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

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
CONS 385 – Hydrology and Hydrogeology

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Canino School of Engineering Technology

Department: Civil and Construction Technology

Semester/Year: Fall 2018

A. **TITLE**: Hydrology and Hydrogeology

B. **COURSE NUMBER:** CONS 385

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

 # Credit Hours: 4
 # Lecture Hours: 3 **per week**
 # Lab Hours: (1) two-hour lab **per week**
Other: **per week**

Course Length: 15 **Weeks**

D. **WRITING INTENSIVE COURSE**: Yes ☐ No ☒

E. **GER CATEGORY: None:** ☒ **Yes:** GER
***If course satisfies more than one*:** GER

F. **SEMESTER(S) OFFERED: Fall** ☒ **Spring** ☐ **Fall & 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: None** ☐ **Yes** ☒ **If yes, list below:**

Engineering Geology (CONS 285) or Civil Engineering Materials (CONS 280) or Soils in Construction (CONS 216); and Calculus I (MATH 161); or permission of the instructor.

CO-REQUISITES: None ☐ **Yes** ☐ **If yes, list below:**

I. STUDENT LEARNING OUTCOMES: (*see key below*)

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

Course Student Learning Outcome [SLO]	***Program Student Learning Outcome [PSLO]***	***GER*** *[If Applicable]*	***ISLO & SUBSETS***	
a. Explain the hydrologic cycle.	2488: 1a		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
b. Delineate a drainage basin divide on topographic maps, determine stream order, and determine the gradient of a stream.	2488: 1a, 2b		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
c. Describe general practices of drainage basin management.	2488: 1a, 2abc, 4b, 10a		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
d. Interpret and use stream hydrographs and duration curves in problem solving.	2488: 1a, 2a, 3bc, 6ab		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
e. Conduct common methods for streamflow measurement.	2488: 1a, 2ab, 3a, 5b, 6ab		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
f. Conduct flood risk analyses.	2488: 1a, 2ab, 3bc, 6ab, 9a, 10		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets

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.	2488: 1a, 2ab, 3abc, 6ab		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
h. Construct and use a flow net to determine the discharge under/around a structure.	2488: 1a, 2b, 3ab, 6ab		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
i. Apply the Theis and Jacob Methods to describe groundwater flow to a well and interpret data from a Slug Test.	2488: 1a, 2ab, 3ab, 6ab		2-Crit Think ISLO ISLO	Subsets Subsets Subsets Subsets
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.	2488: 7abcd, 8b, 9ab, 10, 11ad		1-Comm Skills ISLO ISLO	O W Subsets Subsets

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**

*Include program objectives if applicable. Please consult with Program Coordinator

J. - APPLIED LEARNING COMPONENT: Yes ☒ No ☐

If YES, select one or more of the following categories:

- ☒ Classroom/Lab
- ☐ Internship
- ☐ Clinical Placement
- ☐ Practicum
- ☐ Service Learning
- ☐ Community Service
- ☐ Civic Engagement
- ☐ Creative Works/Senior Project
- ☐ Research
- ☐ Entrepreneurship (program, class, project)

K. - TEXTS:

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.

L. - REFERENCES:

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: None ☐ **Needed:** 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:

- **Examinations**
- **Laboratory exercises**
- **Homework assignments**
- **In-class exercises**
- **Quizzes**
- **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: None ☐ Yes ☒

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)**