



## COURSE OUTLINE: ARC217 - SOIL MECHANICS

Prepared: Marc Pilon

Approved: Corey Meunier, Chair, Technology and Skilled Trades

<b>Course Code: Title</b>	ARC217: SOIL MECHANICS
<b>Program Number: Name</b>	4080: CIVIL ENG TECHNICIAN
<b>Department:</b>	CIVIL/CONSTRUCTION
<b>Academic Year:</b>	2022-2023
<b>Course Description:</b>	This is an introductory soil mechanics course. Topics covered include: rock/soil origins, landform analysis, soil identification and classification system, site investigation, laboratory testing, movement of water through soils and compaction control.
<b>Total Credits:</b>	4
<b>Hours/Week:</b>	4
<b>Total Hours:</b>	60
<b>Prerequisites:</b>	There are no pre-requisites for this course.
<b>Corequisites:</b>	There are no co-requisites for this course.
<b>Vocational Learning Outcomes (VLO's) addressed in this course:</b>	<b>4080 - CIVIL ENG TECHNICIAN</b>
Please refer to program web page for a complete listing of program outcomes where applicable.	VLO 1 develop and use strategies to enhance professional growth and ongoing learning in the civil engineering field.
	VLO 6 collect, process and interpret technical data to produce written and graphical project-related documents.
	VLO 7 use industry-specific electronic and digital technologies to support civil engineering projects.
	VLO 8 participate in the design and modeling phase of civil engineering projects by applying engineering concepts, basic technical mathematics and principles of science to the review and production of project plans.
	VLO 10 perform quality control testing and the monitoring of equipment, materials and methods involved in the implementation and completion of civil engineering projects.
	VLO 11 apply teamwork, leadership and interpersonal skills when working individually or within multidisciplinary teams to complete civil engineering projects.
<b>Essential Employability Skills (EES) addressed in this course:</b>	EES 1 Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience.
	EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication.
	EES 3 Execute mathematical operations accurately.
	EES 4 Apply a systematic approach to solve problems.
	EES 7 Analyze, evaluate, and apply relevant information from a variety of sources.
	EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others.



	<p>EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.</p> <p>EES 10 Manage the use of time and other resources to complete projects.</p> <p>EES 11 Take responsibility for ones own actions, decisions, and consequences.</p>								
<b>Course Evaluation:</b>	<p>Passing Grade: 50%, D</p> <p>A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.</p>								
<b>Other Course Evaluation &amp; Assessment Requirements:</b>	<p>Grade Definition Grade Point Equivalent</p> <p>A+ 90 - 100% 4.00 A 80 - 89% B 70 - 79% 3.00 C 60 - 69% 2.00 D 50 - 59% 1.00 F (Fail)49% and below 0.00</p> <p>CR (Credit) Credit for diploma requirements has been awarded. S Satisfactory achievement in field /clinical placement or non-graded subject area. U Unsatisfactory achievement in field/clinical placement or non-graded subject area. X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course. NR Grade not reported to Registrar's office. W Student has withdrawn from the course without academic penalty.</p> <p>Attendance Students are only allowed to miss three classes without a documented explanation. One mark will be deducted from your overall grade for each undocumented explanation. The maximum deduction in overall grade is not to exceed 15%. Valid documented explanation include:</p> <ul style="list-style-type: none"> <li>• Medical reason</li> <li>• Family emergency</li> <li>• Child care issue</li> <li>• Transportation problems</li> </ul> <p>The documented explanation has to be sent to me by e-mail no later than three days from a missed class. A Doctor note, etc., is to be attached as a PDF file to your e-mail.</p>								
<b>Course Outcomes and Learning Objectives:</b>	<table border="1"> <thead> <tr> <th data-bbox="505 1102 802 1137"><b>Course Outcome 1</b></th> <th data-bbox="802 1102 1448 1137"><b>Learning Objectives for Course Outcome 1</b></th> </tr> </thead> <tbody> <tr> <td data-bbox="505 1137 802 1302">           Upon successful completion, the student will be able to:            1. Identify soil types, origins and properties.         </td> <td data-bbox="802 1137 1448 1302">           1.1 Outline the geological and weathering processes that resulted in rock formations and soil deposits.            1.2 Describe the characteristics of common soil deposits in Ontario.            1.3 Review soil and geological maps for probable site conditions.         </td> </tr> <tr> <th data-bbox="505 1302 802 1336"><b>Course Outcome 2</b></th> <th data-bbox="802 1302 1448 1336"><b>Learning Objectives for Course Outcome 2</b></th> </tr> <tr> <td data-bbox="505 1336 802 1458">           Upon successful completion, the student will be able to:            2. Solve applied problems in         </td> <td data-bbox="802 1336 1448 1458">           2.1 Identify the mass volume relationship that exist for soils.            2.2 Calculate mass/volume relationships for given units of soil         </td> </tr> </tbody> </table>	<b>Course Outcome 1</b>	<b>Learning Objectives for Course Outcome 1</b>	Upon successful completion, the student will be able to: 1. Identify soil types, origins and properties.	1.1 Outline the geological and weathering processes that resulted in rock formations and soil deposits. 1.2 Describe the characteristics of common soil deposits in Ontario. 1.3 Review soil and geological maps for probable site conditions.	<b>Course Outcome 2</b>	<b>Learning Objectives for Course Outcome 2</b>	Upon successful completion, the student will be able to: 2. Solve applied problems in	2.1 Identify the mass volume relationship that exist for soils. 2.2 Calculate mass/volume relationships for given units of soil
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soil mechanics.	
<b>Course Outcome 3</b>	<b>Learning Objectives for Course Outcome 3</b>
Upon successful completion, the student will be able to: 3. Use the Unified Soil Classification System (USCS) and assess the capabilities and limitations of soil groups in engineering applications.	3.1 Identify the laboratory tests that are used the identifying soils using the USCS. 3.2 Identify coarse-grained soils and fine-grained soils using the USCS and ending up with both a group symbol and a group name. 3.3 Identify soils using the U.S. Department of Agriculture chart for textural classification of soils.
<b>Course Outcome 4</b>	<b>Learning Objectives for Course Outcome 4</b>
Upon successful completion, the student will be able to: 4. Describe the manner in which water moves through soils such as permeability and capillary action and the effect that water movement has on drainage and frost heave	4.1 Describe the process of water movement through soil particles. 4.2 Outline and illustrate the types of water found in soils 4.3 Explain the mechanics of capillarity. 4.4 Solve permeability problems using Darcy's law of flow. 4.5 Construct simple flow nets for various soil-water conditions. 4.6 Explain and illustrate dewatering systems for construction sites. 4.7 Explain the mechanics of frost heave
<b>Course Outcome 5</b>	<b>Learning Objectives for Course Outcome 5</b>
Upon successful completion, the student will be able to: 5. Conduct laboratory tests.	5.1 Perform a mass-volume relationship test. 5.2 Perform a sieve analysis and hydrometer analysis. 5.3 Perform an Atterberg Limits test. 5.4 Perform a constant head permeability test.
<b>Course Outcome 6</b>	<b>Learning Objectives for Course Outcome 6</b>
Upon successful completion, the student will be able to: 6. Identify how a construction site can be improved moving earth, compacting and stabilizing it.	6.1 list the field procedures and equipment used in improving a site 6.2 Relate the Unified Soils Classification of coarse-grained and fine-grained soils to their compaction characteristics and recommended compaction equipment 6.3 List the field control and field density test that are used in checking soil compaction.
<b>Course Outcome 7</b>	<b>Learning Objectives for Course Outcome 7</b>
Upon successful completion, the student will be able to: 7. Use industry-specific electronic technologies to support the calculations for typical soil mechanics problems.	7.1 Present selected soil mechanics topics using Power Point. 7.2 Solve basic soil mechanics problems using Excel spreadsheets.
<b>Course Outcome 8</b>	<b>Learning Objectives for Course Outcome 8</b>
Upon successful	8.1 Take initiative while working with your team to complete in



	<p>completion, the student will be able to:</p> <p>8. Apply teamwork, leadership and interpersonal skills when working individually or within a team to complete the survey field camp projects.</p>	<p>class assignments and laboratories</p> <p>8.2 Assume accountability for self in managing the use of time and resources to meet established deadline.</p> <p>8.3 Work as an effective team player to complete in class assignments and laboratories while promoting a positive work environment.</p> <p>8.4 Use effective time-management and organizational techniques to prioritize project tasks and to accomplish goals set by the team.</p>
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**Evaluation Process and Grading System:**

<b>Evaluation Type</b>	<b>Evaluation Weight</b>
Final Exam	25%
Mid-Term Exam	25%
Quizzes/Assignments/Laboratories	50%

**Date:** August 15, 2022

**Addendum:** Please refer to the course outline addendum on the Learning Management System for further information.