COURSE OUTLINE

CALENDAR DESCRIPTION
This course introduces techniques for collecting, evaluating, and using data-based evidence in environmental research, including descriptive statistics (measures of centre, variation and shape, and measures of association between two variables), statistical research designs, sampling theory, and fundamental probability theory for inferential statistics. The course also develops skills in using statistical software for data display and analysis.

(Prereq: Not open to students in the Faculty of Mathematics.)

COURSE OBJECTIVES
The objectives for this course fall into three broad thematic areas:

1) Data management and visualization
   a) To introduce students to data management using spreadsheet software
   b) To introduce students to graphing and other data visualization techniques

2) Statistics
   a) To verify knowledge of basic mathematics and develop quantitative aptitude
   b) To provide an introduction to the statistical techniques used to describe data
   c) To provide a foundation for learning more about inferential statistics in future courses

3) Probability

LEARNING MODES
This course consists of weekly lectures, tutorials, and self-directed homework exercises.

Attendance and completing weekly exercises are very important to student success.
Students are expected to:

- **Complete the readings before attending lectures**
- **Attempt assignments before attending tutorials**

Keeping up with the readings and assignments is important. Lecture may seem to be too fast if you have not completed the readings ahead of time. Tutorial is an additional time to ask questions about the readings, the lecture, and assignments. You will get the most out of tutorial if you have attempted the assignments. Students are required to submit homework assignments on LEARN at the beginning of each class day (Fridays, 9:00 AM).

Lectures are a required component of the course. Lectures are supplementary to the readings and include reviewing software tools for this course. You will require detailed understanding of the readings AND lecture material to do well. Examples from readings will come up in class, but it is not the purpose of lecture to summarize all aspects of the readings. It is the students’ responsibility to ensure they fully comprehend the readings, and ask questions if clarification is required.

**COMMUNICATION, OR Q&A**

There are many ways to get your questions about course content answered. The following is a list of strategies in order of priority. Only move down the list of strategies if you still have questions after you have already attempted the previous strategies.

1. **FIRST**: Ask your question during lecture or tutorial so that all students get to benefit from the answer in person.
2. **SECOND**: Ask your question on the LEARN discussion board for the week. Read through the discussion posts to ensure your question has not already been asked/answered.
3. **THIRD**: Come to the office hours of a TA, which are held every day of the week outside of tutorial (Tuesday – Friday).
4. **FOURTH**: Email the TA responsible for your tutorial to ask your question. Please use “ENVS 178” in the subject line.
5. **FIFTH**: Come to Dr. Schweizer’s office hours.
6. **LAST**: Email Dr. Schweizer to arrange a meeting outside of regular office hours. Remember to use “ENVS 178” in the subject line. This last strategy will require a signed form from both of your tutorial TAs outlining your question and indicating that they were unable to help you understand the concept.

**Email communication between you and your ENVS 178 TA/instructor is discouraged.** If you must send an email, use “ENVS 178” in the subject line to ensure your questions are answered in a timely manner. If ENVS 178 does not appear in the subject line, your email may go unanswered or may receive a delayed response. An effort will be made to deal with email requests within three days of receipt. The instructor does not respond to email outside of regular working hours (M-F 9AM-5PM).

Students’ UW email accounts will be used for communication outside of lecture and tutorial. Course materials will be available on LEARN. Students are responsible for checking their UW email and LEARN accounts regularly.
Cautions

The rate at which new information and concepts are presented in university may be faster than previously experienced by students. Students are expected to take detailed notes during lectures and tutorials (even during discussion exercises). Your notes will be an important aid when the time comes to study for exams.

It is essential that students stay up-to-date, particularly with readings, definitions, assumptions, and concepts. Students should:

- Complete readings before each lecture
- Review notes after each lecture
- Review notes after each tutorial
- Ask questions during lectures, tutorial, via the LEARN discussion board, or during office hours if you are unsure about any of the material or feel you are falling behind.

Don’t wait until the mid-term or end of term to ask questions.

Completing the readings and attending lectures will not be sufficient to do well in this course. Students are expected to think critically about the material, ask questions, participate in discussion exercises, and begin to develop skills that help them synthesize knowledge from different sources (e.g., lectures, guests, readings, discussions, etc.).

Readings

Class Meetings
Lectures occur once a week: Friday 12:30PM – 2:20PM in RCH 101.
Each student is also assigned to a mandatory tutorial on Monday (check your class schedule for time/location).

Office Hours
The instructor will hold office hours on Wednesdays, 12:30 - 1:30PM. Please limit your use of email to ask questions – most questions for this type of course are most efficiently and effectively dealt with in person during lectures, tutorials, or office hours. Teaching assistants will also hold office hours every day of the week outside of tutorial (Tuesdays – Fridays). Times and location will be posted in LEARN.

Office hours are there for you to ask questions or discuss issues with the TAs or instructor that you are experiencing in the course. So do come see your TAs and me if you require assistance or clarification. We are here to help.

Student Evaluation
The professor determines the content and establishes the grading rules for all exercises, assignments, and exams. Teaching assistants will help mark under the supervision of the instructor. Your final grade will be calculated as follows:

<table>
<thead>
<tr>
<th>Course Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework assignments</td>
<td>45%</td>
</tr>
<tr>
<td>Mid-term examination</td>
<td>25%</td>
</tr>
<tr>
<td>Final examination</td>
<td>30%</td>
</tr>
</tbody>
</table>
To calculate your final grade in the course, some of your lowest marks will be dropped as follows:

- Your lowest mark on homework assignments will be dropped.
- Students receiving a higher grade on the final exam than on the mid-term will see their final exam count toward 55% of their final course grade (and the mid-term grade becomes void).

When determining a student's final grade in the course, the professor will examine the record of each individual student's achievement; the final grade may be adjusted to take into account extenuating and compassionate circumstances and the student's general pattern of achievement in the course.

**PROFESSIONALISM AND ATTENDANCE**
In the Faculty of Environment and at the University of Waterloo, you are expected to communicate with your instructors, staff and fellow students in a mutually respectful and professional manner. Use formal salutations in emails and personal interaction, and be attentive in class.

During lectures and seminars, ensure that you are not distracting other students. Cell phones are to be silenced or turned off. Laptops can be useful to facilitate note taking but web browsers, social media, games, films, etc. need to be closed and notifications turned off. Use classroom time to listen and absorb the ideas and material presented by the instructor and guest lectures, and participate in discussions. You are expected to pay attention and participate as appropriate.

To obtain full marks, students need to complete all homework exercises, be actively engaged in the classroom (notetaking, active listening), and act in a professional manner as defined above. **To succeed in this course, be present at all lectures and tutorials (unless there are extenuating circumstances).**

**ACADEMIC INTEGRITY**
In order to maintain a culture of integrity and professionalism, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility (see https://uwaterloo.ca/academic-integrity/). Students who are unsure what constitutes an academic offence are requested to visit the on-line tutorial at www.lib.uwaterloo.ca/ait/

**HOMEWORK EXERCISES AND ASSIGNMENTS**
To help you prepare for the mid-term and final exams, regular homework assignments are part of this class. Further details regarding assignments will be distributed in class. Pearson MyLab is required to complete the assignments, as is a recent version of MS Excel. Homework is open-book and open-note. Students are expected to complete homework assignments on their own, as students will complete exams on their own (note that exams are not open-book nor open-note). It is natural to discuss challenges encountered with the homework with peers during tutorial or on the LEARN discussion board. In this vein, good habits for group study are encouraged. Tips for ensuring academic integrity while engaging in group study:

- If a peer helps you think through a complicated problem, write notes about the appropriate steps in your own words.
- Take a break after group study (approximately 15-30 minutes, e.g. grab a snack, go for a walk, do some exercise) to give your mind downtime to process what you learned. However, avoid activities that may clutter your mind, e.g. watching YouTube (unless it's about stats!), checking Facebook.
- Return to your homework assignment on your own and complete it. This ensures that whatever you write/present will be in your own style and words.
Please note that TAs and the instructor are required to report any suspected violation of academic integrity. This includes suspicion that a student submitted work that does not accurately reflect their level of mastery. The University of Waterloo takes its culture of integrity seriously because it prepares you for the professional world. The tips stated above are best practices for individual learning while working in groups. Students are also encouraged to seek guidance from their TAs and/or instructor if they encounter difficulties with homework assignments.

**Mid-term Examination**

A mid-term exam will be held in class on October 19. The exam will be the entire length of the class. Students arriving late will not be provided with additional time to complete the exam. At the exam, students are allowed to bring water bottles, pens/pencils and standalone handheld calculators (use of calculators on phones or other digital devices is not permitted). All other items must be left at the back or front of the room. The mid-term exam covers all material covered in class at that point and the readings.

**Final Examination**

There is a compulsory final examination in this course. Students are required to be present to write the examination. The examination is scheduled by the registrar and is within the University’s normal examination period. Students should not make travel arrangements until they have consulted the final examination time table. The University examination schedule is published by the Registrar during the Fall term.

The final exam covers all material from the course. Students receiving a higher grade on the final exam than on the mid-term will see their final exam count toward 55% of their final course grade (and the mid-term grade becomes void).

**Term Overview and Required Readings**

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Preparatory readings, lecture activities</th>
<th>Assignments due (Fridays, 9:00 AM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 7</td>
<td>Course expectations, tools, and resources</td>
<td>MyLab Statistics</td>
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</tr>
<tr>
<td>September 14</td>
<td>What is statistics? Why statistics? Data and variables</td>
<td>Chapters 1 &amp; 2 (2.1), Excel</td>
<td>01: MyLab &amp; Math Survey</td>
</tr>
<tr>
<td>September 21</td>
<td>Displaying/describing categorical data</td>
<td>Chapter 2, Excel</td>
<td>02: MyLab &amp; Excel</td>
</tr>
<tr>
<td>September 28</td>
<td>Displaying/summarizing quantitative data</td>
<td>Ch. 3 (3.1 – 3.5), Excel</td>
<td>03: MyLab</td>
</tr>
<tr>
<td>October 5</td>
<td>Displaying/summarizing quantitative data</td>
<td>Ch. 3 (3.6 – 3.8), Excel</td>
<td>04: MyLab</td>
</tr>
<tr>
<td>October 12</td>
<td>Wednesday lecture schedule due to mid-term study break</td>
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<td></td>
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<tr>
<td>October 19</td>
<td>Mid-term exam</td>
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<td></td>
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<tr>
<td>October 26</td>
<td>Understanding/comparing distributions</td>
<td>Chapter 4</td>
<td>05: MyLab &amp; Excel</td>
</tr>
<tr>
<td>November 2</td>
<td>Standard deviation and the Normal model</td>
<td>Chapter 5</td>
<td>06: MyLab</td>
</tr>
<tr>
<td>November 9</td>
<td>Probability</td>
<td>Chapters 11 &amp; 12 (Sections 12.1 – 12.3)</td>
<td>07: MyLab</td>
</tr>
<tr>
<td>November 16</td>
<td>Probability models for random variables</td>
<td>Ch. 13 (exceptions: correlation &amp; covariance, 13.5, 13.8)</td>
<td>08: MyLab</td>
</tr>
</tbody>
</table>
## Date | Topic | Prepatory readings, lecture activities | Assignments due (Fridays, 9:00 AM)
--- | --- | --- | ---
November 23 | Scatterplots, association, correlation | Ch. 6 (6.1 – 6.3), Excel | 09: MyLab
November 30 | Linear regression & extrapolation | Chapters 7 & 8 | 10: MyLab & Excel

### POLICIES, GRADE PENALTIES AND SPECIAL CONSIDERATIONS:

**Late submissions:** All assignments are due at the date and time set by the instructor. Teaching assistants are NOT allowed to change the due dates or times. Due to the size of this class, **late homework assignments will not be accepted.**

**Computer use:** Assignments must be completed through MyLab Statistics and, where applicable, with MS Excel and word processing software. **For assignments requiring use of Excel, if Excel is not used, the assignment will not be accepted.**

**Readability and clarity:** Students are expected to submit work that is well organized and written in proper English. Penalties of up to 25% may be applied in cases where readability and/or clarity are inadequate.

**Examinations and tests:** Students are expected to be present at the time examinations are scheduled. **There is a required final examination in the normal examination period as scheduled and administered by the Office of the University Registrar. Students should consult the final examination time table before making any December travel plans. No “make-up” examinations are provided to accommodate travel plans.**

**Requests for exemptions or compassionate considerations:** These are to be discussed with the professor in advance or as soon as possible. In accord with university policy, official documentation is required for extensions, test deferral or absence from class on medical grounds. **Extensions or exam deferrals will not be granted to accommodate travel plans or other recreational activities.**

### UNCLAIMED ASSIGNMENTS

Unclaimed assignments that are not final exams will be retained until one month after term grades become official in quest. After that time, they will be destroyed in compliance with UW’s confidential shredding procedures ([http://www.adm.uwaterloo.ca/infostor/Confidential%20Shredding%20procedures%202008.htm](http://www.adm.uwaterloo.ca/infostor/Confidential%20Shredding%20procedures%202008.htm)). Final exams will be retained for one year.
MENTAL HEALTH
The University of Waterloo, the Faculty of Environment, and your instructors and Teaching Assistants consider students' well-being to be extremely important. We recognize that throughout the term students may face health challenges – physical and/or emotional. Please note that help is available.

Mental health is a serious issue for everyone and can affect your ability to do your best work. Counseling Services (www.uwaterloo.ca/counselling-services) is an inclusive, non-judgmental, and confidential space for anyone to seek support. They offer confidential counseling for a variety of areas including anxiety, stress management, depression, grief, substance use, sexuality, relationship issues, and much more.

For emergencies, contact the mobile crisis team (available 24 hrs/day) at 519-744-1813 or UW police at 519-888-4911.

NOTE FOR STUDENTS WITH DISABILITIES
AccessAbility Services, located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of a disability, please register with Accessability Services at the beginning of each academic term.

RELIGIOUS OBSERVANCES
Please inform the instructor at the beginning of term if special accommodation is needed for religious observances that are not otherwise accounted for in the scheduling of classes and assignments.

INTELLECTUAL PROPERTY
Students should be aware that this course contains the intellectual property of their instructor, TAs, and/or the University of Waterloo. Intellectual property includes items such as:

- Lecture content, spoken and written (and any audio/video recording thereof);
- Lecture handouts, presentations, and other materials prepared for the course (e.g., PowerPoint slides);
- Questions or solution sets from various types of assessments (e.g., assignments, quizzes, tests, final exams); and
- Work protected by copyright (e.g., any work authored by the instructor or TA or used by the instructor or TA with permission of the copyright owner).

Course materials and the intellectual property contained therein, are used to enhance a student’s educational experience. However, sharing this intellectual property without the intellectual property owner's permission is a violation of intellectual property rights. For this reason, it is necessary to ask the instructor, TA and/or the University of Waterloo for permission before uploading and sharing the intellectual property of others online (e.g., to an online repository).

Permission from an instructor, TA or the University is also necessary before sharing the intellectual property of others from completed courses with students taking the same/similar courses in subsequent terms/years. In many cases, instructors might be happy to allow distribution of certain materials. However, doing so without expressed permission is considered a violation of intellectual property rights.
Please alert the instructor if you become aware of intellectual property belonging to others (past or present) circulating, either through the student body or online. The intellectual property rights owner deserves to know (and may have already given their consent).

RESEARCH ETHICS
Please also note that the "University of Waterloo requires all research conducted by its students, staff, and faculty which involves humans as participants to undergo prior ethics review and clearance through the Director, Office of Human Research and Animal Care (Office). The ethics review and clearance processes are intended to ensure that projects comply with the Office’s Guidelines for Research with Human Participants (Guidelines) as well as those of provincial and federal agencies, and that the safety, rights and welfare of participants are adequately protected. The Guidelines inform researchers about ethical issues and procedures which are of concern when conducting research with humans (e.g. confidentiality, risks and benefits, informed consent process, etc.). If the development of your research proposal consists of research that involves humans as participants, then please contact the course instructor for guidance and see http://iris.uwaterloo.ca/ethics/

CONSEQUENCES OF ACADEMIC OFFENCES

A student is expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. Please note that TAs are required to report suspected academic violations to the instructor, and the instructor is required to report suspected academic violations to the Dean's Office. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline, http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm. Typical penalties can be found at https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/guidelines/assessment-penalties.

Within ENV, those committing academic offences (e.g. cheating, plagiarism) will be placed on disciplinary probation and will be subject to penalties which may include a grade of 0 on affected course elements, 0 on the course, suspension, and expulsion.

ENV students are strongly encouraged to review the material provided by the university’s Academic Integrity office (see: http://uwaterloo.ca/academicintegrity/Students/index.html).

GRIEVANCE
Students who believe that they have been wrongfully or unjustly penalized have the right to grieve; refer to Policy 70, Student Petitions and Grievances, Section 4. http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm

APPEALS
A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition; https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/policy-70), or Policy 71, Student Discipline (https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/policy-71), may be appealed if there is ground. A student who believes they have ground for appeal should refer to Policy 72, Student Appeals (https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/policy-72).
**GRADES**
The following Faculty of Environment guidelines are useful in interpreting your grade (see also [https://uwaterloo.ca/environment/undergraduate/student-support/exams-and-grades](https://uwaterloo.ca/environment/undergraduate/student-support/exams-and-grades)).

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<tr>
<th>Score Range</th>
<th>Description</th>
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<tbody>
<tr>
<td>80 – 100</td>
<td>Student has demonstrated a full understanding of the subject matter, has capacity to analyze, and has demonstrated critical thinking, shows evidence of creative thinking, familiarity with literature and previous work in the area, highly developed communication and presentation skills. The work is of outstanding quality according to the criteria established for the evaluation.</td>
</tr>
<tr>
<td>70-79</td>
<td>Student has shown good comprehension of subject matter, evidence of critical and creative thought, familiarity with literature and previous work in the subject area, competence in communication and presentation skills, but none of the above to the degree found in the ‘A’ category. The work is of very good quality according to the evaluation criteria.</td>
</tr>
<tr>
<td>65-69</td>
<td>Student has demonstrated some understanding of subject matter and can assimilate and communicate basic aspects of the subject matter. The work is of satisfactory or adequate quality according to evaluation criteria.</td>
</tr>
<tr>
<td>50-64</td>
<td>Student has demonstrated minimal or weak understanding of the subject matter, poorly developed communication skills, inability to apply subject matter understanding in other contexts, and little evidence of critical or creative thinking. The work is of unsatisfactory but passable quality according to evaluation criteria.</td>
</tr>
<tr>
<td>0-49</td>
<td>Inadequate understanding of subject matter, failed to complete course requirements, no demonstration of critical thought, communication skills very poor. The work is clearly of unacceptable quality according to evaluation criteria.</td>
</tr>
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