



## CEN 322 Advanced Hydrology

Winter 2024

**Course Credits:** 4

**Contact Hours:** 56 hours

**Instructor:** TBA

**Email:**TBA

### **COURSE OBJECTIVES**

This course explores advanced principles in hydraulic engineering with a focus on watershed management. Topics include the hydrologic cycle, evaporation, snowmelt, infiltration, well hydraulics, stream flow, unit hydrograph, S-curve method, and hydraulic routing. Gain practical skills through case studies and hands-on projects, preparing you to design hydraulic structures and effectively manage water resources.

Upon Completion of this Course, students will be able to:

1. Gain a thorough grasp of the hydrologic cycle, including processes like evaporation, transpiration, snowmelt, and infiltration;
2. Acquire in-depth knowledge of subsurface water dynamics and well hydraulics;
3. Develop skills in analyzing stream flow, utilizing unit hydrograph theory, and performing S-curve analysis for flood flows;
4. Learn techniques for river and reservoir routing, crucial for effective watershed management;
5. Master statistical methods, particularly in handling extreme values, enhancing the ability to assess and manage hydrological risks.

### **PREREQUISITES**

MATH 2423 Probability

### **GRADING**

Grades will be determined by accumulating points, with 100 points being the



maximum, as follows:

ITEM	POINTS
Assignments	20 Points
Midterm 1	15 Points
Midterm 2	15 Points
Projects	20 Points
Final Exam	30 Points
Total	100 Points

Late submissions will be graded at the end of the course. Grades will be assigned according to the following rule:

$A \geq 90 > B \geq 80 > C \geq 70 > D \geq 60 > F$ .

We reserve the right to make adjustments to the overall grading policy.

## COURSE MATERIALS

### **Required Texts:**

Ram S. Gupta, *Hydrology and Hydraulic Systems*, 4th Edition, Waveland Press, 2017.

### **Recommended (Optional) Texts or Other Materials:**

None

## COURSE TOPICS

MODULE	TASKS
Module 1	<b>Topics:</b> Topic 1: Demand for Water Topic 2: Power and Energy Production from Available Streamflows Topic 3: Elements of the Hydrologic Cycle: Precipitation Topic 4: Elements of the Hydrologic Cycle: Evaporation and Transpiration <b>Assessments:</b> Assignment#1



Module 2	<p><b>Topics:</b>  Topic 5: Evaporation from Free-Water Bodies  Topic 6: Elements of the Hydrologic Cycle: Runoff  Topic 7: Infiltration Capacity Curve Approach  Topic 8: Infiltration-Index Approach for Direct Runoff</p> <p><b>Assessments:</b>  Assignment#2  Project#1</p>
Module 3	<p><b>Topics:</b>  Topic 9: Direct Runoff from Snowmelt  Topic 10: Classification of Subsurface Water  Topic 11: Applications and Development of Groundwater Flow  Topic 12: Steady-State Confined Flow to a Well</p> <p><b>Assessments:</b>  Midterm#1</p>
Module 4	<p><b>Topics:</b>  Topic 13: Wells Near Boundaries: The Theory of Images  Topic 14: Well Field Design  Topic 15: Determination of Streamflow  Topic 16: Unit Hydrograph and Instantaneous Unit Hydrograph</p> <p><b>Assessments:</b>  Midterm#2  Project#2</p>
Module 5	<p><b>Topics:</b>  Topic 17: S-Curve Method  Topic 18: Extreme Value Distribution  Topic 19: Hydrodynamic Principles, Kinematics and Flow Routing  Topic 20: Hydraulic Routing</p> <p><b>Assessments:</b>  Final Exam</p>

## ATTENDANCE

1) Class attendance is required. Missing classes without permission will lead to decrease in overall grade.

Missing less than two classes: no penalty.

Missing more than two classes: 7% will be taken off from the overall grade.

If the instructor reports a student's frequent missing of class to the Soochow University Academic Administration Office, the student might get a written warning and might be prohibited from attending final exam.



2) Participants in this course are expected to arrive in class promptly and adequately prepared. The primary objective of this course is to critically engage with the readings and the subject matter. Therefore, course participants are expected to have completed the reading prior to class and prepare thoughtful reflections/commentaries to share with fellow colleagues.

### **LEARNING REQUIREMENTS**

- 1) Late assignments are not acceptable and are subjected to grade deductions.
- 2) Assignments submitted in the wrong format will be counted as not submitted.
- 3) Failure to submit or fulfill any required course component results in failure of the class.
- 4) Make-up for midterm and final exams only with valid excuses, as defined by the University.
- 5) In order to earn a Certificate of Completion, participants must thoughtfully complete all assignments by stated deadlines and earn an average quiz score of 50% or greater.

### **TECHNOLOGY POLICY**

The use of electronic devices in class is distracting, both for the user and for the rest of the class. Only non-programmable calculators can be used in the tests and exam. Any attempts to use cell phones and other electronic communication devices will be seemed as cheating. Laptops are discouraged, unless you use them for activities DIRECTLY related to the course (eg., note taking, reading course documents).

### **ACADEMIC INTEGRITY POLICY**

Soochow University highly values the academic integrity and aims to promote the academic fairness, honesty and responsibility. Any academic dishonesty behaviors and any attempts to cheats and plagiarism will be reported to the university administration office. A written warning and the relevant penalties will be imposed. The record might be shown on the official university transcript.

### **DISABILITY ACCOMMODATION**



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Soochow University is committed to maintaining a barrier-free environment so that students with disabilities can fully access programs, courses, services, and activities at Soochow University. Students with disabilities who require accommodations for access to and/or participation in this course are welcome.

Note:

Please contact the University Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material.