Western University
Faculty of Engineering
***Department of Civil and Environmental Engineering***

# CEE 9880 – Offshore Geotechnical Engineering Design

## COURSE OUTLINE 2023-2024

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**DESCRIPTION**
This course is intended to introduce the field of offshore geotechnical engineering and to apply fundamental soil mechanics and foundation engineering principles to problems associated with this environment. To present the behaviour of offshore soils, the interaction of these soils and structures during cyclic loading events due to wave and wind loading. To show offshore geotechnical engineering systems and the approaches required for their design. On completion of the course, students will have the necessary knowledge and skills for them to approach the design of a wide range of offshore geotechnical engineering problems.

**ENROLLMENT RESTRICTIONS/PREREQUISITES**
Enrollment in this course is restricted to graduate students in the civil and environmental engineering programs, as well as any student that has obtained special permission to enroll in this course from the course instructor as well as the Graduate Chair (or equivalent) from the student's home program. The course is intended for students who have completed a civil engineering undergraduate degree or equivalent. It is expected that students will have a strong understanding of soil mechanics, geotechnical and foundation engineering obtained by having already taken suitable courses. Pre-requisites are CEE4426 Geotechnical Engineering Design or the permission of the instructor. Although not a prerequisite, students are strongly recommended to have completed CEE9619 Dynamics of soils and foundations or CEE9529 Foundation Design prior to taking the course. Students without a suitable background in shallow and deep foundation engineering should discuss this with the instructor before registering for the course.

**INSTRUCTOR CONTACT INFORMATION**
Dr Tim Newson
Email address: tnewson@eng.uwo.ca
Office: SEB3084
Contact policy:

- Contact instructor via email (above)
- Weekly Office hours will be held via Zoom (time TBD)

**COURSE FORMAT**
Contact hours - three lecture hours per week. Although the intent is for this course to be delivered in-person, the changing COVID-19 landscape may necessitate some or all of the course to be delivered online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will not change. Any assessments affected will be conducted online as determined by the course instructor. When deemed necessary, tests and examinations in this course will be conducted using a remote proctoring service.

By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide personal information (including some biometric data) and the session will be recorded. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at: https://remoteproctoring.uwo.ca.

**TOPICS**

| Topic # | Description | Learning Activities | Tentative timeline |
|---|---|---|---|
| 1 | Introduction to offshore geotechnics; | • Lectures | Week 1 |
| 2 | The offshore environment, sediments and geohazards; | • Lectures<br>• Assignment | Week 2 |
| 3 | Cyclic loading of soils; | • Lectures<br>• Assignment | Week 3 |
| 4 | In situ testing and offshore surveys; | • Lectures<br>• Assignment | Week 4 |
| 5 | Shallow offshore foundations and gravity bases (I); | • Lectures<br>• Assignment | Week 5 |
| | Shallow offshore foundations and gravity bases (II); | • Lectures<br>• Assignment | Week 6 |
| 6 | Jackups and multiple foundations; | • Lectures<br>• Assignment | Week 7 |
| 7 | Jackets and pile foundations; | • Lectures<br>• Assignment | Week 8 |
| 8 | Pipelines, cables and umbilicals; | • Lectures<br>• Assignment | Week 9 |
| | Offshore case-study; | • Case study session<br>• Assignment | Week 10 |
| 9 | Arctic and deep offshore environments; | • Lectures | Week 11 |
| | Class presentations and wrap-up. | • Communication and reading skills | Week 12 |

*There will be no lectures during reading week

**SPECIFC LEARNING OUTCOMES**

| Degree Level Expectation | Weight | Assessment Tools | Outcomes |
|---|---|---|---|
| **Depth and breadth of knowledge** | 30% | • Assignments<br>• Case study<br>• Literature review | • Understanding of advanced concepts and theories<br>• Awareness of important current problems in the field of study |

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|---|---|---|---|
| | | | • Understanding of computational and/or empirical methodologies to solve related problems |
| **Research & scholarship** | 25% | • Literature review | • Ability to conduct critical evaluation of current advancements in the field of specialization |
| **Application of knowledge** | 35% | • Assignments<br>• Case study | • Ability to apply knowledge in a rational way to analyze a particular problem<br>• Ability to use coherent approach to design a particular engineering system using existing design tools |
| **Communication skills** | 10% | • Project | • Ability to communicate (oral and written) ideas, issues, results and conclusions clearly and effectively |

**ASSESSMENTS**

| Assessment Type | Material Covered | Tentative Due Date | Weight |
|---|---|---|---|
| Homework Assignments (two) | Topic 2 and 3; Topic 4-7 | Week 5 and 9 | 15% x 2 |
| Case Study Report (one) | Topics 2-8 | Week 11 | 30% |
| Project report (one) | Literature review of a selected topic | Week 11 | 30% |
| Project presentation (one) | Literature review of a selected topic | Week 12 | 10% |

**Activities in which collaboration is permitted:**

- Case Study Report (group assignment)
- Project report and presentation (group assignment)

**Activities in which students must work alone (collaboration is not permitted):**

- Homework Assignments (individual)

**REQUIRED TEXTBOOK**

None.

**OPTIONAL COURSE READINGS**

There is no set textbook for the course. There are a number of textbooks that cover many of the aspects of the course material and which are available through Western Libraries, either physically or online. These include:

a) R. Whitlow., Basic soil mechanics. Longman Scientific. 1995.
b) R.F. Craig., Soil mechanics. Chapman and Hall. 1997.
c) Reading, H., Sedimentary Environments and Facies. Blackwell. 1978, 1986.

d) Pickering, K T., et al., Deep Marine Environments. Unwin Hyman. 1989.
e) Kennet, J., Marine Geology. Prentice Hall. 1982.

Prepared class notes will be made available through the course OWL site at http://owl.uwo.ca/, along with other useful reference material and data for assignments.

**CHEATING, PLAGIARISM/ACADEMIC OFFENCES**

Academic integrity is an essential component of learning activities. Students must have a clear understanding of the course activities in which they are expected to work alone (and what working alone implies) and the activities in which they can collaborate or seek help; see information above and ask instructor for clarification if needed. Any unauthorized forms of help-seeking or collaboration will be considered an academic offense. University policy states that cheating is an academic offence. If you are caught cheating, there will be no second warning. Students must write their essays and assignments 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. Plagiarism is a major academic offence. Academic offences are taken seriously and attended by academic penalties which may include expulsion from the program. Students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence at the following website: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_grad.pdf

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).

**CONDUCT**

Students are expected to follow proper etiquette to maintain an appropriate and respectful academic environment. Any student who, in the opinion of the instructor, is not appropriately participating in course activities and/or is not following the rules and responsibilities associated with the course activities, will be reported to the Associate Dean (Graduate) (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Associate Dean (Graduate), the student could be debarred from completing the assessment activities in the course as appropriate.

**HEALTH/WELLNESS SERVICES**

As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Western provides several health and wellness related services to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. 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. Faculty of Engineering has a Student Wellness Counsellor. Information on how to schedule an appointment with the councilor is available at:

https://www.eng.uwo.ca/undergraduate/academic-support-and-accommodations/Student-Wellness-Counselling.html

Students who are in emotional/mental distress should refer to Mental Health@Western: http://www.uwo.ca/uwocom/mentalhealth/ for a complete list of options about how to obtain help.

**SICKNESS**

Students should immediately consult with the Instructor (for a particular course) or Associate Chair (Graduate) (for a range of courses) if they have problems that could affect their performance. The student should seek advice from the Instructor or Associate Chair (Graduate) regarding how best to deal with the problem. Failure to notify the Instructor or the Associate Chair (Graduate) immediately (or as soon as possible thereafter) will have a negative effect on any appeal. Obtaining appropriate documentation (e.g., a note from the doctor) is valuable when asking for accommodation due to illness.

Students who are not able to meet certain academic responsibilities due to medical, compassionate or other legitimate reason(s), could request for academic consideration. The Graduate Academic Accommodation Policy and Procedure details are available at: https://www.eng.uwo.ca/graduate/current-students/academic-support-and-accommodations/index.html

**ACCESSIBLE EDUCATION WESTERN (AEW)**

Western is committed to achieving barrier-free accessibility for all its members, including graduate students. As part of this commitment, Western provides a variety of services devoted to promoting, advocating, and accommodating persons with disabilities in their respective graduate program. Graduate students with disabilities (for example, chronic illnesses, mental health conditions, mobility impairments) are strongly encouraged to register with Accessible Education Western (AEW): http://academicsupport.uwo.ca/accessible_education/index.html

AEW is a confidential service designed to support graduate and undergraduate students through their academic program. With the appropriate documentation, the student will work with both AEW and their graduate programs (normally their Graduate Chair and/or Course instructor) to ensure that appropriate academic accommodations to program requirements are arranged. These accommodations include individual counselling, alternative formatted literature, accessible campus transportation, learning strategy instruction, writing exams and assistive technology instruction.