1. **Course Number and Name**
   a. **CENG 4352**: Hydraulic System Analysis, Fall 2020
   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.

   **Instructions to join the virtual office hour sessions (simultaneous with face to face office hrs):**
   1. In your Blackboard go to the Home tab then go to My organizations module
   2. Select Engineering Community Organization, which looks like a regular course blackboard page.
   3. On the organization menu, select Virtual Engineering Hub which takes you to a Collaborate Ultra virtual meeting room.
   4. In there, find the correct Office Hours Session series in the scheduled Collaborate sessions (e.g., Prof. Pinon Tuesdays Office Hours)
   5. Fifteen min before the session starts (and during the session) you will be able to join the session. Choose your role as participant.

4. **Course Materials:**
   a. **Required Textbooks:**
      Top Hat Pro (www.tophat.com) will be used for class participation. Cost of Top Hat Pro is $22 per semester. If you already have Top Hat account, go to https://app.tophat.com/e/719102 to be taken directly to our course. If you are new to Top Hat, go to https://app.tophat.com/register/student and search for our course with the following join code: 719102. For more instructions refer to the invitation sent to your school email address or consult Top Hat’s Getting Started Guide (https://bit.ly/31TGMLw). For questions or support send an email to support@tophat.com, use the in-app support button, or call 1-888-663-5491.

   b. **Recommended Textbooks:**

CENG 4352-1
c. **Software**

*NOTE:* Bring a USB Flash drive with at least 10 GB of space to every lecture. Alternatively, you can share files using One Drive cloud (up to 1 TB available through ASU); sharing via Google drive may not support correct files for the software used in this course.

- HEC-HMS v4.2.1, Hydrologic Engineering Center (HEC), Army Corps of Engineers- available for free download on the [HEC Website](#).
- HEC-RAS v5.0.7, Hydrologic Engineering Center (HEC), Army Corps of Engineers- available for free download on the [HEC Website](#).
- Stormwater Studio, Stringer, T. Hydrology Studio. A link and key code will be sent by your instructor so you can install in your laptop.
- Civil 3D/AutoCAD 2000, Autodesk. Installed in the Virtual server.

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

5. **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)

6. **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

<table>
<thead>
<tr>
<th>ABET Student Outcomes</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Solve Problems</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>2. Design</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Communication</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>4. Ethics &amp; Professionalism</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>5. Teamwork</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Experimentation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Acquire New Knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

7. **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.
7. Open channel regulating structures and flow measurement.
8. Reservoir design, hydrologic routing and storage volume.
9. Culvert, storm and sanitary sewer design.
8. Course structure and communication

NOTE: the course format could change without prior notice from a blended format to an online format if ASU dictates that courses need to be taught remotely in the event that COVID-19 cases pose a serious threat to the University Community.

The course is a mixture between face to face and online formats. Class sessions will be face to face. All lectures will be recorded and uploaded to blackboard within 24 hrs. for those who may not be able to attend. Some parts of the lecture such as laboratory or project assignments may be provided via video webcasts posted in blackboard asynchronously. The instructor will be holding face to face and online synchronous sessions simultaneously during published office hours.

You are expected to complete all required reading and video webcasts independently before each class period. Please bring the textbook, any relevant handouts and a calculator with you to the class. You are also expected to collaborate with peers virtually for online assignments and to communicate frequently with your instructor for any questions or clarifications you may have. All lesson materials will be organized on the Blackboard course website. Important course announcements and changes will be sent via Blackboard. Students are expected to regularly check their Angelo State University email for these messages.

Academic integrity is expected from all students at all times in accordance with Part I, Section B.1 of the Angelo State University Code of Student Conduct. Respect for your fellow classmates in the face to face or online environments is required. While online do not act in a manner that perturbate others.

8.1 Calculator policy

The use of a calculator is required and allowed on all tests and in class problems. Computers, tablets, smart phones, i-Pads and similar electronics are not allowed on tests. Calculators with graphing capabilities will be allowed in the course. 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 tests and quizzes. Please refer to the NCEES calculator policy for the list of acceptable calculators.

8.2 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.

9. Graded Material

9.1 In-Class Problems

You will be able to submit answers to in- or after-class questions using any smartphone, tablet or laptop using Top Hat Pro. In-class short problems will be presented during synchronous sessions and these will remain open until the next day by midnight. These are short examinations of varying formats containing
multiple choice, calculation and short answer questions. The purpose of the quizzes is to encourage you to complete the reading and web-based material. Your lowest score will be dropped.

9.2 **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.

9.3 **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. Assignments will be available in top hat.

9.4 **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. **Online group discussions are highly encouraged to keep physical contact to a minimum.**

9.5 **Exams**

There will be a total of two partial exam required to pass the course. The exams are open-notes and open-textbook. You will be allowed to use an approved calculator during the exams.

9.6 **Late Assignments**

No late assignments or missed assignments will be accepted unless a prior arrangement has been made with the instructor. All arrangements must be accompanied by a memorandum containing (i) the reason for the late submission, (ii) specific preventive action(s) to ensure the situation, if preventable, does not repeat in the future, and (iii) a proposed new timeline for the submission. Acceptance of the terms and grade deduction for late assignment is at the discretion of your instructor.

9.7 **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>
<thead>
<tr>
<th>Item</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>In class problems (Top Hat)</td>
<td>10%</td>
</tr>
<tr>
<td>Problem Sets (7)</td>
<td>10%</td>
</tr>
<tr>
<td>Sustainability Readings (4)</td>
<td>10%</td>
</tr>
<tr>
<td>Term Projects (2)</td>
<td>30%</td>
</tr>
<tr>
<td>Partial Exams (2)</td>
<td>40%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
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%).

10. Classroom and University Policies and Student Support

10.1 General Policies

All students are required to follow the policies and procedures presented in the Angelo State University Student Handbook and Angelo State University Catalog.

10.2 Student Disability Services

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. The employee charged with the responsibility of reviewing and authorizing accommodation requests is:

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

10.3 Title IX at Angelo State University

The University prohibits discrimination based on sex, which includes pregnancy, sexual orientation, gender identity, and other types of Sexual Misconduct. Sexual Misconduct is a broad term encompassing all forms of gender-based harassment or discrimination including: sexual assault, sex-based discrimination, sexual exploitation, sexual harassment, public indecency, interpersonal violence (domestic violence and/or dating violence), and stalking. As a faculty member, I am a Responsible Employee meaning that I am obligated by law and ASU policy to report any allegations I am notified of to the Office of Title IX Compliance.

Students are encouraged to report any incidents of sexual misconduct directly to ASU’s Office of Title IX Compliance and the Director of Title IX Compliance/Title IX Coordinator at:

- Michelle Boone, J.D.
  Director of Title IX Compliance/Title IX Coordinator
  Face to face: Mayer Administration Building, Room 210
  325-942-2022, michelle.boone@angelo.edu

You may also file a report online 24/7 at www.angelo.edu/incident-form.
If you are wishing to speak to someone about an incident in confidence you may contact the University Health Clinic and Counseling Center at 325-942-2173 or the ASU Crisis Helpline at 325-486-6345. For more information about Title IX in general you may visit www.angelo.edu/title-ix.10.

10.4 Observance of Religious Holy Day

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 Day11 for more information.

10.5 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 for more information.

10.6 Student Conduct Policies

10.6.1 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.

The College of Science and Engineering adheres to the university’s Statement of Academic Integrity.

10.6.2 Plagiarism

Plagiarism is a serious topic covered in ASU’s Academic Integrity policy12 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. Resources to help you understand this policy better are available at the ASU Writing Center13.

10.6.3 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.

11. Instructor Prerogative

The instructor reserves the right to change the policies and procedures of this course when he deems it necessary. Any such changes will be implemented fairly and will typically not be a detriment to your grade. The instructor will notify you of any such changes in a timely manner.
12. Format of Homework Assignments and Project Reports

Handwritten assignments must be completed on engineering paper using the format shown in Figure 1 before being scanned and submitted via Gradescope. All pages must be numbered and contain the header information shown in Figure 1. Work completed using a computer should be typed on word document converted to PDF and submitted. All equations should be typed using the insert equation button from the main menu bar in word® or a specialized mathematics typing application or software. Project reports require a cover page containing the project name, names of team members, as well as course name, instructor name, and report submission date. See handout Grading and Formatting of Lab reports in the Orientation Module in Bb for detailed information about report format and expectations.

Figure 1: Required format for handwritten homework
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

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Date</th>
<th>Topic</th>
<th>Problem Sets (PS) and Project Deliverables</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>T, 08/18</td>
<td>Water Distribution Systems, design criteria for design of hydraulic systems</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>R, 08/20</td>
<td>Pipe hydraulics, head loss equations</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>T, 08/25</td>
<td>Economics and cost optimization</td>
<td>Project 1 assigned</td>
</tr>
<tr>
<td>4</td>
<td>R, 08/27</td>
<td>Hydraulic transients (Water hammer)</td>
<td>PS 1 due</td>
</tr>
<tr>
<td>5</td>
<td>T, 09/01</td>
<td>Control of hydraulic transients</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>R, 09/03</td>
<td>Automatic control Valves</td>
<td>Reading 1 due</td>
</tr>
<tr>
<td>7</td>
<td>T, 09/08</td>
<td>Pipe Network Analysis – Hardy cross method</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>R, 09/10</td>
<td>Pipe network analysis in KY-Pipe</td>
<td>PS 2 due</td>
</tr>
<tr>
<td>9</td>
<td>T, 09/15</td>
<td>Pipe network analysis in KY-Pipe cont’d</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>R, 09/17</td>
<td>Types of pumps (centrifugal pumps and multi-stage pumps, pump scaling laws</td>
<td>Reading 2 due</td>
</tr>
<tr>
<td>11</td>
<td>T, 09/22</td>
<td>Pipe, pump and reservoir network, intake structures</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>R, 09/24</td>
<td>Pump selection and Design, calculating annual costs</td>
<td>PS 3 due</td>
</tr>
<tr>
<td>13</td>
<td>T, 09/29</td>
<td>Open channel hydraulics</td>
<td>Project 1 due</td>
</tr>
<tr>
<td>R, 10/01</td>
<td>Exam 1 (Lectures 1-12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>T, 10/06</td>
<td>Energy and Continuity principles in open channel</td>
<td>Project 2 assigned</td>
</tr>
<tr>
<td>15</td>
<td>R, 10/08</td>
<td>Surface water Profile classification, step method</td>
<td>Reading 3 due</td>
</tr>
<tr>
<td>16</td>
<td>T, 10/13</td>
<td>Introduction to Hec-RAS modeling</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>R, 10/15</td>
<td>Open channel design</td>
<td>PS 4 due</td>
</tr>
<tr>
<td>18</td>
<td>T, 10/20</td>
<td>Regulating structures and flow measurement</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>R, 10/22</td>
<td>Hydrologic routing</td>
<td>PS 5 due</td>
</tr>
<tr>
<td>20</td>
<td>T, 10/27</td>
<td>River routing</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>R, 10/29</td>
<td>Pond design</td>
<td>PS 6 due</td>
</tr>
<tr>
<td>T, 11/03</td>
<td>Culvert design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>R 11/05</td>
<td>Exam 2 (Lectures 13-21)</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>T, 11/10</td>
<td>Culvert design</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>R, 11/12</td>
<td>Storm sewer design</td>
<td>Reading 4 due</td>
</tr>
<tr>
<td>25</td>
<td>T, 11/17</td>
<td>Introduction to Stormwater studio software</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>R, 11/19</td>
<td>Work on Project # 2</td>
<td>PS 7 due, Project 2 due during finals week</td>
</tr>
</tbody>
</table>

CENG 4352-9
End Notes

1 https://ncees.org/engineering/fe/
5 http://ncees.org/exams/calculator-policy/
6 http://www.angelo.edu/student-handbook/
7 http://www.angelo.edu/catalogs/
8 http://www.angelo.edu/services/disability-services/
9 http://www.angelo.edu/incident-form
10 http://www.angelo.edu/title-ix
11 http://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of
12 http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php
13 http://www.angelo.edu/dept/writing_center/academic_honesty.php