

**ENVS\*4390 Soil Variability and Land Evaluation**

### Fall 2018

Section(s): C01

School of Environmental Sciences Credit Weight: 1.00

Version 1.00 - September 04, 2018

# Course Details

## Calendar Description

This course integrates formal in-field (including a two-day camp & excursions during orientation week) and laboratory training, with classroom discussions of concepts, to guide independent group projects on the gathering and interpreting of soilscape information. The principal focus is on soil, as a spatially- and temporally-variable product and component of ecosystems; special consideration is given to the factors controlling soil processes, from local to global scales. An examination of methods, for describing and quantifying the distribution of soils, includes survey and sensor-based techniques, in conjunction with data trend analysis and modelling. Students are required to notify the instructor in the preceding Winter semester of their intention to participate.

#### Pre-Requisite(s):

**Restriction(s):**

* 1. **Course Description**

15.00 credits including (1 of AGR\*2320, ENVS\*2060, ENVS\*2310, ENVS\*2340, SOIL\*2010)

ENVS\*3120, ENVS\*4150, ENVS\*4250, SOIL\*4250.

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## Timetable

Timetable is subject to change. Please see WebAdvisor for the latest information.

## Final Exam

Scheduled by the Registrar's Office - Friday December 14, 2018, 19:00 to 21:00; location TBD.

# Instructional Support

## Instructor(s)

#### Richard Heck Email: Telephone: Office:

**Office Hours:**

[rheck@uoguelph.ca](mailto:rheck@uoguelph.ca)

+1-519-824-4120 x52450

ALEX 140

Appointments arranged by email

# Learning Resources

## Required Resource(s)

#### Characterizing Sites, Soils & Substrates in Ontario (Other)

Heck, R.J., Kroetsch,D.J., Lee,H.T., Leadbeater,D.A, Wilson, E.A. & Winstone, B.C. 2017 “Characterizing Sites, Soils & Substrates in Ontario Volume 1-Field Description Manual” School of Environmental Sciences, University of Guelph.

#### Characterizing Sites, Soils & Substrates in Ontario (Lab Manual)

Copies of “Characterizing Sites, Soils & Substrates in Ontario Volume 2-Compendium of Interpretive Frameworks” and “Munsell Soil Color Charts” will be provided for field activities.

## Recommended Resource(s)

#### Soil: Morphology, Genesis and Classification (Textbook)

Fanning, D.S. & Fanning, M.C.B. 1989. “Soil: Morphology, Genesis and Classification” Wiley

#### Soils: Genesis and Geomorphology (Textbook)

Schaetzl, R. & Anderson, S. 2005. “Soils: Genesis and Geomorphology” Cambridge University Press.

#### Manual of Methods for Soil and Land Evaluation (Other)

Constantini, E.A.C. 2009. “Manual of Methods for Soil and Land Evaluation” Science Publishers.

#### The System of Soil Classification for Canada (Textbook)

Soil Classification Working Group. 1998-revised. “The System of Soil Classification for Canada” Publication 1646. Canada Department of Agriculture. NRC Research Press, Ottawa

# Learning Outcomes

## Course Learning Outcomes

By the end of this course, you should be able to:

* + 1. Comprehend the techniques for in-field description of soils and their landscape setting
    2. Recognize the major types of landforms and soils in SW Ontario, under both natural and managed ecosystems.
    3. Understand principal controls on the distribution of soils and dynamics of the dominant processes occurring in them.
    4. Be acquainted with both traditional and evolving approaches gathering, processing and interpreting soilscape information.
    5. Use the Canadian System of Soil Classification and recognize the main international systems
    6. Apply major national systems/frameworks to evaluate and rate land capability or suitability
    7. Working within a group context, collect key characteristics of a focus landscape, then integrate/rationalize with existing land resource information and primary literature.

# 5 Teaching and Learning Activities

## 5.1 Lecture

#### Tue, Sep 11

**Topic(s):**

Evaluation: Midterm Exam

#### Thu, Sep 13

1 Soil & the Pedosphere

#### Topic(s):

Evaluation: Midterm Exam

#### Tue, Sep 18

* 1. Natural Controls on Soil Variability - Site Factors

#### Topic(s):

Evaluation: Midterm Exam

#### Thu, Sep 20

* 1. Natural Controls on Soil Variability - Flux Factors

#### Topic(s):

Evaluation: Midterm Exam

#### Tue, Sep 25

* 1. Soilscape Inventory - Traditional Soil Survey & Mapping (Legacy Surveys, SLC – CANSIS)

#### Topic(s):

Evaluation: Midterm Exam

#### Thu, Sep 27

* 1. Soilscape Inventory - Application of Remote Sensing (Systems, Segmentation, Indices)

#### Topic(s):

* 1. Soilscape Inventory - Application of Proximal Sensing Techniques (Inversion)

Evaluation: Midterm Exam

#### Tue, Oct 2

**Topic(s):**

Evaluation: Midterm Exam

#### Thu, Oct 4

* 1. Land Evaluation Systems - Canada Land Inventory (Ontario Implementation)

#### Topic(s):

Evaluation: Midterm Exam

#### Thu, Oct 11

* 1. Land Evaluation Systems - Ecological & Agri-Environmental Systems

#### Topic(s):

Evaluation: Midterm Exam

#### Thu, Oct 18

* 1. Land Evaluation Systems - Land Suitability Rating Systems

#### Topic(s):

Evaluation: Midterm Exam

#### Tue, Oct 23

* 1. Quantifying Soilscape Variability - Conventional Statistics & Geostatistics

#### Topic(s):

Evaluation: Midterm Exam

#### Thu, Oct 25

* 1. Quantifying Soilscape Variability - Modelling the Soil Continuum

#### Topic(s):

Evaluation: Midterm Exam

#### Tue, Oct 30

* 1. Soil Development - Gains & Losses

#### Topic(s):

Evaluation: Final Exam

#### Thu, Nov 1

* 1. Soil Development - Translocations & Transformations

#### Topic(s):

Evaluation: Final Exam

#### Tue, Nov 6

* 1. Soil Development - Soil Morphogenesis

#### Topic(s):

Evaluation: Final Exam

#### Thu, Nov 8

* 1. Soil Development - Soil Through Time

#### Topic(s):

Evaluation: Final Exam

#### Tue, Nov 13

* 1. Soil Quality - Human Impact on Soil

#### Topic(s):

Evaluation: Final Exam

#### Thu, Nov 15

* 1. Soil Quality - Indicators

#### Topic(s):

Evaluation: Final Exam

#### Tue, Nov 20

* 1. Soil Classification - Basic Concepts

#### Topic(s):

Evaluation: Final Exam

#### Thu, Nov 22

* 1. Soil Classification - Wetland Soils

#### Topic(s):

Evaluation: Final Exam

#### Tue, Nov 27

* 1. Soil Classification - Woodland Soils

#### Topic(s):

Evaluation: Final Exam

#### Thu, Nov 29

* 1. Soil Classification - Grassland Soils

#### Topic(s):

Evaluation: Final Exam

## 5.2 Lab

#### Fri, Sep 14 Topic(s):

Due Date: 21 Sep 2018

Grade: 1%

#### Fri, Sep 14 Topic(s):

Due Date: 21 Sep 2018

Grade: 1%

#### Fri, Sep 21

8.5 Soil Classification - Azonal Soils

Geological Inventory Resources for Soilscape Evaluation - accessing & interpreting geological spatial data and reports

Digital Elevation Models in Soilscape Evaluation - accessing digital elevation models & landform segmentation

#### Topic(s):

Due Date: Same day Grade: 1%

#### Fri, Sep 28 Topic(s):

Due Date: same day Grade: 1%

#### Fri, Oct 5 Topic(s):

Due Date: 12 Oct 2018

Grade: 1%

#### Fri, Oct 5 Topic(s):

Due Date: 12 Oct 2018

Grade: 1%

## Field Trips

Soil Inventory Resources for Soilscape Evaluation - accessing & interpreting soil spatial data and reports.

Airphotos & Satellite Imagery for Soilscape Evaluation - accessing

& interpreting stereo airphotos, ortho airphotos and satellite imagery.

Ecological Inventory Resources for Soilscape Evaluation - accessing & interpreting ecological spatial data and reports.

Land Capability Inventories for Soilscape Evaluation - accessing & interpreting land capability data and reports

|  |  |  |  |
| --- | --- | --- | --- |
| Date | Activity | Due Date | Grade |
| Sep 4 | Field Camp/Excursion – University of Guelph Arboretum & Hand Texturing | same day | 4% |
| Sep 5 | Field Camp/Excursion – Guelph Turfgrass Institute & Guelph Drumlin Field (UofG Elora Research Station) | same day | 5% |
| Sep 6 | Field Camp/Excursion – Flamborough Plain (Kirkwall area), Haldimand Clay Plain (Cayuga area), Norfolk Sand Plain (UofG Simcoe Research Station) | same day | 3% |
| Sep 7 | Field Camp/Excursion – Paris Moraine & Outwash Plain (Starkey Conservation Area/Arkell Springs), Blackbridge Road/Speed River & Luther Marsh Conservation Area | same day | 3% |
| Sep 8 to | Independent Group Project – reconnaissance of study area sub-region | Sept | 5% |

to Oct 22 (required for Preliminary Technical Report)

t 22 10%

## Field Trip Equipment and Transportation

|  |  |  |
| --- | --- | --- |
| 24 | (required for Group Project Plan) | 24 |
| Sep 29 | Independent Group Project - in-field survey of study area sub-region | Oc |

\*Equipment (including reflective vests and safety supplies) and transportation (rental vehicles) will be provided for the Field/Camp Excursions. Equipment will be provided for Group Projects, but students are responsible for their own transportation.

## Additional Costs

Students must use appropriate clothing for field work, including protective footware.

# Assessments

## Marking Schemes & Distributions

|  |  |
| --- | --- |
| Name | Scheme A (%) |
| Field Camp & Excursion Exercises/Notes | 15 |
| Laboratory Exercises (best 5 of 6) | 5 |
| Group Project Plan | 5 |
| Midterm Examination - sections 1 to 4 | 20 |
| Project Preliminary Technical Report | 10 |
| Project Final Technical Report | 10 |
| Group Project Oral Presentation | 10 |
| Final Examination - sections 5 to 8 | 25 |
| Total | 100 |

* 1. **Assessment Details**

**Field Camp & Excursion Exercises/Notes (15%) Due:** Tue, Sep 4 - Fri, Sep 7

#### Laboratory Exercises (best 5 of 6) (5%)

Due Date: On the same day as lab or one week later, as per specific instructions

**Group Project Plan (5%) Due:** Mon, Sep 24

#### Midterm Examination (25%)

**Due:** Tue, Oct 16, regular classroom

#### Project Preliminary Technical Report (10%) Due: Mon, Oct 22

**Project Final Technical Report (10%) Due:** Mon, Nov 12

**Group Project Oral Presentation (10%) Due:** Mon, Nov 26 - Fri, Nov 30

Specific date & time to be collectively determined

#### Final Examination (scheduled by registrar) (20%)

**Date:** Fri, Dec 14, 8:30 AM - , 9:00 PM, to be set by Registrar's Office Date and time set by Registrar's Office.

* 1. Additional Notes (if required):

Best five of six laboratory exercises will be counted toward final grade.

### Additional Course Information

#### Independent Group Project Technical Reports & Presentation

(Instructions and Guidelines)

Overview - this group exercise constitutes 35% of the final course grade:

Each group of 3 or 4 students will research relevant literature, acquire available biophysical resource inventories (including, but not restricted to, soils, geology, physiography and ecology) for an assigned sub-region of a study area to be determined (within or near Guelph), as well as conduct in-field surveys (including, but not limited to, soil and vegetation). This information is to be collated, synthesized and interpreted. Special guidance, with respect to aspects to be considered, will be provided once study area has been confirmed.

1. Group Project Plan (5% final grade) – due Sep 24’18, feedback same week:

Structure: cover page; table of contents; goals & objectives; identification of study area sub- region; existing biophysical resource inventories and type of literature to be reviewed; in-field survey activities to be conducted, with methods and resources/equipment to be used; timeline for project development (considering reports and presentation); distribution of tasks among group members; references cited.

Formatting: 2 to 3 pages; font size 12 Times New Roman (for graphics use sans serif); 1.5 line spacing; 1” margins; section headings/subheadings, tables and graphics, and pages to be numbered. Use referencing style of ‘Canadian Journal of Soil Science - CJSS’.

Evaluation (by instructor) Criteria: presentation, organization, content, synthesis, writing style. Rubric to be provided at start of class.

1. Project Preliminary Technical Report (10% final grade) – due Oct 22’18, feedback same week:

Structure: cover page; table of contents; list of tables; list of figures; introduction, with goals & objectives; relevant excerpts of existing biophysical resource inventories; type of literature encountered; description of in-field survey activities, with methods and resources/resources

used; presentation (summary tables or graphics) of results of in-field survey; strategy for interpretation of material; references cited.

Formatting: 10 to 15 pages (not including references and appendices); font size 12 Times New Roman (for graphics use sans serif); 1.5 line spacing; 1” margins; section headings/subheadings, tables and graphics, and pages to be numbered. Summary tables and graphs to be inserted in report body; other materials (including field forms/notes, as well as previous feedback from instructor) go in Appendix. Use referencing style of CJSS.

Evaluation (by instructor) Criteria: presentation, organization, content, synthesis and writing style. Rubric to be provided at start of class.

1. Project Final Technical Report (10% final grade) – due Nov 12’18, feedback same week:

Structure: cover page; table of contents; list of tables; list of figures; introduction, with goals & objectives; review of literature; characterization of study area sub-region, using relevant excerpts of existing biophysical resource inventories; description of in-field survey activities, with methods and resources/resources used; results of in-field survey & discussion; summary and conclusions; references cited.

Formatting: 15 to 20 pages (not including tables and figures, references and appendices); font size 12 Times New Roman (for graphics use sans serif); 1.5 line spacing; 1” margins; section headings/subheadings, tables and graphics, and pages to be numbered. Summary tables and graphs to be inserted in report body; other materials (including previous feedback from instructor) go in Appendix. Use referencing style of CJSS.

Evaluation (by instructor) Criteria: presentation, organization, content, synthesis and writing style. Rubric to be provided at start of class.

1. Group Oral Presentation (10% of final grade) – Nov 26 to Nov 30’18 (location & time TBD): Time Slot: 20 minutes per group.

Format: computer (with PowerPoint) and projector will be available.

Evaluation (by instructors and students – all students must attend other presentations) Criteria: suitability/quality of AV aids, organization, presentation style, content and audience engagement. Students who do not submit the evaluation forms, will lose 1 point off their final grade. Rubric to be provided at start of class.

# Course Statements

## Grading Policies:

**10% reduction of grade (evaluated), for item in question, for each week or part thereof. Items not received before the date set for start of final exams, will be assigned a grade of 0 (zero).**

* 1. **Course Policy on Group Work:**

**Technical reports/oral presentations will be completed in groups of 3 or 4.**

* 1. **Course Policy regarding use of electronic devices and recording of lectures:**

Electronic recording of classes is expressly forbidden without consent of the instructor. When recordings are permitted they are solely for the use of the authorized student and may not be reproduced, or transmitted to others, without the express written consent of the instructor.

# University Statements

## Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e- mail is the official route of communication between the University and its students.

## When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The regulations and procedures for [Academic Consideration](https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml) are detailed in the Undergraduate Calendar.

## Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two- semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for [Dropping Courses](https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml) are available in the Undergraduate Calendar.

## Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

## Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: [www.uoguelph.ca/sas](http://www.uoguelph.ca/sas)

## Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it.

Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The [Academic Misconduct Policy](https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml) is detailed in the Undergraduate Calendar.

## Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

## Resources

The [Academic Calendars](https://www.uoguelph.ca/registrar/calendars/) are the source of information about the University of Guelph’s procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.