# COURSE OUTLINE: ARC217 - SOIL MECHANICS

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Approved: Corey Meunier, Dean, Technology, Trades, and Apprenticeship

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| **Course Code: Title** | ARC217: SOIL MECHANICS |
| **Program Number: Name** | 4080: CIVIL ENG TECHNICIAN |
| **Department:** | CIVIL/CONSTRUCTION |
| **Academic Year:** | 2024-2025 |
| **Course Description:** | 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. |
| **Total Credits:** | 4 |
| **Hours/Week:** | 4 |
| **Total Hours:** | 56 |
| **Prerequisites:** | There are no pre-requisites for this course. |
| **Corequisites:** | There are no co-requisites for this course. |
| **Vocational Learning Outcomes (VLO's) addressed in this course:**<br>**Please refer to program web page for a complete listing of program outcomes where applicable.** | **4080 - CIVIL ENG TECHNICIAN**<br>VLO 1 develop and use strategies to enhance professional growth and ongoing learning in the civil engineering field.<br>VLO 6 collect, process and interpret technical data to produce written and graphical project-related documents.<br>VLO 7 use industry-specific electronic and digital technologies to support civil engineering projects.<br>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.<br>VLO 10 perform quality control testing and the monitoring of equipment, materials and methods involved in the implementation and completion of civil engineering projects.<br>VLO 11 apply teamwork, leadership and interpersonal skills when working individually or within multidisciplinary teams to complete civil engineering projects. |
| **Essential Employability Skills (EES) addressed in this course:** | 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.<br>EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication.<br>EES 3 Execute mathematical operations accurately.<br>EES 4 Apply a systematic approach to solve problems.<br>EES 7 Analyze, evaluate, and apply relevant information from a variety of sources.<br>EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others. |

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| | EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.<br>EES 10 Manage the use of time and other resources to complete projects.<br>EES 11 Take responsibility for ones own actions, decisions, and consequences. |
| **Course Evaluation:** | Passing Grade: 50%, D<br><br>A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation. |
| **Other Course Evaluation & Assessment Requirements:** | Grade<br>Definition Grade Point Equivalent<br>A+ 90 - 100% 4.00<br>A 80 - 89%<br>B 70 - 79% 3.00<br>C 60 - 69% 2.00<br>D 50 - 59% 1.00<br>F (Fail)49% and below 0.00<br><br>CR (Credit) Credit for diploma requirements has been awarded.<br>S Satisfactory achievement in field /clinical placement or non-graded subject area.<br>U Unsatisfactory achievement in field/clinical placement or non-graded subject area.<br>X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.<br>NR Grade not reported to Registrar`s office.<br>W Student has withdrawn from the course without academic penalty.<br><br>Attendance<br>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:<br>• Medical reason<br>• Family emergency<br>• Child care issue<br>• Transportation problems<br>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. |
| **Course Outcomes and Learning Objectives:** | |

| **Course Outcome 1** | **Learning Objectives for Course Outcome 1** |
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| Upon successful completion, the student will be able to:<br>1. Identify soil types, origins and properties. | 1.1 Outline the geological and weathering processes that resulted in rock formations and soil deposits.<br>1.2 Describe the characteristics of common soil deposits in Ontario.<br>1.3 Review soil and geological maps for probable site conditions. |
| **Course Outcome 2** | **Learning Objectives for Course Outcome 2** |
| Upon successful completion, the student will be able to:<br>2. Solve applied problems in | 2.1 Identify the mass volume relationship that exist for soils.<br>2.2 Calculate mass/volume relationships for given units of soil |

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| soil mechanics. | |
| **Course Outcome 3** | **Learning Objectives for Course Outcome 3** |
| Upon successful completion, the student will be able to:<br>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.<br>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.<br>3.3 Identify soils using the U.S. Department of Agriculture chart for textural classification of soils. |
| **Course Outcome 4** | **Learning Objectives for Course Outcome 4** |
| Upon successful completion, the student will be able to:<br>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.<br>4.2 Outline and illustrate the types of water found in soils<br>4.3 Explain the mechanics of capillarity.<br>4.4 Solve permeability problems using Darcy`s law of flow.<br>4.5 Importance of moisture in compaction.<br>4.6 Explain and illustrate dewatering systems for construction sites.<br>4.7 Explain the mechanics of frost heave |
| **Course Outcome 5** | **Learning Objectives for Course Outcome 5** |
| Upon successful completion, the student will be able to:<br>5. Conduct laboratory tests. | • Proctor density<br>• Hydrometer<br>• Atterberg (plastic and Liquid limit)<br>• Relative density of fine and coarse<br>• Flat and elongated<br>• Specific gravity |
| **Course Outcome 6** | **Learning Objectives for Course Outcome 6** |
| Upon successful completion, the student will be able to:<br>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<br>6.2 Relate the Unified Soils Classification of coarse-grained and fine-grained soils to their compaction characteristics and recommended compaction equipment<br>6.3 List the field control and field density test that are used in checking soil compaction.<br>6.4 Principles of compaction. |
| **Course Outcome 7** | **Learning Objectives for Course Outcome 7** |
| Upon successful completion, the student will be able to:<br>7. Use industry-specific electronic technologies to support the calculations for typical soil mechanics | 7.1 Present selected soil mechanics topics using Power Point.<br>7.2 Solve basic soil mechanics problems using Excel spreadsheets.<br>7.3 Prepare components of a geotechnical report based on field data. |

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| | problems. |

| Course Outcome 8 | Learning Objectives for Course Outcome 8 |
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| Upon successful completion, the student will be able to:<br>8. Apply teamwork, leadership and interpersonal skills when working individually or within a team to complete the survey field camp projects. | 8.1 Take initiative while working with your team to complete in class assignments and laboratories<br>8.2 Assume accountability for self in managing the use of time and resources to meet established deadline.<br>8.3 Work as an effective team player to complete in class assignments and laboratories while promoting a positive work environment.<br>8.4 Use effective time-management and organizational techniques to prioritize project tasks and to accomplish goals set by the team. |

**Evaluation Process and Grading System:**

| Evaluation Type | Evaluation Weight |
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| Final Exam | 20% |
| Mid-Term Exam | 20% |
| Quizzes/Assignments/Laboratories | 60% |

**Date:** August 18, 2024

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