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## Env E 251 ENVIRONMENTAL ENG MATERIALS Winter 2025

### Instructor

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### Teaching Assistants

Idelgardy Costa (soil and geosynthetics)  
4-030.11 Markin Canadian Natural Resources Engineering Facility (NREF)  
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Peter Enyoze (concrete)  
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### Course Dates

<b>Lectures:</b>	Jan 07 – Apr 08	Tuesdays, Thursdays	9:30 – 10:50 am	NREF 2-090
<b>Labs:</b>				
Soil Lab		Fridays (starting Jan 17 to Feb 07)	2:00 – 4:50 pm	NREF L2-030
Concrete Lab		Fridays (starting Feb 28 to Mar 28)	2:00 – 4:50 pm	NREF 1-106
<b>Midterm:</b>		<b>Friday, February 14</b>	<b>2:30 – 4:30 pm</b>	<b>NREF- 2-001</b>

*A missed midterm examination will result in a grade of 0.0 unless approved by the Faculty of Engineering. In such a case, the midterm weight will be rolled over to the final exam weight.*

### Final Examination

The **final examination** will follow the University of Alberta timetable for final exams. Students must check the posted examination timetable in the weeks prior to the final examination period to confirm the date and time.

If a student misses the final exam, the student can apply for a deferred exam, which will be held in the following semester.

*Confirm final exam time and location with BEARTRACKS*

## Grading

The grading will be done according to the regulations of the University of Alberta.

<https://www.ualberta.ca/registrar/examinations/assessment-and-grading/index.html>

Assignments:	20%
Lab Reports:	20%
Midterm:	25%
Final:	35%

## Reference Material and Texts

1. Lecture Notes (Softcopy on eClass. A hardcopy will not be provided)
2. Introduction to Geotechnical Engineering, 2<sup>nd</sup> Edition, Holtz, R.D., Kovacs, W.D., Sheahan, T.C., 2011
3. Fundamentals of Geotechnical Engineering, 5<sup>th</sup> Edition, B.M. Das and N. Sivakugan, 2016
4. Design and Control of Concrete Mixtures, 8th Ed., CPCA, 2011. TA 439 D45 2011
5. Designing with Geosynthetics, Koerner, 5th ed., 2005. ISBN-13: 978-0131454156 TA 455 G44 K78 2005

## Assignments and tutorials

Assignments will be posted on the ENV E 251 eClass site, through an online link. *Your assignments must be uploaded in jpeg or pdf format using the same link, before the due date.*

## Laboratory Report and Marking Guidelines

The ENV E 251 Laboratory Manuals (posted on eClass) explain what is required to properly present laboratory reports and how the lab reports will be marked. *Laboratory reports are normally due the week after the experiment is complete. Due dates will be listed on the lab handout but may be extended if required. Extensions will be communicated via eclass.* Submit reports prior to 11:59 pm on the following Thursday after the lab, using the online submission link in the eclass.

## Solutions

Assignment solutions will be posted on the ENV E 251 eClass website.

## Course Communications

The ENV E 251 eClass site will be used for any class wide communications such as updated assignment deadlines, announcements regarding laboratories, or other relevant course information. It is the student's responsibility to ensure they review the course announcements and communications.

### **Learning Outcomes:**

1. Classify soil based on its formation, composition, and engineering properties.
2. Analyze data from laboratory and field measurement of hydraulic conductivity.
3. Describe the unique behaviour of clay and resulting engineering properties.
4. List and describe the different types and functions of geosynthetics.
5. Explain mechanisms that impact the engineering behaviour of geosynthetics.
6. Perform engineering design calculations for geosynthetic applications.
7. List and describe the components of and their resulting impact on the engineering behaviour of concrete.
8. Perform concrete mix designs to meet specified functions.

### **Course Information**

#### Topics

1. Soil
  - a. Introduction to Soils
  - b. Mass-Volume Relationships
  - c. Grain Size Distribution
  - d. Flow of Water Through Soils
  - e. Clay Mineralogy and Properties
  - f. Soil Plasticity and Atterberg Limits
  - g. Soil Classification
  
2. Concrete
  - a. Introduction to Portland Cement Concrete
  - b. Portland Cement & Hydration
  - c. Aggregate for Concrete
  - d. Properties of Fresh Concrete & Placement
  - e. Properties of Hardened Concrete
  - f. Long-term Performance & Durability of Concrete
  - g. Concrete Mix Design
  - h. Additions to Concrete Mixtures
  
3. Geosynthetics
  - a. An introduction to Geosynthetics
  - b. An introduction to Polymers
  - c. Polymer Degradation
  - d. Geosynthetics Soil Reinforcement
  - e. Geosynthetic Barriers
  - f. Geosynthetic Clay Liners

### Lecture Schedule Winter 2025 Env E 251

Week	Day	Date	Topic	Section
1	Tues	07-Jan	Introduction to Soil	
	Thurs	09-Jan	Mass Volume Relationship	
	Fri	10-Jan	No Lab	
2	Tues	14-Jan	Grain Size Distribution	
	Thurs	16-Jan	Clay Mineralogy Plasticity and Atterberg Limits	
	Fri	17-Jan	Grain Size Distribution Lab 1	1
3	Tues	21-Jan	Soil Classification	
	Thurs	23-Jan	Flow of Water through Soils	
	Fri	24-Jan	Grain Size Distribution Lab 2	2
4	Tues	28-Jan	Introduction and History of Cement	
	Thurs	30-Jan	Manufacture of Portland Cement	
	Fri	31-Jan	Atterberg Lab 1	1
5	Tues	04-Feb	Hydration of Portland Cement	
	Thurs	06-Feb	Hydration of Portland Cement	
	Fri	07-Feb	Atterberg Lab 2	2
6	Tues	11-Feb	Aggregates and Cement Interaction	
	Thurs	13-Feb	<b>No Lecture (Midterm Review)</b>	
	Fri	14-Feb	<b>Midterm Exam (2:30 to 4:30 pm; first 5-week material)</b>	
7	Tues	18-Feb	Reading Week, No Class	
	Thurs	20-Feb		
	Fri	21-Feb		
8	Tues	25-Feb	Aggregates and Cement Interaction	
	Thurs	27-Feb	Properties of Fresh Concrete	
	Fri	28-Feb	Properties of Fresh Concrete (1)	1
9	Tues	04-Mar	Properties of Hardened Concrete: Stiffness	
	Thurs	06-Mar	Properties of Hardened Concrete: Strength	
	Fri	07-Mar	Properties of Fresh Concrete (2); Properties of Hardened Concrete (1)	1&2
10	Tues	11-Mar	<b>Guest Speaker Presentation</b>	
	Thurs	13-Mar	Long-Term Performance & Durability of Concrete	
	Fri	14-Mar	Properties of Hardened Concrete (2); Compression Test (1 & 2)	1&2
11	Tues	18-Mar	Designing a Concrete Mix	
	Thurs	20-Mar	Designing a Concrete Mix	
	Fri	21-Mar	Compression Test (1 & 2)	1&2
12	Tues	25-Mar	Additions to the Concrete Mixtures	
	Thurs	27-Mar	Introduction to Geosynthetics, Introduction to Polymers	
	Fri	28-Mar	Compression Test (1 & 2)	1&2
13	Tues	01-Apr	<b>Guest Speaker Presentation</b>	
	Thurs	03-Apr	Polymers Degradation System, Geosynthetic Reinforcement	
	Fri	05-Apr	No Lab	
14	Tues	08-Apr	Geomembranes, Geosynthetics Clay Liners	