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

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
CONS 486 – Soil and Groundwater Remediation

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Canino School of Engineering Technology

Department: Civil and Construction Technology

Semester/Year: Fall 2018

A. **TITLE**: Soil and Groundwater Remediation

B. **COURSE NUMBER:** CONS 486

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

 # Credit Hours: 3
 # Lecture Hours: 3 **per week**
 # Lab Hours: **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:**

Students learn about the different types and characteristics of soil and groundwater contaminants. Remedial methods and technologies for soil and groundwater contamination are examined. There is review and discussion of federal and state guidance, regulations, and other pertinent legislation.

H. **PRE-REQUISITES: None** ☐ **Yes** ☒ **If yes, list below:**

CONS 385 (Hydrology and Hydrogeology); and CHEM 150 (College Chemistry I and lab); and CONS 285 (Engineering Geology) or CONS 280 (Civil Engineering Materials) or CONS 216 (Soils in Construction); or permission from 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. Access possible sources of contamination	2488: 1a, 6b		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
b. Explain the structuring and function of regulatory bodies, such as the US Environmental Protection Agency (EPA) and NYS Department of Environmental Conservation (DEC)	2488: 1a, 9b		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
c. Explain, discuss, and/or interpret environmental legislation that relates to soil, surface water, and groundwater contamination, assessment, evaluation, and remediation.	2488: 1a, 8b, 9ab, 10		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
d. Discuss contaminant fate and transport of common environmental contaminants.	2488: 1a, 2b		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
e. . Discuss, explain, and/or analyze the objectives, application, design, operation, and effectiveness of commonly used soil, surface water, groundwater, or air/vapor remedial systems.	2488: 1a, 4b		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
f. Design a remedial treatment system.	2488: 2ab, 4b		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets

g. Present and instruct the class on topics related to the course content in several assigned oral presentations.	2488: 1a, 5a ,7abcd, 11d		1-Comm Skills ISLO ISLO	O W Subsets Subsets
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			ISLO ISLO ISLO	Subsets Subsets 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:

Bedient, Philip B., Rifai, Hanadi S., and Newell, Charles J. (1997). Groundwater Contamination, Transport, and Remediation, 2nd edition. Upper Saddle River, New Jersey: Prentice Hall PTR.

L. - REFERENCES:

Hammer, Mark J. and Hammer Mark. J. Jr. (2008). Water and Wastewater Technology, 6th edition. Upper Saddle River, New Jersey: Pearson Prentice Hall.

Knocke, William R., van Benschoten, John E., Kearney, Maureen (1990). Alternative Oxidants for the Removal of Soluble Iron and Manganese. Denver, Colorado: American Water Works Association Research Foundation and American Water Works Association.

The Interstate Technology and Regulatory Council Perchlorate Team (2005). Perchlorate: Overview of Issues, Status, and Remedial Options, Technology Overview. Washington, D.C.: Interstate Technology and Regulatory Council.

Interstate Technology and Regulatory Council In Situ Bioremediation Team (2002). A systematic Approach to In Situ Bioremediation in Groundwater, Technical/Regulatory Guidelines. Washington D.C.: Interstate Technology and Regulatory Council.

Droste (1997). Theory and Practice of Water and Wastewater Treatment. New York, New York: John Wiley and Sons, Inc..

M. - EQUIPMENT: None ☒ Needed:

N. - GRADING METHOD: A-F

O. - SUGGESTED MEASUREMENT CRITERIA/METHODS:

- **Oral Presentations (each student will give 4 presentations throughout the semester, on each of the topics III, IV, V, and VI in the detailed course outline)**
- **Assignments**
- **Examinations**

P. DETAILED COURSE OUTLINE:

I. - Introduction

II. - Review of Hydrology and Hydrogeology

A. River and Aquifer Systems
B. Principles of Surface and Groundwater Flow
C. Well Mechanics
III. Sources and Types of Groundwater and Soil Contamination
A. Underground Storage Tanks
B. Dry Cleaners
C. Landfills
D. Septic Systems
E. Agricultural Waste
F. Industrial Waste
G. Mining Operations
H. Former US Defense Sites
IV. Site Assessment, Evaluation, and Remediation Regulations and Process
A. Regulatory structure (US EPA, NYS DEC)
B. Phase I ESAs (objectives, methods, requirements, procedures)
C. Phase II ESAs (objectives, methods, requirements, procedures)
D. Phase III ESAs (objectives, methods, requirements, procedures)
E. CERCLA
F. Updates, revisions, and changes to site assessment/remediation regulations
V. Contaminant Fate and Transport
A. Advection, Absorption, Diffusion, and Dispersion
B. Mass Transport Modeling
C. Fate and Transport of common contaminants::
i. Persistent organic pollutants (POPs)
ii. Chromium IV
iii. MTBE
iv. 1,4-Dioxane
v. Perchlorate
vi. Mercury
vii. DNAPLs
viii. TCE
VI. Remedial Technologies and Approaches
A. Natural Attenuation
B. Groundwater Extraction – Pump and Treat
C. In-Situ Chemical Remediation
D. Bioremediation
E. Institutional Controls
F. Soil Vapor Extraction
G. Flushing and Circulation Wells
H. Nanotechnology
I. Evapotranspiration Covers
J. Electrokinetcs
K. In-Situ Thermal Treatment
L. Phytotechnology
M. Solidification
N. Permeable Reactive Barriers
VII. Design of a Remedial System
A. Review technical literature on new/emerging remedial technology
B. Design a remedial system
C. Analyze and interpret results from a remedial system

Q. <u>LABORATORY OUTLINE</u>: None ☒ Yes ☐