

1. Course Number and Name

- a. **CENG 4352:** Hydraulic System Analysis, Fall 2021
- b. Section 010, TR 9:30 – 10:45 am

2. Credits and Contact Hours

- a. **Credits:** 3
- b. **Contact Hours:** 2.5 hours/week (Classroom)

3. Instructor Information

- a. **Course Coordinator:** Aldo R. Pinon-Villarreal
- b. **Instructor:** Aldo R. Pinon-Villarreal, 325-486-5510, apinonvillarreal@angelo.edu.
Office: VIN 272. For office hours see [faculty homepage](#)¹.

4. Course Materials:

Required Textbooks:

- Mays, L. W. (2010). *Water Resources Engineering, 2nd edition*. Hoboken, NJ: Wiley. ISBN: 978-0470460641.

5. Technology Requirements and Software

This course requires internet access and the ability to use the following online tools: Blackboard, Gradescope, Blackboard Collaborate, Google Drive, Adobe Acrobat (or another pdf maker), YouTube.

- HEC-HMS v4.2.1, Hydrologic Engineering Center (HEC), Army Corps of Engineers- available for free download on the [HEC Website](#)².
- HEC-RAS v5.0.7, Hydrologic Engineering Center (HEC), Army Corps of Engineers- available for free download on the [HEC Website](#)³.
- Pipe2016 Wood, D. J. and Srinivasa, L. Installed in the Virtual server.
- Stormwater Studio, Stringer, T. Hydrology Studio. Download the free trial version at the [hydrology studio downloads webpage](#)⁴ then enter the key that will be sent by your instructor to install the software.
- HY-8 v7.6. Culvert Hydraulic Analysis Program, Philip L. Thompson and federal highway administration. Available for free download on the [FHWA-Department of Transportation website](#)⁵
- Civil 3D/AutoCAD 2000, Autodesk. Installed in the Virtual server.

- a. **Other Supplemental Materials:** Posted on Blackboard® Learning Management System

6. Specific Course Information

- a. **Catalog Description:** Analysis and design of hydraulic systems including pipe networks, open channels, sanitary sewer, storm management, water storage tanks and pumping systems.
- b. **Prerequisites and Corequisites:** Prerequisites: CENG 3352
Required or Elective: Elective (satisfies CE Technical Elective)

7. Specific Goals for the Course

a. Course Learning Outcomes:

1. Determine pipe pressure tolerance against water hammer and mitigation measures.
2. Evaluate and design a water distribution system to meet water usage demands under various scenarios using computer software.
3. Evaluate adequate pump selection, and configuration based on application, energy and capacity needs.
4. Distinguish different water surface profiles in an open channel. Use boundary conditions and energy principles to model surface profiles in reaches by using computer software.
5. Apply principles of hydrology, open channel hydraulics, and design criteria to solve problems related to culverts, sanitary sewer, and storm management systems.
6. Recognize ethical and professional responsibilities in the design of hydraulic systems.
7. Discuss contemporary issues in water resources and civil engineering practice with an emphasis on sustainability.

b. Course Learning Outcome Mapping to ABET Criterion 3 Student Outcomes:

Table 1: Course Learning Outcomes mapped to ABET Student Outcomes

ABET Student Outcomes	1	2	3	4	5	6	7
1. Solve Problems	X	X	X	X	X		
2. Design		X	X		X		
3. Communication		X			X		
4. Ethics & Professionalism						X	X
5. Teamwork		X			X		
6. Experimentation							
7. Acquire New Knowledge							X

8. Topics Covered

1. Pipe hydraulics, water hammer, and pipe pressure tolerance.
2. Water distribution systems, pipe network simulation, Hardy cross method.
3. Pump and storage tank selection and design.
4. Intensity-Duration-Frequency curves and rational method.
5. Open channel flow, water surface profile classification.
6. Water surface profile modeling.
7. Open channel regulating structures and flow measurement.
8. Reservoir design, hydrologic routing and detention pond design.
9. Culvert, storm and sanitary sewer design.

9. Course Delivery and Communications

9.1 Delivery Method(s)

This is a face-to-face course with learning resources and supplemental materials posted in [Blackboard](#)⁶. Accommodations will be made for students who are in quarantine or isolation and are unable to attend.

9.2 Communications

You may communicate with me via Blackboard discussion board, email, phone, or via GroupMe text.

I will respond to email or telephone messages within 24 hours during working hours Monday through Friday. Weekend messages may not be returned until Monday.

Written communication via email: All private communication will be done exclusively through your ASU email address. Check frequently for announcements and policy changes. In your emails to faculty, include the course name and section number in your subject line.

Office hours or advising may be arranged with the assistance of Collaborate, Zoom, or another web meeting platform.

9.3 Calculator policy

The use of a calculator is required and allowed on all tests and online quizzes. Calculators with graphing capabilities will be allowed in the course but not during tests. Recommended calculators with these capabilities include the HP48, HP49, HP50, TI86, and TI89. However, only calculators currently allowed in the Fundamentals of Engineering (FE) and Professional Engineering (PE) exams will be allowed in Celebration of Knowledge tests and In-class problems. Please refer to the NCEES [calculator policy](#)⁷ for the list of acceptable calculators.

10. Professionalism

Professional engineering standard apply in this class. You are expected to demonstrate a behavior consistent with the conduct of an individual practicing in the engineering profession. You are expected to: (1) come prepared for class; (2) respect faculty and peers; (3) demonstrate responsibility and accountability for your own actions; (4) demonstrate sensitivity and appreciation for diverse cultures, backgrounds, and life experiences; (5) offer and accept constructive criticism in a productive manner; (6) demonstrate an attitude that fosters professional behavior among peers and faculty; (7) be punctual to class meetings; (8) maintain a good work ethic and integrity; and (9) recognize the classroom as a professional workplace.

11. Graded Material

11.1 Class Attendance, Participation, Timeliness and Teamwork

The number one complaint of engineering clients is the timeliness of deliverables (reports, drawings, specifications, etc.). As a professional engineer you will be expected to arrive at scheduled meetings on time and prepared. Late proposals are not generally accepted. Late specifications or drawings may cost the engineer a monetary penalty. Professional engineering standards apply in this course.

You are expected to meet every class meeting on time and prepared. Attendance will be taken. Should you find it necessary to miss a class for any reason, you are expected to notify your instructor as early as the absence is known—preferably before the absence. It's important that you communicate clearly your instructors.

Your online assignments will be due at the time specified on Gradescope. Any assignments submitted in hard copy are due at the beginning of class on the due date. Your instructor may assess penalties for late work.

11.2 In-Class Problems

These are short examinations of varying formats containing multiple choice, calculation and short answer questions. The purpose of the in-class problems is to encourage you to complete the reading and web-based material. Your lowest score will be dropped.

11.3 Problem Sets

Problem set assignments are designed to demonstrate analytical, computational, and critical thinking skills. These will consist of problems, data-analysis and modeling problems, and essay-type questions. Due dates for Problem Sets will be posted in Bb. All submissions require you to scan the assignment and upload it to blackboard using Gradescope.

NOTE: Bring a USB Flash drive with at least 5 GB of space to every lecture. Alternatively, you can share files using the One Drive cloud App installed in your computer (up to 1 TB available through ASU); sharing via Google drive may not support correct files for the software used in this course.

11.4 Sustainability Readings

Individual self-reflection or discussion assignments to be completed after reading an article or watching a video dealing with current relevant issues about water resources engineering from the perspective of sustainability and public security.

11.5 Design Term Projects

This is a three-person team project. There will be two projects where you will be required to use hydrologic and hydraulic principles and modeling tools to propose and analyze a sustainable engineering solution. The first project consists of designing a new water distribution pipe network system in a small village or urban sub development, the second is a re-design of an existing storm sewer system including at least three separate pipes. Your team will present your final proposed solution in both a written report and an oral forms. Due dates will be listed in Blackboard. 10% of the lab report grade will be based on self and peer evaluation.

11.6 Exams

There will be a total of two partial exams required to pass the course. The exams are individual and take home format. You will be allowed to use an approved calculator during the exams.

11.7 *Grade Weighting and Letter Grades*

The weighting system shown in Table 2. **Error! Reference source not found.** will be used in determining final grade for the course

Table 2: Grade Weighting

Item	Percent
Attendance and Quizzes	10%
Problem Sets (7)	10%
Sustainability Readings (4)	10%
Term Projects (2)	30%
Partial Exams (2)	40%
Total	100%

The instructor will determine letter grades for the course using his professional judgment, and the following standards as described in the University Catalog:

A = excellent work (> 89%), B = good work (80-89%), C = average work (70-79%), D = poor work (60-69%), F = failing work (< 60%).

11.8 *Incomplete Grade Policy*

It is policy that incomplete grades be reserved for student illness or personal misfortune. Please contact faculty if you have serious illness or a personal misfortune that would keep you from completing course work. Documentation may be required. See ASU Operating Policy 10.11 [Grading Procedures](#)⁸ for more information.

12. Classroom and University Policies and Student Support

All students are required to follow the policies and procedures presented in the [Angelo State University Student Handbook](#)⁹ and [Angelo State University Catalog](#)¹⁰.

12.1 *Accommodations for Students with Disabilities*

ASU is committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs or activities of the university, or be subjected to discrimination by the university, as provided by the Americans with Disabilities Act of 1990 (ADA), the Americans with Disabilities Act Amendments of 2008 (ADAAA) and subsequent legislation.

Student Disability Services is located in the Office of Student Affairs, and is the designated campus department charged with the responsibility of reviewing and authorizing requests for reasonable accommodations based on a disability. It is the student's responsibility to initiate such a request by contacting an employee of the Office of Student Affairs, in the Houston Harte University Center, Room 112, or contacting the department via email at ADA@angelo.edu. For more information about the application process and requirements, visit the [Student Disability Services website](#).¹¹ The employee charged with the responsibility of reviewing and authorizing accommodation requests is:

Dr. Dallas Swafford
Director of Student Disability Services

Office of Student Affairs
325-942-2047
dallas.swafford@angelo.edu
Houston Harte University Center, Room 112

12.2 Title IX at Angelo State University

Angelo State University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from sex discrimination of any kind. In accordance with Title VII, Title IX, the Violence Against Women Act (VAWA), the Campus Sexual Violence Elimination Act (SaVE), and other federal and state laws, the University prohibits discrimination based on sex, which includes pregnancy, and other types of Sexual Misconduct. Sexual Misconduct is a broad term encompassing all forms of gender-based harassment or discrimination and unwelcome behavior of a sexual nature. The term includes sexual harassment, nonconsensual sexual contact, nonconsensual sexual intercourse, sexual assault, sexual exploitation, stalking, public indecency, interpersonal violence (domestic violence or dating violence), sexual violence, and any other misconduct based on sex.

You are encouraged to report any incidents involving sexual misconduct to the Office of Title IX Compliance and the Director of Title IX Compliance/Title IX Coordinator, Michelle Miller, J.D. You may submit reports in the following manner:

Online: [Incident Reporting Form](#)¹²
Face to Face: Mayer Administration Building, Room 210
Phone: 325-942-2022
Email: michelle.miller@angelo.edu

Note, as a faculty member at Angelo State, I am a mandatory reporter and must report incidents involving sexual misconduct to the Title IX Coordinator. Should you wish to speak to someone in confidence about an issue, you may contact the University Counseling Center (325-942-2371), the 24-Hour Crisis Helpline (325-486-6345), or the University Health Clinic (325-942-2171).

For more information about resources related to sexual misconduct, Title IX, or Angelo State's policy please visit the [Title IX website](#).¹³

12.3 Student Absence for Observance of Religious Holy Days

A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. See ASU Operating Policy 10.19 Student Absence for [Observance of Religious Holy Day](#)¹⁴ for more information.

12.4 Information About COVID-19

Please refer to ASU's [COVID-19 \(Coronavirus\) Updates](#)¹⁵ web page for current information about campus guidelines and safety standards as they relate to the COVID-19 pandemic.

12.5 Student Conduct Policies

12.5.1 Academic Integrity

Students are expected to maintain complete honesty and integrity in all work. Any student found guilty of any form of dishonesty in academic work is subject of disciplinary action and possible expulsion from ASU.

12.5.2 Plagiarism

Plagiarism is a serious topic covered in ASU's [Academic Integrity policy](#)¹⁶ in the Student Handbook. Plagiarism is the action or practice of taking someone else's work, idea, etc., and passing it off as one's own. Plagiarism is literary theft.

In your discussions and/or your papers, it is unacceptable to copy word-for-word without quotation marks and the source of the quotation. It is expected that you will summarize or paraphrase ideas giving appropriate credit to the source both in the body of your paper and the reference list.

Papers are subject to be evaluated for originality via Turnitin or SafeAssign. Resources to help you understand this policy better are available at the [ASU Writing Center](#)¹⁷.

12.5.3 Copyright Policy

Students officially enrolled in this course should make only one printed copy of the given articles and/or chapters. You are expressly prohibited from distributing or reproducing any portion of course readings in printed or electronic form without written permission from the copyright holders or publishers.

13. Course Outline

The course outline is presented in

Table 3. Detailed reading and homework assignments along with updates to this schedule will be provided via Bb. The following schedule may be modified as the semester progresses.

Table 3: Course Lecture Schedules

Lecture	Date	Topic (number is Textbook chapter section to read)	Tentative Problem Sets (PS) and Project Deliverables
1	T, 08/24	12.1 Water Distribution Systems, criteria for design of hydraulic systems	
2	R, 08/26	12.1.2 Pipe hydraulics, head loss equations	
3	T, 08/31	Pipe Economics and cost optimization (Instructor notes)	Project 1 assigned
	R, 9/02	12.8 Hydraulic transients - Water hammer (Instr. notes)	
4	T, 09/07	Pipe pressure tolerance (Instr. notes), water hammer problems	Problem Set (PS) 1 due
5	R, 09/09	12.8.3 Methods of Control of Hydraulic Transients	
6	T, 09/10	Pump classification, pump performance curves (Instr. Notes)	Sustainability Reading 1 due
7	T, 09/14	12.2 Pump scaling laws, Pump selection and Design	PS 2 due
8	R, 09/16	Pump design criteria, Pump economics (Instr. Notes)	
9	T, 09/21	Pump intake structures (Instr. Notes)	
10	R, 09/23	12.4 Hydraulics of simple Networks	Sustainability Reading 2 due
11	T, 09/28	12.6 Network Simulation - Hardy cross method, Intro to KY-Pipe	
12	R, 09/30	Municipal Network Design; Simulation of Pipes, Pump, and reservoir in KY-Pipe software (Instr. Notes)	PS 3 due
	T, 10/05	Project # 1 Presentation	Project 1 due
13	R, 10/07	5.3.1-5.3.2 Open channel gradually varied flow, surface water profile classification; Exam 1 (Lectures 1-12)	
14	T, 10/12	5.3.3 Direct step method, Introduction to Hec-RAS	
15	R, 10/14	Modeling in Hec-RAS (Instr. Notes)	Project 2 assigned
16	T, 10/19	5.1.3 Best hydraulic section	Sustainability Reading 3 due
17	R, 10/21	5.6. Regulating structures and flow measurement	PS 4 due
18	T, 10/26	Open channel design (Instr. Notes)	
19	R, 10/28	9.3 River routing	
20	T, 11/02	9.3 River Routing Cont'd	PS 5 due
21	R, 11/04	15.4.1-15.4.2 Stormwater Detention	
22	T, 11/09	15.4.3 Pond modeling and Design	
23	R 11/11	16.2.1 Culvert hydraulics	
24	T, 11/16	16.2.2 Culvert design, intro to HY8 Software	PS 6 due
25	R, 11/18	15.1-15.2.2 Storm sewer design;	
26	T, 11/23	15.2.3. Hydraulic analysis of storm sewers, Intro. to Stormwater studio; Exam 2 (Lectures 13-24)	Sustainability Reading 4 due
	R, 11/25	Thanksgiving Holiday – No class	
27	T, 11/30	Stormwater Studio Software Modeling	PS 7 due
28	R, 12/02	Project # 2 Presentation	Project 2 due
	T, 12/07	No final exam is required for this course	

End Notes

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- 1 <https://www.angelo.edu/content/profiles/6462-aldo-r-pinon-villarreal>
 - 2 <http://www.hec.usace.army.mil/software/hec-hms/downloads.aspx>
 - 3 <https://www.hec.usace.army.mil/software/hec-ras/download.aspx>
 - 4 <https://www.hydrologystudio.com/download-free-trials/>
 - 5 <https://www.fhwa.dot.gov/engineering/hydraulics/software/hy8/>
 - 6 angelo.blackboard.com
 - 7 <http://ncees.org/exams/calculator-policy/>
 - 8 <https://www.angelo.edu/content/files/14197-op-1011-grading-procedures>
 - 9 <http://www.angelo.edu/student-handbook/>
 - 10 <https://www.angelo.edu/academics/catalog/>
 - 11 <https://www.angelo.edu/current-students/disability-services/>
 - 12 <https://www.angelo.edu/incident-form>
 - 13 <https://www.angelo.edu/title-ix>
 - 14 <http://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of>
 - 15 <https://www.angelo.edu/covid-19/>
 - 16 <http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php>
 - 17 http://www.angelo.edu/dept/writing_center/academic_honesty.php