>
<th>Topic</th>
<th>Read</th>
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<tbody>
<tr>
<td>1</td>
<td>28-AUG</td>
<td>Introduction</td>
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<tr>
<td></td>
<td>30-AUG</td>
<td>Dimension and unit</td>
<td>Chapter 1</td>
</tr>
<tr>
<td>2</td>
<td>4-SEP</td>
<td>Fundamental concepts – velocity field</td>
<td>Chapter 2</td>
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<td></td>
<td>6-SEP</td>
<td>Classification of fluid motions</td>
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<td>3</td>
<td>11-SEP</td>
<td>Fluid statics – basic equations</td>
<td>Chapter 3</td>
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<td></td>
<td>13-SEP</td>
<td>Pressure variation in a static fluid</td>
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<tr>
<td>4</td>
<td>18-SEP</td>
<td>Hydrostatic force on submerged surfaces I</td>
<td>Chapter 3</td>
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<tr>
<td></td>
<td>20-SEP</td>
<td>Hydrostatic force on submerged surfaces II</td>
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<tr>
<td>5</td>
<td>25-SEP</td>
<td>1st Midterm Exam</td>
<td>Chapter 4</td>
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<tr>
<td></td>
<td>27-SEP</td>
<td>Basic equations in integral forms for a control volume</td>
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<td>6</td>
<td>2-OCT</td>
<td>Reynolds Transport Theorem</td>
<td>Chapter 4</td>
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<td></td>
<td>4-OCT</td>
<td>Momentum equation for control volume</td>
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<td>7</td>
<td>9-OCT</td>
<td>Continuity and momentum equations practices I</td>
<td>Chapter 4</td>
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<tr>
<td></td>
<td>11-OCT</td>
<td>Continuity and momentum equations practices II</td>
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<tr>
<td>8</td>
<td>16-OCT</td>
<td>Incompressible inviscid flow – Euler’s equation</td>
<td>Chapter 6</td>
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<tr>
<td></td>
<td>18-OCT</td>
<td>Bernoulli equations along streamline coordinate</td>
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<tr>
<td>9</td>
<td>23-OCT</td>
<td>Energy equation applications</td>
<td>Chapter 6</td>
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<td></td>
<td>25-OCT</td>
<td>Energy grade line and hydraulic grade line</td>
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<td>10</td>
<td>30-OCT</td>
<td>2nd Midterm Exam</td>
<td>Chapters 6 &amp; 7</td>
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<td></td>
<td>1-NOV</td>
<td>Dimensional analysis and similitude – Buckingham theorem</td>
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<tr>
<td>11</td>
<td>6-NOV</td>
<td>Model similitude</td>
<td>Chapters 7 &amp; 8</td>
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<tr>
<td></td>
<td>8-NOV</td>
<td>Internal incompressible viscous flow</td>
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<td>12</td>
<td>13-NOV</td>
<td>Head loss and Moody diagram</td>
<td>Chapter 8</td>
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<td>15-NOV</td>
<td>Flow in pipe applications</td>
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<td>13</td>
<td>20-NOV</td>
<td>Flow measurements</td>
<td>Chapter 8</td>
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<td></td>
<td>22-NOV</td>
<td>Thanksgiving Holiday – no class Flow measurements</td>
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<tr>
<td>14</td>
<td>27-NOV</td>
<td>Flow in open channels</td>
<td>Chapter 11</td>
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<td></td>
<td>29-NOV</td>
<td>The hydraulic jump and energy control</td>
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<tr>
<td>15</td>
<td>4-DEC</td>
<td>3rd Midterm Exam</td>
<td>Hand out</td>
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<td></td>
<td>6-DEC</td>
<td>Study day – no class</td>
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<tr>
<td>16</td>
<td>13-DEC</td>
<td>Final Exam 8:00 – 9:45 am</td>
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Civil Engineering Student Outcomes
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
c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. an ability to function on multidisciplinary teams
e. an ability to identify, formulate, and solve engineering problems
f. an understanding of professional and ethical responsibility
g. an ability to communicate effectively
h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i. recognition of the need for, and an ability to engage in life-long learning
j. a knowledge of contemporary issues
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

| Contribution of Course Outcomes to Program Outcomes |
|---------------------------------|------|------|------|------|-------|------|-------|------|------|
|                                 | a    | b    | c    | d    | e     | f    | g     | h    | i     |
| 1                               | X    |      |      |      |       |      |       |      |       |
| 2                               | X    |      |      |      |       |      |       |      |       |
| 3                               | X    |      |      |      |       |      |       |      |       |
| 4                               | X    |      |      |      |       |      |       |      |       |
| 5                               | X    |      |      |      |       |      |       |      |       |
| 6                               | X    |      |      |      |       |      |       |      |       |
| 7                               | X    |      |      |      |       |      |       |      |       |
| 8                               | X    |      |      |      |       |      |       |      |       |

CIVIL ENGINEERING COURSE POLICIES
Grades:
• Course grades will be based upon demonstrated understanding of course content.
• An understanding of prerequisite knowledge is assumed and will not be graded.
  o To be graded, student work must demonstrate retention, understanding and confidence in the exercising of prerequisite knowledge.
• At least 10% of the course grade will be attributed to participation; tardiness, alertness, disruptive conversation, web surfing, texting, working on homework, listening to music or any other behavior that does not contribute to course success may be penalized.
Attendance:
• Lecture, laboratory, quiz, exam and any other course related meetings are required.
• Students not attending course meetings and/or not turning in assignments will be dropped from the course by the instructor.
Homework:
• will be completed in a consistent format in all Civil Engineering courses;
  o The student's full name will be provided in the upper right corner of the first page.
  o The student's last name will be provided in the upper right corner of additional pages.
  o The page number and total number of pages will be shown in the upper right corner of the second and any additional pages.
  o Homework will not be stapled.
Only one side (the front side, binding holes on the left, heavily printed grid on the back) of the paper will be used.

Homework that is not legible will not be graded.

- will be turned in on time and at the beginning of lecture (first 6 minutes), when due at a lecture;
  - No late homework will be accepted for full credit.
  - Two assignments (maximum) per course may be submitted at the beginning of the following lecture for at most 50% credit.

- problems involving calculations will be completed on engineering paper;
  - Homework completed on paper from a spiral notebook will have any spiral perforations trimmed from the pages.
  - Engineering paper created using a watermark, title block and/or border may be printed.
  - Spreadsheet solutions will include algebraic equations and adequate notations to follow the development of the solution and facilitate checks with hand calculations.

- problem solutions will include the problem statement at the top of the problem followed by any data or other information given to solve the problem.

- Assumptions used to solve problems will be clearly identified.

- References to materials used to solve the problem will be provided, including (when used) solution manuals.
  - Solutions appearing to have been copied from a solution manual will not be graded.
  - Solutions will include detailed progression of calculations.

- Answers will be well identified (circled, boxed, underlined or highlighted) and will include units.
- Completed homework solutions will be folded in half (4.25” x 11” when folded, typical) with the students full name written in the upper right corner of the back page.

**Electronic Devices:**

- During lectures, all electronic devices will be turned off and put away: cell phones, i Pods, PDA’s, etc. Electronic devices, including computers, may only be used to reference and/or support course materials, content and discussions.

**Exams:**

- Exams are to be taken at scheduled exam times.
- Academic dishonesty will not be tolerated.
  - When observed, cheating will result in a failing grade
  - Instances of cheating will be referred to the Dean of Students
- Exams will generally be taken with tables/desks cleared.
  - The use of calculator app’s on i-devices may be prohibited.
    - Students should consider using an FE approved calculator.
  - No materials may be shared among students, including: calculators, erasers, pencils, paper, reference materials, etc.
  - Wandering eyes may constitute cheating; look at your paper or your calculator.
- Student will not be permitted to leave the classroom during lectures and exams except for extreme emergencies.
- Make-ups for in-class exams for extreme emergencies will be scheduled at the end of the semester.
UTRGV POLICY STATEMENTS

The UTRGV disability accommodation, mandatory course evaluation statement and sexual harassment statement are required on all syllabi. Additional policy statements are optional, such as those covering attendance, academic integrity, and course drop policies.

STUDENTS WITH DISABILITIES: Required on all syllabi. Do not modify.

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. 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.

MANDATORY COURSE EVALUATION PERIOD: Required on all syllabi. Do not modify.
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 on or about:

Module 1 October 4 – 10
Module 2 November 29 – December 5
Full Fall Semester November 15 – December 5

ATTENDANCE: Recommended on all syllabi; may be modified by the instructor as long as it is not inconsistent with UTRGV policy.
Students are expected to attend all scheduled classes and may be dropped from the course for excessive absences. UTRGV's attendance policy excuses students from attending class if they are participating in officially sponsored university activities, such as athletics; for observance of religious holy days; or for military service. Students should contact the instructor in advance of the excused absence and arrange to make up missed work or examinations.

SCHOLASTIC INTEGRITY: Recommended on all syllabi.
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.

**SEXUAL HARASSMENT, DISCRIMINATION, and VIOLENCE:** Required on all syllabi. Do not modify.

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.

**COURSE DROPS:** Recommended on all syllabi; may be modified by the instructor as long as it is not inconsistent with UTRGV policy.

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.

**STUDENT SERVICES:** Recommended on all syllabi.

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) 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)