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

MASTER SYLLABUS

CONS 316– Foundation Design

CIP Code: 15.0201

Created by: Adrienne C. Rygel
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School: Canino School of Engineering Technology
Department: Civil and Construction Technology
Implementation Semester/Year: Fall 2024

A. TITLE: Foundation Design

B. COURSE NUMBER: CONS 316

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

# Credit Hours per Week	**3**
# Lecture Hours per Week	**2**
# 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:

Principles of soil mechanics are taught: stress distribution, consolidation and settlement, shear strength, and lateral earth pressure. Students apply concepts of soil mechanics to foundation design. Soil-supported foundations for buildings and structures are discussed, which include different foundation types, design methods, design considerations and criteria, and installation techniques. Students learn about shallow foundations, deep pile and drilled shaft foundations, retaining structures, and slope stability.

H. PRE-REQUISITES:

CONS 216 Soils in Construction, and CONS 272 Strength of Materials for Technicians or ENGS 203 Strength of Materials, or permission of the instructor.

CO-REQUISITES: None

I. STUDENT LEARNING OUTCOMES:

Course Student Learning Outcome [SLO]	Program Student Learning Outcome [PSLO]	GER	ISLO & Subsets
a. Analyze data to determine the stress distribution in soil from an applied load.	SLO 1		ISLO 2 & ISLO 5
b. Calculate the amount of consolidation settlement and the time associated with settlement in fine grained soils.	SLO 1		ISLO 2 & ISLO 5
c. Analyze shear strength test data with Mohr's circles to determine the cohesion, internal friction, and shear strength of a soil sample.	SLO 1		ISLO 2 & ISLO 5
d. Calculate lateral earth pressures acting on a structure.	SLO 1		ISLO 2 & ISLO 5
e. Design and analyze a spread footing foundation for settlement and bearing capacity.	SLO 2		ISLO 2 & ISLO 5

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:

K.

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

TEXTS: Braja Das, Principles of Foundation Engineering, 8th ed., Cengage Learning, 2016, ISBN 978-1-305-08155-0.

L. REFERENCES: None

M. EQUIPMENT: None

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

Exams
Quizzes
Design Project(s)
Homework

P. DETAILED COURSE OUTLINE:

Part 1: Principles of Soil Mechanics
- A. Stress Distribution
  1. Principles of Stress Distribution In Soil From Applied Loads
  2. Calculation of Stress Distribution Under Concentrated Loads
  3. Calculation of Stress Distribution Under Uniform Loads
- B. Consolidation and Settlement
  1. Causes of Consolidation and Settlement
  2. Impact of Soil Type on Consolidation and Settlement
  3. Calculating the Amount and Rate of Consolidation and Settlement
- C. Shear Stress and Shear Strength
  1. Definition and Calculation of Shear Stress and Shear Strength
  2. Field and Laboratory Tests
  3. Shear Strength of Common Soil Types
- D. Lateral Earth Pressure
  1. Lateral Earth Pressure at Rest
  2. Active Lateral Pressure
  3. Passive Lateral Pressure

II.Part 2: Shallow Foundation Design
- A. Design Approach and Considerations
- B. Bearing Capacity Design
- C. Load and Resistance Factor Design
- D. Contact Pressure
- E. Sizing of Footings
- F. Settlement Check

III.Part 3: Deep Foundation Design
  A. Design Approach and Considerations
  B. Bearing Capacity Design
  C. Pile Grouping and Spacing
  D. Settlement Check

IV.Part 4: Retaining Structure Design
  A. Stability Analysis
  B. Backfill and Drainage
  C. Design and Construction of Different Types of Retaining Structures
    1. Gravity walls
    2. Cantilever walls
    3. Reinforced earth walls
    4. Slurry trench walls
    5. Anchored bulk heads

V.Part 5: Slope Stability Design
  A. Analysis of mass resting on an inclined layer of impermeable soil
  B. Slopes in homogenous cohesionless soils
  C. Slopes in homogenous soils possessing cohesion
  D. Method of slices
  E. Slope Stability Techniques

Q. LABORATORY OUTLINE:

1. Stress Distribution Analysis
2. Consolidation and Settlement Analysis
3. Shear Stress and Strength Analysis
4. Lateral Earth Pressure Analysis
5. Shallow Foundation Design
6. Deep Foundation Design
7. Retaining Structure Design
8. Slope Stability Design