1 Course Details

1.1 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-Requisites: 15.00 credits including (1 of AGR*2320, ENVS*2060, ENVS*2310, ENVS*2340, SOIL*2010)

Restrictions: ENVS*3120, ENVS*4150, ENVS*4250, SOIL*4250.

1.2 Course 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.

1.3 Timetable
1.4 Final Exam
Scheduled by the Registrar’s Office - Tuesday December 10, 2019, 08:30 to 10:30; location TBD.

2 Instructional Support

2.1 Instructional Support Team
Instructor: Richard Heck
Email: rheck@uoguelph.ca
Telephone: +1-519-824-4120 x52450
Office: ALEX 140
Office Hours: Appointments arranged by email

3 Learning Resources

3.1 Required Resources

Characterizing Sites, Soils & Substrates in Ontario (Other)
“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.

3.2 Recommended Resources

Soil: Morphology, Genesis and Classification (Textbook)

Soils: Genesis and Geomorphology (Textbook)

Manual of Methods for Soil and Land Evaluation (Other)

The System of Soil Classification for Canada (Textbook)
4 Learning Outcomes

4.1 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 10

Topics: 1 Soil & the Pedosphere

Evaluation: Midterm Exam

Thu, Sep 12

Topics: 2.1 Natural Controls on Soil Variability - Site Factors

Evaluation: Midterm Exam

Tue, Sep 17
2.2 Natural Controls on Soil Variability - Flux Factors

Evaluation: Midterm Exam

Thu, Sep 19

Topics: 3.1 Soilscape Inventory - Traditional Soil Survey & Mapping

Evaluation: Midterm Exam

Tue, Sep 24

Topics: 3.2 Soilscape Inventory - Application of Remote Sensing

Evaluation: Midterm Exam

Thu, Sep 26

Topics: 3.3 Soilscape Inventory - Application of Proximal Sensing Techniques

Evaluation: Midterm Exam

Tue, Oct 1

Topics: 4.1 Land Evaluation Systems - Canada Land Inventory

Evaluation: Midterm Exam

Thu, Oct 3

Topics: 4.2 Land Evaluation Systems - Ecological & Agri-Environmental Systems

Evaluation: Midterm Exam

Tue, Oct 8

Topics: 4.3 Land Evaluation Systems - Land Suitability Rating Systems

Evaluation: Midterm Exam

Thu, Oct 10

Topics: 5.1 Quantifying Soilscape Variability - Conventional Statistics & Geostatistics

Evaluation: Final Exam
Thu, Oct 17

Topics: 5.2 Quantifying Soilscape Variability - Modelling the Soil Continuum

Evaluation: Final Exam

Tue, Oct 22

Topics: 6.1 Soil Development - Gains & Losses

Evaluation: Final Exam

Tue, Oct 29

Topics: 6.2 Soil Development - Translocations & Transformations

Evaluation: Final Exam

Thu, Oct 31

Topics: 6.3 Soil Development - Soil Morphogenesis

Evaluation: Final Exam

Tue, Nov 5

Topics: 6.4 Soil Development - Soil Through Time

Evaluation: Final Exam

Thu, Nov 7

Topics: 7.1 Soil Quality - Human Impact on Soil

Evaluation: Final Exam

Tue, Nov 12

Topics: 7.2 Soil Quality - Indicators

Evaluation: Final Exam

Thu, Nov 14

Topics: 8.1 Soil Classification - Basic Concepts

Evaluation: Final Exam

Tue, Nov 19
8.2 Soil Classification - Wetland Soils
Evaluation: Final Exam

Thu, Nov 21
Topics: 8.3 Soil Classification - Woodland Soils
Evaluation: Final Exam

Tue, Nov 26
Topics: 8.4 Soil Classification - Grassland Soils
Evaluation: Final Exam

Thu, Nov 28
Topics: 8.5 Soil Classification - Azonal Soils
Evaluation: Final Exam

5.2 Lab
Fri, Sep 13
Due Date: same day (13 Sep 2019)
Grade: 1%

Fri, Sep 20
Topics: Digital Elevation Models in Soilscape Evaluation - accessing digital elevation models & landform segmentation
Due Date: one week later (27 Sep 2019)
Grade: 1%

Fri, Sep 27
Topics: Geological & Ecological Inventory Resources for Soilscape Evaluation - accessing & interpreting geological and ecological spatial data and reports
Due Date: one week later (04 Oct 2019)
Grade: 1%
Fri, Oct 4
Topics: Soil Inventory Resources for Soilscape Evaluation - accessing & interpreting soil spatial data and reports.
Due Date: one week later (11 Oct 2019)
Grade: 1%

Fri, Oct 11
Topics: Land Capability Inventories for Soilscape Evaluation - accessing & interpreting land capability data and reports
Due Date: one week later (18 Oct 2019)
Grade: 1%

5.3 Field Trips

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
<th>Due Date</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep 3</td>
<td>Field Camp/Excursion – University of Guelph Arboretum &amp; Hand Texturing</td>
<td>same day</td>
<td>4%</td>
</tr>
<tr>
<td>Sep 4</td>
<td>Field Camp/Excursion – Guelph Turfgrass Institute &amp; Guelph Drumlin Field (UofG Elora Research Station)</td>
<td>same day</td>
<td>5%</td>
</tr>
<tr>
<td>Sep 5</td>
<td>Field Camp/Excursion – Flamborough Plain (Kirkwall area), Haldimand Clay Plain (Cayuga area), Norfolk Sand Plain (UofG Simcoe Research Station)</td>
<td>same day</td>
<td>3%</td>
</tr>
<tr>
<td>Sep 6</td>
<td>Field Camp/Excursion – Paris Moraine &amp; Outwash Plain (Starkey Conservation Area/Arkell Springs), Blackbridge Road/Speed River &amp; Luther Marsh Conservation Area</td>
<td>same day</td>
<td>3%</td>
</tr>
<tr>
<td>Sep 9 to 23</td>
<td>Independent Group Project – reconnaissance of study area sub-region (required for Group Project Plan)</td>
<td>Sept 23</td>
<td>5%</td>
</tr>
<tr>
<td>Sep 28 to Oct 21</td>
<td>Independent Group Project - in-field survey of study area sub-region (required for Preliminary Technical Report)</td>
<td>Oct 21 10%</td>
<td>10%</td>
</tr>
</tbody>
</table>
5.4 Field Trip Equipment and Transportation

*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.

5.5 Additional Costs

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

6 Assessments

6.1 Marking Schemes & Distributions

<table>
<thead>
<tr>
<th>Name</th>
<th>Scheme A (%)</th>
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<tbody>
<tr>
<td>Field Camp &amp; Excursion Exercises/Notes</td>
<td>15</td>
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<tr>
<td>Laboratory Exercises (best 5 of 6)</td>
<td>5</td>
</tr>
<tr>
<td>Group Project Plan</td>
<td>5</td>
</tr>
<tr>
<td>Midterm Examination - sections 1 to 2</td>
<td>22.5</td>
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<tr>
<td>Project Preliminary Technical Report</td>
<td>10</td>
</tr>
<tr>
<td>Project Final Technical Report</td>
<td>10</td>
</tr>
<tr>
<td>Group Project Oral Presentation</td>
<td>10</td>
</tr>
<tr>
<td>Final Examination - sections 6 to 8</td>
<td>22.5</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

6.2 Assessment Details

Field Camp & Excursion Exercises/Notes (15%)
   Due: Tue, Sep 3 - Fri, Sep 6

Laboratory Exercises (5%)
   Due: On the same day as lab or one week later, as per specific instructions

Group Project Plan (5%)
   Due: Mon, Sep 23

Midterm Examination (22.5%)
   Due: Thu, Oct 24, regular classroom
      Exams sections 1 to 5, inclusive.
Project Preliminary Technical Report (10%)
Due: Mon, Oct 21

Project Final Technical Report (10%)
Due: Mon, Nov 11

Group Project Oral Presentation (10%)
Due: Mon, Nov 25 - Fri, Nov 29
Specific date & time to be collectively determined

Final Examination (scheduled by registrar) (22.5%)
Date: Tue, Dec 10, 8:30 AM - , 10:30 AM, to be set by Registrar's Office
Date and time set by Registrar's Office. Exams sections 6 to 8, inclusive.

6.3 Additional Notes (if required):

6.4 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.

A) Group Project Plan (5% final grade) – due Sep 23’19, feedback same week:

Structure: cover page; table of contents; goals & objectives; identification of study area sub-region (imagery/maps); 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; reference cited.

Formatting: 4 pages (including cover page and table of contents); font size 12 Times New Roman (for graphics use sans serif); 1.5 line spacing; 1” margins, justified; sequentially-numbered section headings/subheadings, sequentially-numbered tables and graphics, and pages to be numbered; all tables and graphs must have appropriate titles. Must 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.

B) Project Preliminary Technical Report (10% final grade) – due Oct 21’19, 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; appendices.

Formatting: 9 to 11 pages (NOT including cover page, tables of contents, list of tables, list of figures, reference citation list and appendices); font size 12 Times New Roman (for graphics use sans serif); 1.5 line spacing; 1” margins, justified; sequentially-numbered section headings/subheadings, sequentially-numbered tables and graphics, and pages to be numbered; all tables and graphs must have appropriate titles. Summary tables and graphs to be inserted in report body; other materials (including field forms/notes, as well as any previous feedback from instructor) go in appendices. Must use referencing style of ‘Canadian Journal of Soil Science - CJSS’.

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

C) Project Final Technical Report (10% final grade) – due Nov 11’19, 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; appendices.

Formatting: 12 to 14 pages (NOT including cover page, tables of contents, list of tables, list of figures, reference citation list and appendices); font size 12 Times New Roman (for graphics use sans serif); 1.5 line spacing; 1” margins, justified; sequentially-numbered section headings/subheadings, sequentially-numbered tables and graphics, and pages to be numbered; all tables and graphs must have appropriate titles. Summary tables and graphs to be inserted in report body; other materials (including any previous feedback from instructor) go in Appendix. Must use referencing style of ‘Canadian Journal of Soil Science - CJSS’.

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

D) Group Oral Presentation (10% of final grade) – Nov 25 to Nov 29’19 (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.

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7 Course Statements

7.1 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).

7.2 Course Policy on Group Work:

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

7.3 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.

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8 University Statements

8.1 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.

8.2 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 grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Graduate Calendar - Grounds for Academic Consideration
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

8.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

Graduate Calendar - Registration Changes
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-regregchg.shtml

Associate Diploma Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml

8.4 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.

8.5 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 can be found on the SAS website
https://www.uoguelph.ca/sas

8.6 Academic Integrity

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 encourages academic integrity. 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.

Undergraduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

Graduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

8.7 Recording of Materials

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

8.8 Resources

The Academic Calendars are the source of information about the University of Guelph’s procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars
https://www.uoguelph.ca/academics/calendars