STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

CIVL 322 – Hydrology and Hydrogeology

CIP Code: 14.0805

Created by: Adrienne C. Rygel
Updated by:

School: Canino School of Technology
Department: Civil and Construction Technology
Implementation Semester/Year: Fall 2026

A. TITLE: Hydrology and Hydrogeology

B. COURSE NUMBER: CIVL 322

C. CREDIT HOURS (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity):

# Credit Hours per Week	**4**
# Lecture Hours per Week	**3**
# Lab Hours per Week	**2**
Other per Week	

D. WRITING INTENSIVE COURSE:

Yes	
No	x

E. GER CATEGORY:

Does course satisfy a GER category(ies)? If so, please select all that apply.

[1-2] Communication	
[3] Diversity: Equity, Inclusion & Social Justice	
[4] Mathematics & Quantitative Reasoning	
[5] Natural Science & Scientific Reasoning	
[6] Humanities	
[7] Social Sciences	
[8] Arts	
[9] US History & Civic Engagement	
[10] World History & Global Awareness	
[11] World Languages	

F. SEMESTER(S) OFFERED:

Fall	x
Spring	
Fall and Spring	

G. COURSE DESCRIPTION:

This course includes the study of surface and groundwater systems, with an emphasis on civil and environmental engineering related topics. Surface water topics include: principles of hydrology, hydrologic cycle, surface water environments, surface water flow, flood hazard analysis, watershed management and river engineering, and drainage basins. Specific groundwater topics include: principles of hydrogeology, aquifers, aquitards, groundwater flow regimes, well construction and testing, porosity and permeability of earth materials, and aquifer property testing and analysis. Laboratory and field exercises are used to introduce

students to technologies and analytical methods used by industry to understand surface and groundwater systems.

H. PRE-REQUISITES: CIVL 384 Engineering Geology or ESCI 107 Earth Science or CIVL 314 Soil Mechanics, or permission of the instructor

CO-REQUISITES:

I. STUDENT LEARNING OUTCOMES:

Course Student Learning Outcome [SLO]	Program Student Learning Outcome [PSLO]	GER	ISLO & Subsets
a. Explain the hydrologic cycle.	SO7		ISLO 5
b. Delineate a drainage basin divide on topographic maps, determine stream order, and determine the gradient of a stream.	SO1		ISLO 5
c. Describe general practices of drainage basin management.	SO7		ISLO 5
d. Interpret and use stream hydrographs and duration curves in problem solving.	SO1		ISLO 5
e. Conduct common methods for streamflow measurement.	SO6		ISLO 5
f. Conduct flood risk analyses.	SO1		ISLO 5
g. Determine and/or define common properties of aquifers (coefficient of permeability, amount of drawdown) for confined and unconfined aquifers using principles of groundwater flow.	SO7		ISLO 5
h. Construct and use a flow net to determine the discharge under/around a structure.	SO1		ISLO 5
i. Apply the Theis and Jacob Methods to describe groundwater flow to a well and interpret data from a Slug Test.	SO1		ISLO 5
j. Research a topic related to the course by conducting a technical literature review and prepare a written deliverable (standard report, fact sheet, or poster) and present the research findings to the class in an oral presentation.	SO3		ISLO 1 (O+W)

KEY	Institutional Student Learning Outcomes [ISLO 1 – 5]
ISLO #	ISLO & Subsets
1	**Communication Skills** Oral [O], Written [W]
2	**Critical Thinking** *Critical Analysis [CA], Inquiry & Analysis [IA] , Problem Solving [PS]*
3	**Foundational Skills** *Information Management [IM], Quantitative Lit, /Reasoning [QTR]*
4	**Social Responsibility** *Ethical Reasoning [ER], Global Learning [GL],* *Intercultural Knowledge [IK], Teamwork [T]*
5	**Industry, Professional, Discipline Specific Knowledge and Skills**

J. APPLIED LEARNING COMPONENT:

Yes	x
No	

If yes, select [X] one or more of the following categories:

Classroom / Lab	x	Community Service	
Internship		Civic Engagement	
Clinical Practicum		Creative Works/Senior Project	
Practicum		Research	
Service Learning		Entrepreneurship [program, class, project]	

K. TEXTS:

Jayawardena, A.W. (2021) Fluid Mechanics, Hydraulics, Hydrology and Water Resources for Civil Engineer2, 1st edition, CRC Press, ISBN 9780429423116.

L. REFERENCES:

C.W. Fetter (2001). Applied Hydrogeology, 4th Edition, Upper Saddle River, New Jersey: Prentice-Hall Inc..

K. Lee, C.W. Fetter, J.E. McCray (2003). Hydrogeology Laboratory Manual, Upper Saddle River, New Jersey: Pearson Education, Inc.

Freeze, R. Allan and Cherry, John A. (1979). Groundwater, Englewood Cliffs, New Jersey: Prentice Hall.

Dunne, Thomas and Leopold, Luna B. (1978). Water in Environmental Planning. New York, New York: W.H. Freeman and Company.

Bedient, Philip B., Huber, Wayne C., and Vieux, Baxter E. (2008). Hydrology and Floodplain Analysis, 4thedition. Upper Saddle River, New Jersey: Pearson Prentice Hall.

Sanders, Laura L. (1998). A Manual of Field Hydrogeology. Upper Saddle River, New Jersey: Prentice Hall.

Stone, William J. (1999). Hydrogeology in Practice A Guide to Characterizing Ground-Water Systems. Upper Saddle River, New Jersey: Prentice Hall.

M. EQUIPMENT: Laboratory equipment, provided by the department will include:
Constant Head Permeability Devices,
Fall Head Permeability Devices,
Porosimeter

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:
Exams
Homework Assignments
Laboratory Assignments
Term Project

P. DETAILED COURSE OUTLINE:

I. Hydrology
A. Part 1: Hydrologic Cycle
1. Evaporation
2. Transpiration
3. Evapotranspiration
4. Condensation
5. Precipitation

Part 2: Streams and Drainage Basins
1. Formation of Streams
2. Drainage Basins
3. Anatomy of Streams
4. Stream Erosion and Sediment Transport
5. Landscape Evolution and Types of Streams
6. Stream Hydraulics
7. Measurement of Streamflow

Part 3: Watershed Management and River Engineering
1. Stream Analysis
2. Hydrographs
3. Rainfall-Runoff Relationship
4. Duration Curves
5. Groundwater Recharge from Baseflow
6. Flood Risk Analysis
7. River Engineering

II. Hydrogeology
Part 4: Aquifer Properties
1. Porosity
2. Permeability

Part 5: Groundwater Flow
1. Darcy's Law

2. Constant Head and Falling Head Permeameters
3. Flow Nets
4. Theis Method
5. Jacob Method
6. Slug Tests

Q. LABORATORY OUTLINE:

1. Evaporation and Water Budget
2. Precipitation Analysis I
3. Precipitation Analysis II
4. Delineating Drainage Basins, Determining Stream Order, Stream Profiles and Gradient
5. Stream Gauging
6. Stream Flow Analysis: Stream Hydrographs, Rainfall-Runoff Relationships, Duration Curves, and Baseflow
7. Flood Risk Analysis
8. Aquifer Property Testing
9. Permeability Testing
10. Flow Nets
11. Theis and Jacob Methods
12. Slug Test Analysis
13. Term Project Presentations (2 laboratory periods)