1. Course Number and Name
   a. CENG 3352: Hydrology and Hydraulics, Fall 2020
   b. Section 010, MW 1:00 – 1:50 pm

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.

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 Textbook:
      - National Council of Examiners for Engineering and Surveying (NCEES). Fundamentals of Engineering (FE) Supplied—Reference Handbook, 280 Seneca Creek Road, Clemson, SC 29631. Which can be downloaded for free after creating an account in the NCEES Website.
      - 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/057681 - 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: 057681. 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. Software
      NOTE: Bring a USB Flash drive with at least 10 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.
• 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\(^2\).
• HEC-HMS v4.2.1, 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.
• Civil 3D/AutoCAD 2000, Autodesk. Installed in the Virtual server.

c. Other Supplemental Materials: Posted on Blackboard\(^\circ\) Learning Management System

5. 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
   c. Required or Elective: Required (satisfies Introductory CE Discipline)

6. 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

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

7. Topics Covered

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

CENG 3352-3
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 quizzes. Computers, tablets, smart phones, i-Pads and similar electronics are not allowed on tests/quizzes. 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 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 in-class problems is to encourage you to participate actively in class or complete the reading and web-based material. Your lowest score will be dropped.

9.2 Problem Sets

Eight 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 blackboard using Gradescope. Due dates for Homework assignments will be listed in Bb.

9.3 Laboratory Reports

NOTE: Bring a USB Flash drive with at least 10 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. The instructor will post the handouts for every lab in Bb at least one week in advance of the session. Ensure to read them in advance to be prepared for the lab activity and to answer any pre-lab online or in-class quiz. Most sessions require submission of a high-quality written report submitted as a team. 10% of the lab report grade will be based on a self and peer evaluation. Unless stated otherwise each lab report will be due at the beginning of the lab session, one week after the lab is completed.

9.4 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. Due dates will be listed in Blackboard. Online group discussions are highly encouraged to keep physical contact to a minimum.

9.5 Exams

There will be a total of two partial and one comprehensive final exam required to pass the course. All the exams are open-notes and open-textbook. You will be allowed to use the NCEES 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 will be used in determining final grade for the course.

<table>
<thead>
<tr>
<th>Item</th>
<th>Blackboard Points</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>In class problems (Top Hat)</td>
<td>200</td>
<td>10%</td>
</tr>
<tr>
<td>Problem Sets</td>
<td>200 (8 x 25 pts)</td>
<td>10%</td>
</tr>
<tr>
<td>Laboratory Reports</td>
<td>300 (8 x 37.5 pts)</td>
<td>15%</td>
</tr>
<tr>
<td>Hydrology &amp; Hydraulics Project</td>
<td>300</td>
<td>15%</td>
</tr>
<tr>
<td>Partial Exams (2 x 250 pt each)</td>
<td>500</td>
<td>25%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>500</td>
<td>25%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2000</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](http://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](http://www.angelo.edu/title-ix).

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 Day 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](http://www.angelo.edu/title-ix).

10.6.2 **Plagiarism**

Plagiarism is a serious topic covered in ASU’s [Academic Integrity policy](http://www.angelo.edu/title-ix) 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 Center.

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 Laboratory Reports

Hand written 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 may be submitted on regular 8 x 11 in. paper. 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. Drawings, plans and maps can be printed in 11 x 17 in. paper folded in half and attached to the report(s). Every lab report will require a cover page containing the student name, names of team members, as well as course name, instructor name, date when experiment/analysis was undertaken, 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.
Given: Perez & Rabinowite prob 6-13

A ship on a lake is sighted from 2 stations located 521.67' apart, along an E-W baseline.
The azimuth measured from the westernmost station is 30°17'23''.
The azimuth measured from the easternmost station is 321°47'08''.

Find: The distance from the baseline to the ship.

Solution:

\[\alpha = 90° - 30°17'23'' = 59°42'37''\]
\[\beta = 321°47'08'' - 370° = 51°47'08''\]
\[\theta = 180° - \alpha - \beta\]
\[= 180° - 59°42'37'' - 51°47'08''\]
\[= 69°30'15''\]

Using law of sines

\[
\frac{AP}{\sin \theta} = \frac{AB}{\sin \beta}
\]
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

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Date</th>
<th>Topic</th>
<th>Textbook Reading*</th>
<th>Problem Sets (PS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M, 8/17</td>
<td>Introduction, Energy equation, HGL/EGL</td>
<td>4.2; 4.3.4 examples</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>W, 8/19</td>
<td>Pipe flow in simple network</td>
<td>4.5.1-4.5.2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>M, 08/24</td>
<td>Pipe flow in simple network cont’d</td>
<td>4.5.3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>W, 08/26</td>
<td>Pump systems</td>
<td>12.1-12.2</td>
<td>PS 1 due 8/30</td>
</tr>
<tr>
<td>5</td>
<td>M, 08/31</td>
<td>Pump system analysis</td>
<td>12.5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>W, 09/02</td>
<td>Open channel: Steady uniform flow, Manning’s Eq.</td>
<td>5.1</td>
<td>PS 2 due 9/04</td>
</tr>
<tr>
<td></td>
<td>M, 09/07</td>
<td>Labor Day - No class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>W, 09/09</td>
<td>Open channel: Specific energy</td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>M, 09/14</td>
<td>Open channel: Rapidly varied flow</td>
<td>5.5</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>W, 09/16</td>
<td>Hydrology, the water cycle</td>
<td></td>
<td>PS 3 due 9/18</td>
</tr>
<tr>
<td></td>
<td>M, 09/21</td>
<td>Exam 1 (Lectures 1-8)</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>W, 09/23</td>
<td>Precipitation</td>
<td>7.2</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>M, 09/28</td>
<td>Precipitation cont’d</td>
<td>7.2</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>W, 09/30</td>
<td>Evaporation</td>
<td>7.3.1</td>
<td>PS 4 due 10/02</td>
</tr>
<tr>
<td>13</td>
<td>M, 10/05</td>
<td>Infiltration</td>
<td>7.4</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>W, 10/07</td>
<td>Infiltration cont’d</td>
<td>7.4</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>M, 10/12</td>
<td>Surface runoff, Unit hydrograph method</td>
<td>8.1-8.3</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>W, 10/14</td>
<td>SCS method, SCS Unit hydrograph</td>
<td>8.6-8.8</td>
<td>PS 5 due 10/16</td>
</tr>
<tr>
<td>17</td>
<td>M, 10/19</td>
<td>SCS Unit hydrograph cont’d</td>
<td>8.8</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>W, 10/21</td>
<td>Storm and sanitary sewer design</td>
<td>15.1-15.2.2</td>
<td>PS 6 due 10/23</td>
</tr>
<tr>
<td></td>
<td>M, 10/26</td>
<td>Exam 2 (Lectures 9-17)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>W, 10/28</td>
<td>Probability concepts &amp; Probability Distributions</td>
<td>10.1-10.2</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>M, 11/02</td>
<td>Hydrologic design criteria</td>
<td>10.3</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>W, 11/04</td>
<td>Hydrologic frequency analysis</td>
<td>10.4</td>
<td>PS 7 due 11/06</td>
</tr>
<tr>
<td>22</td>
<td>M, 11/09</td>
<td>Groundwater flow and Darcy’s Law</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>W, 11/11</td>
<td>Groundwater flow: Governing equations</td>
<td>6.2</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>M, 11/16</td>
<td>Steady-state well hydraulics</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>W, 11/18</td>
<td>Steady-state well hydraulics Cont’d</td>
<td>6.4</td>
<td>PS 8 due 11/06</td>
</tr>
</tbody>
</table>

*Besides the textbook readings, each lecture includes PDF notes found in blackboard which must be read and printed/downloaded before attending each class.
Table 4: Schedule for Laboratory and Project Activities

<table>
<thead>
<tr>
<th>Lab Activity</th>
<th>Date</th>
<th>Topic</th>
<th>Lab Reading*</th>
<th>Lab location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>M, 8/17</td>
<td>Expectations, safety, Fluid Units and Quantities</td>
<td>Bb Orientation folder, PowerPoint, Lab Assignment</td>
<td>MCS 115</td>
</tr>
<tr>
<td>1</td>
<td>M, 08/24</td>
<td>Lab 01: Pipe Network simulation</td>
<td>Lab Assignment</td>
<td>MCS 115</td>
</tr>
<tr>
<td>2</td>
<td>M, 08/31</td>
<td>Lab 02: Pumps in series/parallel</td>
<td>Lab Manual, PowerPoint</td>
<td>HSEL 103</td>
</tr>
<tr>
<td></td>
<td>M, 09/07</td>
<td>Labor Day Holiday, No lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>M, 09/14</td>
<td>Lab 03: Open Channel – Hydraulic jump</td>
<td>Lab Handout, Video</td>
<td>HSEL 103</td>
</tr>
<tr>
<td>4</td>
<td>M, 09/21</td>
<td>Lab 04: Analysis of precipitation records</td>
<td>Lab Manual, City of San Angelo Stormwater manual, 2 excel files</td>
<td>MCS 115</td>
</tr>
<tr>
<td></td>
<td>M, 09/28</td>
<td>Lab 05: Watershed delineation (bring USB drive)</td>
<td>Lab Manual,</td>
<td>MCS 115</td>
</tr>
<tr>
<td>6</td>
<td>M, 10/05</td>
<td>Lab 06: Watershed characteristics</td>
<td>Lab Manual, PowerPoint, excel file</td>
<td>MCS 115</td>
</tr>
<tr>
<td></td>
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<td>Lab 07: Hydrologic modeling in HEC-HMS</td>
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<td>Lab 08: Reservoir Routing in HEC-HMS</td>
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<td>Lab 09: Project Detention Pond Routing</td>
<td>PowerPoint</td>
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<td>Final Project Presentations</td>
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End Notes

1. https://ncees.org/engineering/fe/
11. http://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of