THE UNIVERSITY OF WESTERN ONTARIO
FACULTY OF ENGINEERING
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

CEE9529a/b FOUNDATION DESIGN
COURSE OUTLINE Winter 2020

Objectives: To develop understanding of the concepts, theories and procedures of design for different types of foundations. The students will learn to calculate the capacity of shallow and deep foundations. Also, they will learn how to evaluate the performance of these foundations under static loads.

Topics:

1. BRIEF BACKGROUNDS TO BASIC PRICIPLES

1.1 Basic Principles
1.1.1 Effective Stress
1.1.2 Stress Distribution
1.1.3 Shear Strength and Bearing Capacity
1.1.3 Compressibility and Settlement
1.2 Site Characterization
1.3 Soil Investigation
1.3.1 Field Tests
1.3.1 Laboratory Tests

2. SHALLOW FOUNDATIONS

Ultimate Bearing Capacity of Shallow Foundations
- Introduction
- Terzaghi's Bearing Capacity Theory

General Bearing Capacity Theory
- Effect of footing shape
- Effect of footing depth
- Footing with inclined load
- Footing with base inclination
- Footing with ground inclination (near slopes)
- Effect of water table on bearing capacity
- Bearing Capacity of Footing Subjected to Eccentric/Moment Loading
- Bearing Capacity of Foundations in Layered Soils
- Bearing Capacity from SPT and CPT Testing
- Safety Factors in Foundation Design and Allowable Bearing Capacity

Foundation Settlement
- Types of Foundation Settlements
- Methods of Computing Immediate (Elastic) Settlements
- Consolidation Settlements
- Reliability of Settlement Computations
- Structural Tolerance to Total Settlement and Differential Settlements

Mat Foundation

Types of Mat Foundation
Bearing Capacity of Mat Foundation
Settlement of Mat Foundation

3. DEEP FOUNDATIONS

Introduction
Load transfer mechanism in piles
Effect of method of installation on pile performance
Group effect in piles
Load test on piles
Pile types and pile materials
Piling Equipment and Installation

Analysis and Design of Pile Foundations for Vertical Loads
Bearing capacity of single piles and pile groups
Settlement of single piles and pile groups
Design Procedure for piles
Pullout capacity of piles

Analysis and Design of Pile Foundations for Lateral Loads
Ultimate lateral resistance of single piles and pile groups
Lateral deflection of single piles and pile groups
Design procedure for piles
Limit state Analysis for pile foundation design

Prerequisite:

This course is intended for graduate students enrolled in civil and environmental engineering. It is expected that students will have basic understanding of soil mechanics and geotechnical engineering obtained by taking suitable courses at either the undergraduate or graduate level. Students without a suitable background in soil mechanics should discuss this with the instructor prior to registering for the course.

Corequisite:

None

Antirequisite:

None

Note: It is the **student's responsibility** to ensure that all Prerequisite and Corequisite conditions are met or that special permission to waive these requirements has been granted by the Faculty. It is also the **student's responsibility** to ensure that they have not taken a course listed as an Antirequisite. The student may be dropped from the course or not given credit for the course towards their degree if they violate the Prerequisite, Corequisite or Antirequisite conditions.

Contact hours: 3 lecture hours
Text: Course notes will be available in class.

Project: A design project will be assigned or critical review of some technical papers will be required.

Assignments: 5 assignments will be assigned through the term and the solutions will be submitted two weeks after receiving the assignment.

Examination: A 3-hour examination is held during the examination period on all work covered during the course. The examination is an open book.
Final exam: Friday, April 17, 2015 from 3:30pm-6:30pm hrs in room SEB1059

Evaluation: The final grade is arrived at as follows:

Assignments	30%
Project	30%
Final Examination	40%

Instructor
Dr. M.H. El Naggar, P. Eng., SEB3010
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Administrative Assistant: Ms. **Cynthia Quintus, Room ES3010C**

Use of English:

In accordance with Senate and Faculty Policy, students may be penalised up to 10% of the marks on all assignments, tests, and examinations for the improper use of English. Additionally, poorly written work with the exception of the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

Scholastic Offences:

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_grad.pdf.

Plagiarism:

University policy states that plagiarism, defined as the "act or an instance of copying or stealing another's words or ideas and attributing them as one's own." (excerpted from Black's Law Dictionary, West Group, 1999, 7th ed., p. 1170) is a scholastic offence. In submitting any written work as part of the coursework requirements for this course students must ensure that this work is written in their own words. Whenever students take an idea or a passage of text from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism-detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com).

A student who is found guilty of plagiarism in respect of any written work submitted as part of the coursework requirements for this course will be given a grade of zero for the submitted work. Repeated acts of plagiarism, either in this course or any other course subsequent to a first offence, will result in the student being given a failing grade for the course in which the subsequent

offence occurs, and may also incur further penalties such as requiring the student to withdraw from the program in which they are enrolled in.

Attendance:

Any student who, in the opinion of the instructor, is absent too frequently from class, laboratory, or tutorial periods will be reported to the Dean (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from taking the regular final examination in the course.

Accessibility:

Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

Conduct:

Students are expected to arrive at lectures on time, and to conduct themselves during class in a professional and respectful manner that is not disruptive to others. Late comers may be asked to wait outside the classroom until being invited in by the Instructor. Please turn off your cell phone before coming to a class, tutorial, quiz or exam.

On the premises of the University or at a University-sponsored program, students must abide by the Student Code of Conduct: http://www.uwo.ca/univsec/board/code.pdf.

Graduate Students Health and Wellness

As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Western provides several on campus health-related services to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. For example, to support physical activity, all students, as part of their registration, receive membership in Western's Campus Recreation Centre. Numerous cultural events are offered throughout the year. for example, please check out the Faculty of Music web page http://www.music.uwo.ca/, and our own McIntosh Gallery http://www.mcintoshgallery.ca/. Information regarding health- and wellness-related services available to students may be found at http://www.health.uwo.ca/. Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. Campus mental health resources may be found at http://www.health.uwo.ca/mental_health/resources.html.

Sickness and Other Problems:

Students should immediately consult with the Instructor or Department Chair if they have any problems that could affect their performance in the course. Where appropriate, the problems should be documented (see attached). The student should seek advice from the Instructor or Department Chair regarding how best to deal with the problem. Failure to notify the Instructor or Department Chair immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

For more information concerning medical accommodations, please see:
http://www.uwo.ca/univsec/handbook/appeals/accommodation_medical.pdf.

Notice:

Students are responsible for regularly checking their email, and the course OWL site for new notices related to the course.