Introduction to Hydrology and Hydraulic Engineering: CE 3456

Tuesdays and Thursdays 10:30 am-11:50 am
LART 108
CRN 26178

Laboratory: T (CRN 26179), R (CRN26180) 1:30--4:20 pm
E213

Instructor Contact Information and Biography

Dr. Ivonne Santiago, P.E. (SHE/HER/HERS/ELLA)

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BEST WAY TO COMMUNICATE: MSTEAMS. I will respond to your MSTEAMS messages within 24 business hours.

Phone: 915-747-8478

I grew up in Guayanilla (http://en.wikipedia.org/wiki/Guayanilla,_Puerto_Rico), a municipality of Puerto Rico, located on the southern coast of the island, bordering the Caribbean Sea, south of Adjuntas, east of Yauco; and west of Peñuelas and about 12 miles (20 km) west of Ponce, the 2nd largest city of Puerto Rico. (http://en.wikipedia.org/wiki/Ponce,_Puerto_Rico) (population <200,000).

I have a Bachelor’s degree in Civil Engineering from the University of Puerto Rico at Mayaguez (UPRM), a Master’s degree in Environmental Systems Engineering from Clemson University, and a Ph.D. in Civil Engineering, Specialized in Environmental Engineering, from New Mexico State University. In Puerto Rico, I was a professor in Civil Engineering at UPRM and worked in research (EPA, DOD, NSF) dealing with removal of contaminants from water using natural adsorbents, remote telemetry systems for monitoring of a small community drinking water treatment plant, physical modeling of transport of explosive related chemicals in sub-surface environments, and odor problems of combined sewer overflows. I worked as consultant to the Comptroller of Puerto Rico as an auditor of the 10 largest water and wastewater treatment plants in Puerto Rico. I was part of the Puerto Rico Environmental Quality Board (PREQB) and Director of the Water Quality Area in the PREQB. I was a member of the Environmental Protection Agency National Advisory Committee (NAC). The NAC advises the administrator of the EPA on environmental policy issues related to the implementation of the North American Agreement on Environmental Cooperation. I was also a member of The Good Neighbor Environmental Board (GNEB) that advises the President and Congress of the United States on good neighbor practices along the U.S. border with Mexico. I am currently an Associate Professor in the Department of Civil Engineering, I am Vice-Chair of the El Paso Water Public Service Board (PSB). I have projects dealing with Peace Engineering, remote sensing, Environmental Justice, innovation and development of low cost technologies to provide safe drinking water for underserved communities (locally, regionally, and internationally), and Diversity and Culture of Inclusion. Since I have been at UTEP. I have taught courses in Environmental Engineering, Engineering Economy, Engineering Statics, Water and Wastewater Engineering, Capstone Senior Design Courses (I and II), Thermo-fluids, and Experimental Design. There is not enough space in this syllabus to explain why I left “paradise” for El Paso, but my family ended up here in 2006. I can say I really have come to love UTEP and our students. I
have found hard-working students that truly want to build a better future for themselves and their families.

**Course Description**

Hydraulics is a broad area with many sub-disciplines. This class will focus on fundamental hydraulic principles as illustrated through laboratory experiments. Rather than attempting to cover the entire field, we will focus in detail on surface water hydrology, groundwater hydrology, open channel flow, and flow in pipes. Hydraulics is very much a laboratory-oriented course and cannot be properly learned in the absence of a laboratory. Laboratory exercises are featured prominently in the class and grading.

Mastery of fundamental concepts will facilitate the student in learning more detailed hydraulics applications throughout his/her career. Although computer codes are frequently used in engineering practice to perform many of the calculations we will cover, the computer codes change with time whereas the fundamental principles upon which the codes are based do not change. The class will focus on fundamentals rather than cookbook solutions.

Students are responsible for familiarity with all assigned reading. Quantitative problems on tests will be limited to problems similar to homework problems and problems solved in class. Conceptual and fact questions will be drawn from reading, presentations, and online assignments.

Class format will consist of a combination of brief lectures, presentation of auxiliary materials (e.g., subject matter videos), class exercises, and solution of homework problems. It is assumed that the student has read the textbook chapter and attempted all homework prior to the class period where it is assigned. Unless specifically requested, homework does not have to be turned in but may be the subject of quizzes.
Why is this course so Important that it is required for all Civil Engineering Students?

This course will provide an understanding of fundamental aspects of hydraulic systems, a fundamental task for Civil Engineers. You will need to understand how to transport, store, and regulate water on surface and subsurface environments.

Can you think of any other reasons why this is such an important course?

What should you know or review before you embark in this class?

From your thermofluids class, you must review how to analyze/calculate concepts on water forces:

1. Momentum changes on pipes
2. Buoyancy
3. Surface tension/capillary rise
4. Viscosity and shear stress

If you do not know please ask for my assistance. I am here to help you succeed!

Learning Goals

The class is divided into four major subject areas. Keep in mind these Learning Goals as you prepare to study for the class exams!

1. Pipe Flow

1. Set up the energy equation and solve it for unknown variables (e.g., pipe diameter, flow)
2. Understand fundamentals and determine if a flow is laminar, transitional, or turbulent
3. Estimate major (friction) and minor losses
4. Understand and draw energy and hydraulic grade lines
5. Basic concepts of pump behavior and pump selection

2. Open Channel Flow
1. Estimate flows using Manning Equation
2. Determine channel dimensions required for design flows
3. Understand and calculate the Froude number and specific energy relationships
4. Understand and predict hydraulic jumps and flow measurements
5. Flow measurement

3. Surface Water
1. Hydrologic cycle
2. Methods for estimating peak discharge
3. Return periods and statistics
4. Intensity, Duration, Frequency Curves
5. Design of hydraulic structures.
4. Ground Water

1. Darcy's Law
2. Types of Aquifers
3. Determination of permeability and radius of influence
4. Flow patterns in different groundwater systems
5. Water balance

Course Resources

Fundamentals of HYDRAULIC ENGINEERING SYSTEMS
Fifth Edition

ROBERT J. HOUCHTALEN
A. OSMAN AKAN
NED H. C. HWANG


Blackboard: This is a Technology Enhanced Course (TEC). This means that we will be using Blackboard as the main means of information sharing, on-line quizzes, uploading homework, and resource materials. Your homework and course material for the week will be posted every Monday by COB, so make sure you make visiting BB part of your weekly routine and schedule.

MSTeams: This will be the main form of communication between you and I. Here is the link to our team.

YouTube Channel/ Class Playlist: For your convenience and in case Blackboard is down, all videos that I upload onto Blackboard will also be available on the Class Playlist in my YouTube Channel. Follow this link.

Iclicker REEF: You need to sign in to this Blackboard course and use the link created to sign in to your iClicker REEF account or create a new account if you don’t already have one. Using the Blackboard link automatically adds this course to your account and you won’t have to search for this course to join it. This is an important tool that will be used regularly for quizzes, polling, and attendance. You can use your own mobile device (laptop, tablet, or smartphone) or clicker to submit your responses to iClicker cloud. It is important to remember that if you arrive late and an I-clicker quiz or attendance has been taken no arrangements can be made to accommodate tardiness or missing out on a quiz.

ABCD card: Low-tech in class response system for just-in-time teaching. You will be given one copy. If you lose it, you need to reprint it. We will use ABDC cards for “just in time teaching” and quick polling when not using Iclicker REEF.

Approved calculators

NCEES has approved the following list of calculators for use in the April and October 2013 exam administrations:

Casio: All fx-115 models. Any Casio calculator must contain fx-115 in its model name. Examples of acceptable Casio fx-115 models include but are not limited to the following:
• fx-115 MS
• fx-115 MS Plus
• fx-115 MS SR
• fx-115 ES
• fx-115 ES Plus

**Hewlett Packard:** The HP 33s and HP 35s models, but no others.

**Texas Instruments:** All TI-30X and TI-36X models. Any Texas Instruments calculator must contain either TI-30X or TI-36X in its model name. Examples of acceptable TI-30X and TI-36X models include but are not limited to the following:

- TI-30Xa
- TI-30Xa SOLAR
- TI-30Xa SE
- TI-30XS Multiview
- TI-30X IIB
- TI-30X IIS
- TI-36X II
- TI-36X SOLAR
- TI-36X Pro

**Class format**

**Team Based Learning:** Team-based learning (TBL) is a structured form of small-group learning that emphasizes student preparation out of class and application of knowledge in class. Students will be organized into diverse teams of 5-7 students that work together throughout the semester. This is the same group you will have in your laboratory.

**Flipped classes:** We will often have flipped classes (especially when I am away on UTEP-related travel). That means that you need to study ahead of time the material that may include videos and complete in-class homeworks during the regular class time with a Teaching Assistant.
**Blackboard:** Please be aware that this is a very Blackboard-intensive course that will help you be engaged with the class outside the classroom. You need to make sure that you check Blackboard for homework announcements and deadlines. Generally, you will receive an e-mail with the announcement. If you have a smart phone, make sure you receive your UTEP e-mails on your phone so you have real-time announcements.

**MSTeams:** General class announcements and questions will be answered on MSTeams chat on our Class Team.

**Assignments and quizzes**

**On-line homework.** On-line homework will displayed on your Blackboard Calendar, so check it often. They will show as a test but they will be counted as homework.

**Regular homeworks:** As stated earlier, most homeworks will submitted on-line using Blackboard. Nevertheless, some homeworks will be submitted on paper during the scheduled semester. If a homework is submitted late on the same day before COB, no points will be taken. **Homeworks turned in one day after the due date but no later than the following class will have 25% of the points taken off. No homeworks will be accepted after that.**

**RATs:** A RAT or a Rapid Assessment Test is an individual short-answer or multiple choice quiz given at the beginning of class. Usually a RAT will be followed by an group IF-AT (Immediate Feedback assessment test) or a group assessment quiz.

**Ticket to Class (TTC) Homeworks:** Homeworks classified as TTC homeworks must be turned in before the class starts. Make sure you know if it is a group TTC or an individual TTC. TTC homeworks submitted on paper, need to be turned in at the beginning of the class. TTC homeworks are usually problems that we started solving in the class but did not have time to complete. As soon as you come in place homework on the table without having to ask me. Make-up homeworks or homeworks turned in 15 minutes after the class starts will not accepted.
Exams

Partial exams: A minimum of three partial exams will be given. You must take the exams during the scheduled exam periods. These dates are announced on the first day of class although the dates may be changed according to the progress of the class. Do NOT make other plans on the days that you have scheduled exams. in other words, do NOT schedule personal airline flights on these days. You will NOT be excused for personal travel, only for UTEP-related travel. If you are not present for the exam, you will receive a grade of zero for that exam. No Make-up exam will be given under any circumstance (excused or unexcused). To make up for one missed exam or lowest score, the final exam grade will count for missing or lowest partial exam grade. This will only be done for one exam.

Final Exam: The final exam is a closed book-closed note comprehensive exam. Every student is required to take the final exam at the end of the semester and pass it with at least a grade of 50%, otherwise you get an F in the course.

Attendance: University policy dictates that all students attend all scheduled classes. Attendance can be checked randomly, and not necessarily in every class, by the instructor through sign-up sheets, exams, roll calling, randomly picked names for problem solving in class, or I-Clicker. YOU AND ONLY YOU ARE RESPONSIBLE FOR SIGNING ATTENDANCE SHEETS or getting on -clicker when instructed. You need to be present within the first 15 minutes of the class, otherwise it will be considered an absence. Additionally, all exams, and quizzes may be given at the beginning or end of the classes. No additional time nor make up quizzes will be given to late attendees or early leavers.
Grades

Grade distribution:

- Homework, quizzes, class, and short projects (Peer evaluation): 10%
- Three partial exams: 50%
- Laboratory: 20%
- Project: 5%
- Final Exam: 15%

How your grade is calculated:

Your grade will be calculated as follows: (average % HW)*0.1 + [(average % partial exams)*0.5] + [(average % project)*0.05] + [average % final exam*0.15]. Note you must get more than 50% in final exam.

Grading Scheme:

as stated

The instructor reserves the right to revise this grading plan. However, students will be informed of any changes. Your final grade will be calculated based on the formula provided:

A  >89.45
B  >79.45 but <89.45
C  >69.45 but <79.45
D  >59.45 but <69.45
F  <59.45

Note that 89.44 is B, 79.44 is C, 69.44 is D, 59.44 is F. This is where your bonus points come to your rescue!
Class Policies

Purpose: These policies serve to help make the learning experience optimally effective and enjoyable for everyone.

Professional conduct: Be kinder than necessary! During this course, I expect you to deal with your peers and with me in a professional manner. Be courteous and honest and always communicate with each other in a way that shows respect and sensitivity to cultural, religious, sexual, and other individual differences. I expect you to come to class on time and stay focused on the lecture and learning activities.

Cell Phones ringtones are OFF in Class: First, professionals turn off their cell phone ringtones in a meeting with other professionals in order to give full attention to the discussion. Second, a ringing phone disrupts because the sound of a phone attracts attention. I know for a fact that it disrupts me. Your meeting time in class is valuable, chat and text with your friends outside of your team meeting. However, always bring your laptops or smartphones to class and download I-Clicker app. We will use it during class and when you need to search for information in the internet.

When using your phone or laptop: Do not allow it to control your life and disrupt your learning process! Do not surf the internet on topics not related to your class activities, or answer your email, instant message, facebook, video viewing, music playing, game playing, etc. These activities show a lack of respect for your classmates and myself, and also shows a disinterest in the course which is un-professional and un-acceptable. A few suggestions that will help the use of laptops in class:

a. Charge your laptop batteries fully before coming to class.

b. Set your laptop volume control to mute or off before coming to class.

c. Keep your laptop closed during presentations and other specific in-class activities.

d. If I see you playing games or surfing the net on subjects not related to the class, I have the right to ask you to leave the classroom.

Can we all agree on these terms?
• We will engage with and criticize ideas but not people.
• We will listen with curiosity, not hostility.
• We will not interrupt.
• We will not be afraid to ask questions.
• We will be aware of how much space we are individually taking up in class and step up and stand back as needed.
• We will use I statements and not attempt to speak on behalf of groups.
• We will not expect individuals to act as spokespeople for groups.
• We will name when the guidelines aren’t followed, address it and move forward.

Netiquette (online etiquette)

Since I hope we will be communicating inside and outside the classroom I want to remind you about some basic Netiquette

• **Language:** Given the absence of face-to-face clues, written text can easily be misinterpreted. Avoid the use of strong or offensive language, all capital letters, and the excessive use of exclamation points. If you feel particularly strongly about a point, it may be best to write it first as a draft and then to review it, before posting it, in order to remove any strong language.
• **Respect:** Whether we meet face to face or online, is still a classroom, and comments that would be inappropriate in a regular classroom would also be inappropriate on-line as well. Treat your professor and your fellow students with respect.

• **Be Forgiving and be kind to each other:** If someone states something that you find offensive, mention this directly to the professor. What you find offensive may quite possibly have been unintended and can best be cleared up by the professor.

• **Think First, Write Later:** Think carefully about the content of your message before writing it. When reacting to someone else’s message, address the ideas, not the person. Post only what you or anyone would comfortably state in a face-to-face situation.

• **Edit Your Work:** The grammar, spelling, and punctuation of a message are part of the grading criteria – you should not expect your professor and peers to decode misspelled words or poorly constructed sentences. It is a good practice to compose and check your comments in a word-processor and proofread before posting them.

• **Test for Clarity:** Messages may often appear perfectly clear to you as you compose them, but turn out to be perfectly unclear to your reader. One way to test for clarity is to read your message aloud to see if it flows smoothly. If you can read it to another person before posting it, even better.

• Netiquette (online etiquette)

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**Statement Regarding COVID-19 Precautions**

Would appreciate if you wear face coverings when in common areas of campus or when others are present.

It is important that you participate in UTEP’s COVID testing program and monitor your e-mail for regular testing notices. Knowing your status is vital to taking care of yourself and protecting the health of others around you.

You must **STAY AT HOME** and **REPORT** if you (1) have been diagnosed with COVID19, (2) are experiencing COVID-19 symptoms, or (3) have had recent contact with a person who has received a
positive coronavirus test. Reports should be made at screening.utep.edu. If you know anyone who should report any of these three criteria, encourage them to report. If the individual cannot report, you can report on their behalf by sending an email to COVIDaction@utep.edu. For each day that you attend campus—for any reason—you must complete the questions on the UTEP screening website (screening.utep.edu) prior to arriving on campus. The website will verify if you are permitted to come to campus. Under no circumstances should anyone come to class when feeling ill or exhibiting any of the known COVID-19 symptoms. If you are feeling unwell, please let me know as soon as possible, and alternative instruction will be provided. Students are advised to minimize the number of encounters with others to avoid infection.

Students who are considered high risk according to CDC guidelines and have an ongoing medical condition and/or those who live with individuals who are considered high risk who also have an ongoing medical condition may contact Center for Accommodations and Support Services (CASS) to discuss temporary accommodations for on-campus courses and activities. Apply at cassportal.utep.edu and fill out a three-question application. You will be scheduled to meet with disability coordinator to discuss your unique situation.

Diversity and Culture of Inclusion in the Classroom

- I believe that diversity enriches the educational experience of students and faculty alike.
- I commit to ensuring that every student has a chance to reach their full professional potential, do great work, and be a fully enfranchised member of our community.
- I seek to serve as a model for proactively engaging with deference, with respect, dignity, openness, and acceptance, recognizing that diversity reflects the society in which we live and can be its greatest strength.
• I commit to supporting students from diverse backgrounds and experiences, including but not limited to race, gender, socio-economic status, age, sexual orientation and identity, religion, nationality, culture, ideas (including political perspectives), and methods.

• I commit to incorporating diverse perspectives and sources of knowledge and experience in the class.

Discrimination and Sexual Misconduct

The University of Texas at El Paso ("University" or "UTEP") is committed to maintaining a learning and working environment that is free from discrimination based on sex, in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; the Campus Sexual Violence Elimination Act (SaVE Act); the Violence Against Women Act (VAWA); and the Clery Act. Sexual Misconduct, Retaliation, and other conduct prohibited under the Sexual Misconduct Policy (Handbook of Operating Procedures Section VI, Chapter 3), will not be tolerated and will be subject to disciplinary action.

Sexual Misconduct includes sexual harassment, sexual assault, stalking, domestic violence, and dating violence. The University policy is applicable to administrators, faculty, staff, students, and third parties within the University’s control, including visitors and applicants for admission or employment. It applies to conduct that occurs on University owned or controlled premises, in an education program or activity including University sponsored or supported events, buildings owned or controlled by student organizations officially recognized by the University, or off campus when the conduct potentially affects a person’s education or employment with the University or potentially poses a risk of harm to members of the University community. It also applies regardless of the gender, gender identity, or sexual orientation of the parties.

Responsible Employees are required to report known incidents and information of Sexual Misconduct promptly to the Title IX Coordinator or Deputy Title IX Coordinators, either directly or through the Title IX Incident Reporting Form or email at TitleIX@utep.edu. Others in the University community are strongly encouraged to report Sexual Misconduct, Retaliation, and any other conduct prohibited as soon as they become aware of such conduct. To obtain contact information for the Title IX Coordinator...
and Deputy Title IX Coordinators, or for more information about Title IX including Title IX trainings and on/off campus resources, please visit www.utep.edu/titleix.

**Under state law, if a Responsible Employee knowingly fails to report all information concerning an incident the employee reasonably believes constitutes stalking, dating violence, sexual assault, or sexual harassment committed by or against a student or employee at the time of the incident, the employee is subject to disciplinary action, including termination.** Any person, who in bad faith, knowingly files a false complaint under this Policy or provides materially false information is subject to disciplinary action up to and including dismissal or separation from the University.

**Scholastic Integrity**

**Cheating, Plagiarism, Scholastic Dishonesty, and Student Discipline:** Cheating is unethical and not acceptable. Plagiarism is using information or original wording in a paper without giving credit to the source of that information or wording; it is also not acceptable. Do not submit work under your name that you did not do yourself, ever. You may not submit work for this class that you did for another class. If you cheated or plagiarized, you will be subject to disciplinary action as stated in the UTEP undergraduate catalog policy.

“**Scholastic dishonesty (which includes the attempt of any student to present the work of another as his or her own, or any work which s(he) has not honestly performed, or attempting to pass any examination by improper means) is a serious offense and will subject the student to disciplinary action. The aiding and abetting of a student in any dishonesty is held to be an equally serious offense. All alleged acts of scholastic dishonesty should be reported to the Dean of Students for disposition. It is the Dean of Students’ responsibility to investigate each allegation, dismiss the allegation, or proceed with disciplinary action in a manner which provides the accused student his or her rights of due process.”**

Refer to http://www.utep.edu/dos/acadintg.htm for further information.

You must cite, reference, or quote information obtained from other sources so you give credit where credit is due. If you do not know how to do that, ask. In addition, when an assignment specifies that you must perform a task individually, asking for your classmates’ help is scholastic dishonesty. Do NOT copy any material, regardless of where you obtained it, into your own work. Do NOT submit work under your name if you did not complete it entirely yourself; be honest and tell me you did it together. The consequences will be less severe when you are up front about it than when you try to hide it.
UTEP now has a site license for Turnitin.com, a plagiarism detection tool that you can also use to check your own work for this or other classes to prevent getting in trouble. I will report any instances of plagiarism and dishonesty to the Dean of Students Office whose office decides what grade you will obtain, including the possibility of an “F” or “zero” in the class or homework, respectively.

If you want to test your understanding of plagiarism, take the self-assessment at http://education.indiana.edu/~frick/plagiarism or visit http://www.turnitin.com

Students with Any Type of Disability

UTEP seeks to provide reasonable accommodations for all qualified individuals with disabilities, including learning disabilities. This university will adhere to all applicable federal, state, and local laws, regulations and guidelines with respect to providing reasonable accommodations as required affording equal educational opportunity. It is the student’s responsibility to register with Center for Accomodation and Support Services (CASS) in the East Union Bldg., Room 106 within the first two weeks of classes, and inform the faculty member to arrange for appropriate accommodations.

Center for Accomodation and Support Services (CASS) can also be reached in the following ways:

Web: http://sa.utep.edu/cass/

Monday thru Friday 8:00a.m.-5:00p.m.

Union Building East Room 106
Phone: (915) 747-5148

cass@utep.edu
Time Management

Time Management for Busy Students

An Interactive Workshop

TLC
The Learning Centre

KPU
The tentative schedule contains practice problems. Expect to spend three hours on preparation and learning assignments for every semester credit hour. Since this class is a 3-semester credit hour class, expect to spend about 9-10 hours out of class on assignments in addition to 3 hours of in-class time for a total of about 12 hours per week to obtain an “A” in this class. One of your tasks is to develop a Time Management Plan for yourself. This means that you will:

1) Create a weekly calendar containing you class times, your work times, your family activities, your breakfast, lunch and dinner activities, your physical activities and exercise (no excuses, you are a Kinesiology major!), time to go shopping, etc.

2) Create a semester calendar for including the months of August, September, October, November, and December, in which you enter your weekly activities and the quizzes and exams for each of your courses. Create your plan and stick to it!!
Tentative schedule (subject to change)
Tentative schedule (subject to change)

<table>
<thead>
<tr>
<th>Week</th>
<th>Chapter or Topic</th>
<th>Suggested Practice problems. Check BB for homework problems</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (1-10)</td>
<td>Getting to know each other</td>
<td>1.3.2 to 1.3.9, 5.2 and 1.5.4</td>
<td>Field Activity</td>
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<td></td>
<td>Team formation</td>
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<td></td>
<td>Set up 1-Clicker REEF-attendance</td>
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<td>Field Activity</td>
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<td></td>
<td>Chapter 1-Fundamental properties of water</td>
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<tr>
<td>II (1-10)</td>
<td>Chapter 2 Water Pressure and Pressure forces, manometer. This chapter is a review of material covered in Fluid Mechanics, a prequisite to this course.</td>
<td>2.2.2, 2.2.4, 2.2.6, 2.2.8, 2.4.1, 2.4.4, 2.4.7, 2.4.9, 5.1, 5.2, 5.2, 5.9, 5.10</td>
<td>Buoyancy and Flow between tanks</td>
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<td>III (1-11)</td>
<td>Chapter 3: Water Flow in Pipes, major and minor losses- review from CE235</td>
<td>3.2, 3.3.4, 3.5.1-2, 3.8, 3.10, 3.7.1, 3.7.7, 11.1, 11.1, 2.3.11, 3, 3.11, 3.12.4</td>
<td>Pipe Flow</td>
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<tr>
<td>IV (2-14)</td>
<td>Chapter 4: Pipelines and Pipe Networks: Sections 4.1, 4.2, 4.3, 4.5 (theory) (end of material for exam #3)</td>
<td>4.1, 4.1, 4.2, 4.2.5</td>
<td>Field trip</td>
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<td>Chapter 5: Water Pumps: System curves</td>
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<td>Chapter 6: Water Flow in Open Channels: Specific Energy and Non-Uniform Flow, Critical subcritical and supercritical flow, Hydraulic Jump, Opening of Spillway</td>
<td>5.1.2, 5.1.5, 5.1.3, 5.5.3, 5.5.4, 5.1.1</td>
<td>Pump curve and system curve</td>
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<td>V (2-20)</td>
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<td>Chapter 6: Water Flow in Open Channels: Specific Energy and Non-Uniform Flow, Critical subcritical and supercritical flow, Hydraulic Jump, Opening of Spillway</td>
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<td>Field measurement: Streets flow</td>
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<td>VI (3-7)</td>
<td>Chapter 6: Water Flow in Open Channels: Manning Equation and Energy</td>
<td>6.2.1-6.2.3, 6.2.1, 6.2.8, 6.2.6.2.8, 6.2.6.3.6.4.6.6.8, 6.5.2-6.5.6.6.5.6.9.2.6.9.4</td>
<td>Specific energy/modeling</td>
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<tr>
<td>9-14</td>
<td>SPRING BREAK—NO CLASS</td>
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<tr>
<td>10 (5-21)</td>
<td>Continued Chapter 6: Water Flow in Open Channels: Specific Energy and Non-Uniform Flow, Critical subcritical and supercritical flow, Hydraulic Jump, Opening of Spillway (end of material for exam #2)</td>
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<td>Hydraulic jump/modeling</td>
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<tr>
<td>11 (5-20)</td>
<td>Chapter 9: Water Pressure, Velocity, and discharge measurements</td>
<td>9.1.2, 9.2, 9.3.3.3, 9.3.5, 9.4.1</td>
<td>Flow measurements in pipes, Flow through weirs/modeling</td>
</tr>
<tr>
<td>12 (4-4)</td>
<td>Chapter 11 Hydrology and methods to estimate peak discharge</td>
<td>11.2.16, 11.1.1, 11.2.1-11.23, 11.28, 11.4.5, 4.10, 11.4, 11.6, 11.6, 11.6</td>
<td>Rainfall-Runoff Relationships</td>
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<td>Chapter 11 Hydrology and methods to estimate peak discharge</td>
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<td>Chapter 8: Hydraulic structures</td>
<td>5.4, 5.5, 5.7, 5.8, 9.5</td>
<td>Unit hydrograph</td>
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<td>Chapter 8: Hydraulic structures</td>
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<td>Chapter 7: Groundwater Hydraulics</td>
<td>7.1.4, 7.1.6, 7.1.7, 7.2, 7.2, 7.2, 7.2, 7.3, 7.3, 3.3, 3.3, 3.2, 8.5.2</td>
<td>Modeling Exercise: Calculate peak discharge and volume of runoff for watershed in El Paso</td>
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<tr>
<td>15 (4-25)</td>
<td>Chapter 7: Groundwater Hydraulics</td>
<td></td>
<td>Study flow to well</td>
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<td>16 (5-2)</td>
<td>Chapter 7: Groundwater Hydraulics</td>
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<td>Flow under sheet pile</td>
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<td>Exam 3: Thursday May 9th, 2022</td>
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<td>FINAL EXAM IS ON Thursday May 12, 2022</td>
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<td>from 10:00 am-12:45 pm</td>
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I will let you know when I have UTEP-related travel. When I travel, you should have read the material before hand and be ready for an in-class homework with the TA.

GRADUATE STUDENT PROJECT: Please discuss with me on the first week of classes!