CE 3354 – Engineering Hydrology

Spring 2026

Department of Civil, Environmental, and Construction Engineering
Texas Tech University

Course Catalog Description

Analysis and design methods related to the occurrence and distribution of surface water and groundwater, precipitation, infiltration, runoff, and frequency analysis.

Prerequisites

CE 3305, Mechanics of Fluids, or equivalent. Passing of prerequisites is required and enforced. Please contact the instructor if questions arise.

Course Information

Course number	CE 3354
Course title	Engineering Hydrology
Semester	Spring 2026
Section	Section 002
Meeting time	9:30 AM–10:50 AM, Tuesday and Thursday
Location	CE 00211
Final exam	Friday, May 8, 2026

Instructor Information

Instructor	Seonggyu Park, Ph.D.
Email	seonggyu.park@ttu.edu
Email subject line	Please include "CE 3354" in the subject line
Office location	CECE 203H
Office hours	Thursdays 2:00 PM to 4:00 PM, or by appointment
Teaching Assistant	N/A
TA email	N/A
TA office hours	N/A

Textbook and Reference Materials

There is no required textbook. Lecture materials are drawn heavily from the following references:

- Gupta, R. S. (2017). *Hydrology and Hydraulic Systems*. Waveland Press. ISBN-10: 1-4786-3091-4; ISBN-13: 978-1-4786-3091-3.
- Hornberger, G. M., Wiberg, P. L., Raffensperger, J. P., and D'Odorico, P. (2014). *Elements of Physical Hydrology*. 2nd ed. Johns Hopkins University Press.
- Hendriks, M. (2010). *Introduction to Physical Hydrology*. Oxford University Press.

Additional readings, tutorials, datasets, software instructions, and project materials may be posted on RaiderCanvas.

Course Objectives

By the end of this course, students will be able to:

1. Describe the components and processes of the hydrologic cycle, including precipitation, infiltration, runoff, evaporation, and groundwater flow.
2. Analyze hydrologic data using statistical and graphical techniques to characterize rainfall and streamflow variability.
3. Delineate watersheds and compute watershed properties using both manual and GISbased tools.
4. Apply empirical and conceptual models (e.g., Rational Method, NRCS, Unit Hydrographs) to simulate rainfall-runoff response.
5. Use engineering software tools (HEC-HMS, SWMM, Excel) for hydrologic modeling of drainage and collection systems.
6. Design basic stormwater management components, including pipe and culvert sizing, detention storage, and flow routing.
7. Communicate hydrologic analyses effectively through technical reports, annotated graphics, infographics, and simplified explanatory media.
8. Interpret and explain simulation results in context, considering data uncertainty and practical constraints in engineering design.

Knowledge, Skills, and Abilities

During this course, students will:

1. Read, synthesize, and communicate ideas presented in current and historical technical literature.
2. Delineate watersheds from maps and determine common metrics using digital planimetry.
3. Perform hydrologic computations using Excel, LibreOffice, Python, or other tools as needed.
4. Perform hydrologic simulation using HEC-HMS.
5. Prepare a professional report of a hydrologic analysis for the design of a stormwater management system.

ABET Student Outcomes

This course supports the following ABET student outcomes:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Resources and Tools

Professional software and computational tools may be used in this course. Installation instructions and official download links will be provided through RaiderCanvas when needed.

Examples of tools that may be used include:

- Microsoft Excel, LibreOffice, or equivalent spreadsheet software
- Python, Jupyter Notebook, or Google Colab
- HEC-HMS from the U.S. Army Corps of Engineers
- Hydrologic data tools from USGS, NOAA, and other public agencies

Hardware Requirements

The College of Engineering has specific laptop requirements for engineering courses. Students should refer to the official college guidance:

https://www.depts.ttu.edu/coe/dean/engineeringitservices/buyingtherightcomputer.php

Learning Management System

RaiderCanvas is used as the learning management system for this class. All exercises, assignments, and project materials should be uploaded to RaiderCanvas unless otherwise announced. Late submissions are accepted, but scores are reduced by at least **50%**. The number of homework assignments is tentative and may change based on class progress and student learning needs.

Course Schedule

Calendar note: This schedule follows the Spring 2026 Tuesday/Thursday course plan. The schedule may be adjusted based on class progress, weather, university events, or other contingencies.

Lec.	Date	Topic	Assignments
1	Thu, Jan 15	Introduction • Syllabus review • Team selection • Fundamental concepts • Hydrologic budget	
2	Tue, Jan 20	Hydrologic Cycle • Water budget example • Hydrologic data	
3	Thu, Jan 22	Watershed • Watershed delineation • Watershed characteristics	HW01 Handout

Lec.	Date	Topic	Assignments
4	Tue, Jan 27	Data Analysis for Hydrology • Rainfall data • Estimating missing data • Areal averaging	
5	Thu, Jan 29	Probability and Design Storm 1 • T-year event • DDF and IDF curve	HW01 Due
6	Tue, Feb 3	Probability and Design Storm 2 • Design storm • SCS type curves	
7	Thu, Feb 5	Transpiration and Evaporation • Interception • Depression storage • Evaporation	HW02 Handout
–	Tue, Feb 10	**No class: Closure because of the Job Fair**	
8	Tue, Feb 17	Infiltration 1 • Subsurface flow • Horton equation	HW02 Due HW03 Handout
9	Thu, Feb 19	**Exam 1**	
10	Tue, Feb 24	Infiltration 2 • Green-Ampt method • Index method	
11	Thu, Feb 26	Runoff Modeling • NRCS Curve Number method • Rational method for estimating runoff • Time of concentration	HW03 Due HW04 Handout
12	Tue, Mar 3	Surface Water Hydrology 1 • Streamflow data, discharge, and rating curves • Runoff hydrograph	
13	Thu, Mar 5	Surface Water Hydrology 2 • Rainfall-runoff processes	HW04 Due
14	Tue, Mar 10	HEC-HMS Software Workshop 1 • Rainfall-runoff processes	HW05 Handout
15	Thu, Mar 12	HEC-HMS Software Workshop 2 • Rainfall-runoff processes	–

Lec.	Date	Topic	Assignments
–	Tue, Mar 17	**No class: Spring Break**	
–	Thu, Mar 19	**No class: Spring Break**	
16	Tue, Mar 24	Unit Hydrograph 1 • S-curve method	HW05 Due
17	Thu, Mar 26	Unit Hydrograph 2 • Convolution	HW06 Handout
18	Tue, Mar 31	**Exam 2**	
19	Thu, Apr 2	Hydrograph Routing 1 • River reach	HW06 Due
20	Tue, Apr 7	Hydrograph Routing 2 • Reservoir	HW07 Handout
21	Thu, Apr 9	HEC-HMS Software Workshop 3 • Hydrograph routing	–
22	Tue, Apr 14	HEC-HMS Software Workshop 4 • Hydrograph routing	HW07 Due HW08 Handout
23	Thu, Apr 16	Flood Frequency 1 • Flood and drought • Frequency analysis	Final Report Handout
24	Tue, Apr 21	Flood Frequency 2 • Return period and probability • Data distribution and statistical approaches	HW08 Due HW09 Handout
25	Thu, Apr 23	Groundwater Hydrology 1 • Main concepts: porosity, specific yield, and energy head • Darcy's law	
26	Tue, Apr 28	Groundwater Hydrology 2 • Confined and unconfined aquifers • Groundwater discharge and recharge	HW09 Due HW10 Handout
27	Thu, Apr 30	**Exam 3**	
28	Tue, May 5	Project Presentations • Team 1 • Team 2 • Team 3	HW10 Due

Lec.	Date	Topic	Assignments
29	Fri, May 8	Project Presentations • Team 4 • Team 5 • Team 6 • Final exam day	Final Report Due

Course Assessment and Grading Criteria

Late assignments will be scored at a 50% reduced value unless prior arrangements have been made with the instructor.

Assessment Instrument	Weight (%)
Attendance	5
Exam 1	15
Exam 2	15
Exam 3	15
Homework	25
Quizzes	5
Final Project Report	15
Final Project Presentation	5
Overall total	**100**

Letter Grades

Normalized Score Range	Letter Grade
≥ 90	A
80–89	B
70–79	C
55–69	D
< 55	F

Classroom Policy

The following activities are not allowed in the classroom: texting or talking on a cellphone or other electronic devices, and reading or working on non-course-related materials.

ADA Statement

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make necessary arrangements. Students

must present appropriate verification from Student Disability Services during the instructor's office hours. Please note that instructors are not allowed to provide classroom accommodation to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact the Student Disability Services office in 335 West Hall or call 806.742.2405.

Academic Integrity Statement

Academic integrity is taking responsibility for one's own class and/or course work, being individually accountable, and demonstrating intellectual honesty and ethical behavior. Academic integrity is a personal choice to abide by the standards of intellectual honesty and responsibility. Because education is a shared effort to achieve learning through the exchange of ideas, students, faculty, and staff have the collective responsibility to build mutual trust and respect.

Ethical behavior and independent thought are essential for the highest level of academic achievement, which then must be measured. Academic achievement includes scholarship, teaching, and learning, all of which are shared endeavors. Grades are a device used to quantify the successful accumulation of knowledge through learning. Adhering to the standards of academic integrity ensures grades are earned honestly.

Academic integrity is the foundation upon which students, faculty, and staff build their educational and professional careers. [Texas Tech University ("University") Quality Enhancement Plan, Academic Integrity Task Force, 2010].

Religious Holy Day Statement

"Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known to the instructor prior to the absence.

A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence. A student who is excused may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

Ethical Conduct Policy

Cheating is prohibited, and the representation of the work of another person as your own will be grounds for receiving a failing grade in the course.

Discrimination, Harassment, and Sexual Violence Statement

Texas Tech University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from gender and/or sex discrimination of any kind. Sexual assault, discrimination, harassment, and other Title IX violations are not tolerated by the University.

Report any incidents to the Office for Student Rights & Resolution, 806.742.SAFE (7233), or file a report online at https://titleix.ttu.edu/students. Faculty and staff members at TTU are committed to connecting you to resources on campus. Some of these available resources are:

- TTU Student Counseling Center, 806.742.3674, https://www.depts.ttu.edu/scc/. Provides confidential support on campus.
- TTU 24-hour Crisis Helpline, 806.742.5555. Assists students who are experiencing a mental health or interpersonal violence crisis. If you call the helpline, you will speak with a mental health counselor.

- Voice of Hope Lubbock Rape Crisis Center, 806.763.7273, https://voiceofhopelubbock.org. A 24-hour hotline that provides support for survivors of sexual violence.
- The Risk, Intervention, Safety and Education (RISE) Office, 806.742.2110, https://www.depts.ttu.edu/rise/. Provides a range of resources and support options focused on prevention education and student wellness.
- Texas Tech Police Department, 806.742.3931, http://www.depts.ttu.edu/ttpd/. To report criminal activity that occurs on or near Texas Tech campus.

Civility in the Classroom Statement

Texas Tech University is a community of faculty, students, and staff that enjoys an expectation of cooperation, professionalism, and civility during the conduct of all forms of university business, including the conduct of student–student and student–faculty interactions in and out of the classroom.

Further, the classroom is a setting in which an exchange of ideas and creative thinking should be encouraged and where intellectual growth and development are fostered. Students who disrupt this classroom mission by rude, sarcastic, threatening, abusive, or obscene language and/or behavior will be subject to appropriate sanctions according to university policy. Likewise, faculty members are expected to maintain the highest standards of professionalism in all interactions with all constituents of the university.

To ensure that you are fully engaged in class discussions and team meetings during class time, you are expected to do the following:

- Maintain the same level of civility and professionalism that would be expected in a face-to-face classroom setting.
- Attend all classes regularly.
- Refrain from engaging in non-class-related activities during class time that create a distraction for other students in the class and/or limit your ability to engage in the course.

Failure to meet these expectations may result in the following consequences:

1. Being counted as absent for the class meeting.
2. Not receiving credit for class participation for that class period.
3. Other consequences as stipulated in the syllabus, Texas Tech Code of Student Conduct, or other university policy.

Repeated failure to meet expectations, including attendance and participation expectations, may result in one or more of the following consequences:

1. Referral to the appropriate Associate Dean.
2. Academic penalty, ranging from a warning to failure of the course. Additional information is available at https://www.depts.ttu.edu/ethics/matadorchallenge/ethicalprinciples.php.

Current required syllabus statements are available at:

https://www.depts.ttu.edu/tlpdc/RequiredSyllabusStatements.php

AI Use Syllabus Statement

AI Use Is Encouraged and Allowed

Students may use generative artificial intelligence (AI) tools, such as ChatGPT, in this class, as doing so aligns with our course learning goals. However, AI use must be appropriate, transparent, and properly documented.

When using AI tools, students are responsible for the following:

- AI-assisted work must be properly documented and cited.
- Students are responsible for ensuring that information submitted based on an AI query does not contain misinformation, unethical content, or material that violates intellectual property laws.
- AI responses are often incorrect; students must check that the response makes sense, is technically correct, and is grammatically edited.
- AI use must be disclosed in submitted work when AI tools contribute to the final product.

Submission of AI-generated content as your own work without appropriate acknowledgment is a violation of academic integrity and may result in referral to the Office of Student Conduct. Please contact the instructor if you have questions regarding this course policy.

Additional Texas Tech University AI-use syllabus guidance is available at:

https://www.depts.ttu.edu/tlpdc/AI_Resources/AI-Use-is-Encouraged.pdf

Topical Outline

1. Introduction to hydrology
2. Hydrologic cycle and water budget
3. Watershed delineation and characteristics
4. Hydrologic data analysis
5. Probability and design storms
6. Evaporation and transpiration
7. Infiltration and runoff modeling
8. Surface water hydrology
9. HEC-HMS rainfall-runoff modeling
10. Unit hydrograph methods
11. Hydrograph routing
12. Flood frequency analysis
13. Groundwater hydrology
14. Final project presentations

Key Dates

First class meeting	Thursday, January 15, 2026
Job Fair closure	Tuesday, February 10, 2026
Exam 1	Thursday, February 19, 2026
Spring Break	Monday, March 16 – Friday, March 20, 2026
Exam 2	Tuesday, March 31, 2026
Exam 3	Thursday, April 30, 2026
Project presentations	Tuesday, May 5 and Friday, May 8, 2026
Final exam day	Friday, May 8, 2026

I look forward to working with you this semester. Hydrology is everywhere around us, and this course will help you connect engineering tools with real water-resources decisions.