

1. Course Number and Name

- a. **ENGR 3352:** Hydrology and Hydraulics, Spring 2022
- b. Section 010, MW 1:00 – 1:50 pm in VIN 238
- c. Section 1Z (Lab), T 3:30 – 6:20 pm in VIN 245/HSEL 103 (check weekly schedule)

2. Credits and Contact Hours

- a. **Credits:** 3
- b. **Contact Hours:** 2 hours/week (Classroom) 3/hours/week (Lab)

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. Required Course Materials

a. **Required Textbook:**

- Mays, L. W. (2010). *Water Resources Engineering, 2nd edition*. Hoboken, NJ: Wiley. ISBN: 978-0470460641.
- National Council of Examiners for Engineering and Surveying (NCEES). (2020). *Fundamentals of Engineering (FE) Supplied-Reference Handbook*, version 10.01, 280 Seneca Creek Road, Clemson, SC 29631. Available for download through the [NCEES Website](#)² after creating a free student account.

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

5. Technology Requirements and Software

This 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.

- ArcMap 10.2x with ArcHydro Tools module extension installed, ESRI. Installed in the Virtual server. **Contact your instructor to obtain a 1-year student license.** ArcHydro Tools is available for free download on the [ESRI website](#)³.
- HEC-HMS v4.2.1, Hydrologic Engineering Center (HEC), Army Corps of Engineers- available for free download on the [HEC Website](#)⁴.
- Pipe2016 Wood, D. J. and Srinivasa, L. Installed in the Virtual server.
- Civil 3D/AutoCAD 2000, Autodesk. Installed in the Virtual server.

6. Specific Course Information

- a. **Catalog Description:** The hydrologic budget: precipitation, evaporation, infiltration, runoff, and steady state groundwater flow. Rainfall-runoff analysis, flood routing and hydrologic frequency analysis. Hydraulics of closed conduits and open channel flow with design applications in culverts, pumps, water distribution, storm and sanitary sewer systems.
- b. **Prerequisites and Corequisites:** Prerequisites: ENGR 3404: Intro to Fluid Mechanics.
- c. **Required or Elective:** Required for the BSCE majors.

7. Specific Goals for the Course

- a. Course Learning Outcomes:
1. Describe hydrologic processes and solve basic problems related to evaporation, infiltration, steady-state groundwater flow, runoff, maximum design storm, and hydrologic frequency analysis.
 2. Use GIS tools and engineering software to examine and model hydrologic engineering problems.
 3. Calculate flows and pressures in simple pipe networks and use computer programs to examine distribution network systems.
 4. Apply principles of open channel flow and design criteria to solve problems related to culverts, sanitary sewer, and storm management systems.
 5. Conduct appropriate experimentation, analyze and interpret experimental data in topics of hydrology, pumps, energy and momentum in open channels, and weir discharge.
 6. Analyze a current flood-related problem subject to physical, legal, and economic constraints and design solutions considering social, environmental, and economic aspects. Present and support project recommendations in written and oral forms.
- 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
1. Solve Problems	X	X	X	X		X
2. Design		X	X	X		X
3. Communication						
4. Ethics & Professionalism						
5. Teamwork					X	
6. Experimentation					X	
7. Acquire New Knowledge						

8. Topics Covered

1. Hydrologic budget, precipitation, evaporation, infiltration
2. Intensity-Duration-Frequency curves, SCS 24-hour hyetograph
3. Darcy's Law and groundwater concepts
4. SCS rainfall-runoff relationship, SCS Unit hydrograph method, hydrologic routing
5. Hydrologic design criteria, natural hydrologic risk and hydrologic frequency analysis
6. Water distribution systems, Pipe network simulation
7. Open channel flow, hydraulic jump, weir discharge
8. Storm and sanitary sewer design
9. Pump systems, net positive suction head available.

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](#)⁵. 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](#)⁶ 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 Reading Assignments and Online Quizzes

Students are expected to complete the reading assignments from the assigned textbook or materials posted in Bb according to the syllabus schedule. Short outside-class Gradescope Online Quizzes will be assigned by the instructor to test your proficiency on the material covered. These are short examinations of varying formats containing multiple choice, calculation and short answer questions. Late submissions may be penalized or not accepted. At the end of the semester, the lowest graded Online Quiz will be dropped. This will also count towards any lost points or missed problems.

11.3 Problem Sets

Ten problem sets will be assigned through the semester. These are designed to demonstrate analytical, computational, and critical thinking skills. These will consist of textbook problems, data-analysis and modeling problems, and essay-type questions. All submissions require you to scan the assignment and upload it to Gradescope. Due dates for Problem Set assignments will be listed in Bb.

Students may collaborate to complete the homework; however, each student must individually complete his/her own assignment for grading. Direct copying of other's work is not allowed and may be subject to disciplinary actions. At the end of the semester, the lowest Problem Set grade will be dropped. This will also count towards any lost points or missed assignment.

11.4 Laboratory Reports

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

You must pass the lab portion of the class as a whole in order to pass the course. Weekly laboratory sessions will be undertaken to conduct experiments, visualize concepts covered in class, and to complete the hydrologic analysis portion of your final project. Read the lab manuals in advance to prepare for the lab activity and to answer any pre-lab online or in-class quiz. Most sessions require submission of an engineering report submitted as a team. 10% of the lab report grade will be based on a self and peer evaluation. Reports must be submitted via Gradescope and are due at the beginning of the following week or when indicated by the instructor.

11.5 Hydrology and Hydraulics Project

This is a three-person team project. The project will focus on a real-world hydrologic or flood-related problem. It will require you to apply hydrologic methods to estimate the peak runoff flow and principles of open or closed conduit hydraulics to propose and analyze a sustainable engineering solution. The project will be divided into a number of separate submittals due throughout the semester. Your team will present your final proposed solution in both a written report and an oral presentation.

11.6 Exams

There will be a total of two partial and one final comprehensive exams during the semester to assess what you have learned in each module. Exams are open-notes, open-textbook, closed-browsing and only an NCEES approved calculator can be used. Online and Make-up exams will only be given for extenuating

circumstances, unless prior arrangements with the instructor are agreed upon. Proof, such as a doctor's note or other official document, may be required for unexcused absences during an exam.

11.7 Grades: Weighting and Letter Grades

The weighting system shown in Table will be used in determining final grade for the course

Table 2: Grade Weighting

Course Component	Percent
Problem Sets	12
Online Quizzes	8
Laboratory Reports	15
Hydrology & Hydraulics Project	15
Partial Exams (2 x 12.5% each)	25
Final Exam	25
Total	100

The instructor reserves the right to adjust the weights given to the components listed. The instructor will determine letter grades for the course using his professional judgment, and the following standards as described in the University Catalog:

A (>90%) = excellent work, B (80 – 89%) = good work, C (70 – 79%) = average work, (60 – 69%) = poor work, F (>60%) = failing work

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](#)⁷ 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](#)⁸ and [Angelo State University Catalog](#)⁹.

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](#).¹⁰ 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](#)¹¹
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](#).¹²

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](#)¹³ for more information.

12.4 Information About COVID-19

Please refer to ASU's [COVID-19 \(Coronavirus\) Updates](#)¹⁴ 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](#)¹⁵ 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](#)¹⁶.

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 and the schedule for Lab Activities is presented in Table 4. 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	Textbook Reading	Problem Sets (PS)
	M, 01/17	Martin Luther King Jr Holiday		
1	W, 01/19	Introduction, Energy equation, HGL/EGL	4.2; 4.3.4	
2	M, 01/24	Pipe flow in simple networks	4.5.1-4.5.2	
3	W, 01/26	Pipe flow in simple networks cont'd	4.5.3	PS 1 due 01/28
4	M, 01/31	Pump systems, performance characteristics	12.1-12.2	
5	W, 02/02	Net Positive Suction Head and Pump selection	12.5	
6	M, 02/07	Pump system analysis	12.5	
7	W, 02/09	Open channel: Steady uniform flow, Manning's Eq.	5.1	PS 2 due 02/11
8	M, 02/14	Open channel: Specific energy	5.2	
9	W, 02/16	Open channel: Rapidly varied flow	5.5	PS 3 due 02/18
10	M, 02/21	Hydrology, the water cycle	7.1	
	W, 02/23	Exam 1 (Lectures 1-9)		
11	M, 02/28	Precipitation	7.2	
12	W, 03/02	Precipitation cont'd	7.2	
13	M, 03/07	Precipitation cont'd	7.2	
14	W, 03/09	Evaporation	7.3.1	PS 4 due 03/11
	M, 03/14	Spring Break Holiday		
	W, 03/16	Spring Break Holiday		
15	M, 03/21	Groundwater concepts and Darcy's Law	6.1-6.2	
16	W, 03/23	Infiltration	7.4	
17	M, 03/28	Infiltration cont'd	7.4	
18	W, 03/30	Surface runoff, Unit hydrograph method	8.1-8.3	PS 5 due 04/01
19	M, 04/04	SCS method, SCS Unit hydrograph	8.6-8.8	
	W 04/06	Exam 2 (Lectures 10-18)		
20	M, 04/11	SCS Unit hydrograph cont'd	8.8	
21	W, 04/13	Reservoir Routing – Modified Puls Method	9.1-9.2	PS 6 due 4/15
22	M, 04/18	Reservoir Routing – Modified Puls Method	9.2	
23	W, 04/20	Storm and sanitary sewer design	15.1-15.2.2	
24	M, 04/25	Storm and sanitary sewer design	15.1-15.2.2	
25	W, 04/27	Probability concepts & Probability Distributions	10.1-10.2	PS 7 due 4/29
26	M, 05/02	Hydrologic design criteria and Hydrologic Risk	10.3	
27	W, 05/04	Hydrologic frequency analysis	10.4	PS 8 due 5/06
	W, 05/11	Final Comprehensive Exam, 1:00 p.m. - 3:00 p.m.		

Table 4: Schedule for Laboratory and Project Activities

Lab Activity	Date	Topic	Lab Reading*	Lab location
0	T, 01/18	Lab 0: Expectations, safety, Fluid Units and Quantities	Bb Other Course Info folder, PPT, Lab Assignment	VIN 245
1	T, 01/25	Lab 01: Pipe Network simulation	Lab Manual, PowerPoint	VIN 245
	T, 02/01	Lab 02: Pumps in series/parallel	Lab Manual, PowerPoint	HSEL 103
2	T, 02/08	Lab 03: open channel flow measurement – Midsection method	Lab Manual, PowerPoint	Field Trip
3	T, 02/15	Lab 04: Open Channel – Hydraulic jump	Lab Manual, PowerPoint	HSEL 103
4	T, 02/22	Lab 05 Watershed delineation (bring USB drive)	Lab Manual, PPT	VIN 245
5	T, 03/01	Lab 06: Watershed characteristics	Lab Manual, PPT, excel file	VIN 245
6	T, 03/08	Lab 07: Hydrologic modeling in Hec-HMS	Lab Manual, excel file	VIN 245
7	T, 03/15	Spring Break – No Lab		
8	T, 03/22	Lab 08: Reservoir Routing in Hec-HMS	Lab Manual	VIN 245
9	T, 03/29	Lab 09: Flow through weirs	Lab Manual, Video	HSEL 103
	T, 04/05	Project Presentation Update	Upload your PowerPoint	VIN 245
10	T, 04/12	Lab 10: Culvert Design and Modeling	Lab Manual, PPT	VIN 245
11	T, 04/19	Open Lab	None, report not assigned	VIN 245
	T, 04/26	Lab 11: Field trip to COSA water production	Lab Handout	Field trip
	T, 05/03	Final Project Presentations	Upload your final PowerPoint	VIN 245

End Notes

¹ <https://www.angelo.edu/content/profiles/6462-aldo-r-pinon-villarreal>

² <https://ncees.org/engineering/fe/>

³ <http://downloads.esri.com/archydro>

⁴ <http://www.hec.usace.army.mil/software/hec-hms/downloads.aspx>

⁵ angelo.blackboard.com

⁶ <http://ncees.org/exams/calculator-policy/>

⁷ <https://angelo.policystat.com/policy/10659448/latest/>

⁸ <http://www.angelo.edu/student-handbook/>

⁹ <https://www.angelo.edu/academics/catalog/>

¹⁰ <https://www.angelo.edu/current-students/disability-services/>

¹¹ <https://www.angelo.edu/incident-form>

¹² <https://www.angelo.edu/title-ix>

¹³ <https://angelo.policystat.com/policy/10659368/latest/>

¹⁴ <https://www.angelo.edu/covid-19/>

¹⁵ <https://www.angelo.edu/live/files/27603-student-handbook-2020-21#page=97>

¹⁶ http://www.angelo.edu/dept/writing_center/academic_honesty.php