



ENVS*3340 Use and Management of Environmental Data

Fall 2019

Section(s): C01

School of Environmental Sciences

Credit Weight: 0.50

Version 2.00 - September 04, 2019

1 Course Details

1.1 Calendar Description

This course is focused on finding, collecting and interpreting data of the physical environment. Students will access various online databases, such as meteorological and hydrological time series, and perform and interpret statistical analysis with the data. Issues around calibration and data collection will be explored by performing calibrations and experiments. Students will make a numerical simulation of a dynamic environmental phenomenon. Students will learn to build and query a relational database with both qualitative and quantitative data.

Pre-Requisites: 1 of GEOG*2460, STAT*2040, STAT*2060

Restrictions: ENVS*4110

1.2 Timetable

Lecture: Wed, Fri 8:30 am-9:20 am, ROZH, Room 108

Lab: Fri 11:30 am-02:20 pm, ALEX, Room 020

1.3 Final Exam

None

2 Instructional Support

2.1 Instructional Support Team

Instructor: Genevieve Ali (semester weeks #0, 1, 2, 3, 4, 5 and 7)

Email: gali@uoguelph.ca
Telephone: +1-519-824-4120 x52740
Office: ECBL 2225
Office Hours: By appointment

Instructor: Scott Krayenhoff (semester weeks #6, 8, 9, 10, 11 and 12)
Email: skrayenh@uoguelph.ca
Telephone: +1-519-824-4120 x53694
Office: ALEX (AXEL) 108
Office Hours: By appointment

3 Learning Resources

3.1 Recommended Resources

An Introduction to Error Analysis by John R. Taylor (Textbook)

QA275.T38

Statistics: An Introduction Using R by Michael J. Crawley (Textbook)

3.2 Other

Google is useful for this course.

4 Learning Outcomes

4.1 Course Learning Outcomes

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

1. Assess field data using multiple techniques.
 2. Create and edit visualizations of environmental data with R.
 3. Import, review, manipulate and summarize environmental datasets in R.
 4. Implement statistical analyses and tests in R.
 5. Select appropriate statistical analyses in light of specific objectives.
 6. Quantify errors and uncertainties in data and models.
 7. Create a simulation of a dynamic environmental phenomenon.
 8. Identify and access public environmental databases and use the data in analyses.
 9. Communicate analysis results in writing, orally and graphically according to scientific standards.
-

5 Teaching and Learning Activities

5.1 Lectures

The schedule below is tentative; it may be adjusted through the term as needed.

Week 0, Sept. 6: Syllabus review

Week 1, Sept. 11: What is data?

Week 1, Sept. 13: Descriptive statistics

Week 2, Sept. 18: Data visualization

Week 2, Sept. 20: Comparing data distributions

Week 3, Sept. 25: Correlation and regression I

Week 3, Sept. 27: Correlation and regression II

Week 4, Oct. 2: Hypothesis testing I

Week 4, Oct. 4: Hypothesis testing II

Week 5, Oct. 9: Timeseries analysis

Week 5, Oct. 11: Environmental data quality

Week 6, Oct. 16: How to write a report/paper

Week 6, Oct. 18: Mid-term

Week 7, Oct. 23: Misleading graphs

Week 7, Oct. 25: How to lie (or not) with statistics

Week 8, Oct. 30: Neils Bohr (serves as an introduction to LAB 6)

Week 8, Nov. 1: Numerical simulations - Game of life

Week 9, Nov. 6: Random walk modeling (serves as an introduction to LAB 7; also associated with an introduction to programming in Python)

Week 9, Nov. 8: Options for post-undergrad

Week 10, Nov. 13: Heat flow modelling (serves as an introduction to LAB 8)

Week 11, Nov. 20: Climate change (serves as an introduction to LAB 9)

Week 11, Nov. 22: Analyzing climate timeseries

Week 12, Nov. 27: Data normalization

Week 12, Nov. 29: Writing tips

5.2 Labs

Week 0, Sept. 6: Tutorial – Introduction to R

Week 1, Sept. 13: Tutorial – Introduction to R

Week 2, Sept. 20: LAB 1 – Descriptive statistics and graphs. **Report due Sept. 27**

Week 3, Sept. 27: LAB 2 – Data distributions. **Report due Oct. 4**

Week 4, Oct. 4: LAB 3 – Correlation and regression. **Report due Oct. 11**

Week 5, Oct. 11: LAB 4 – Hypothesis testing. **Report due Oct. 25**

Week 6, Oct. 18: No lab

Week 7, Oct. 25: LAB 5 – Timeseries analysis. **Report due Nov. 1**

Week 8, Nov. 1: LAB 6 – Building heights. **Report due Nov. 8**

Week 9, Nov. 8: LAB 7 – Random walk modelling. **Report due Nov. 15**

Week 10, Nov. 15: LAB 8 – Heat flow modelling. **Report due Nov. 22**

Week 11, Nov. 22: LAB 9 – Final project

Week 12, Nov. 29: LAB 9 – Final project, cont'd. **Report due Dec. 6**

*Attending and actively working through two thirds (i.e., 2 hours) of the lab sessions will earn you a participation bonus of 5% on your overall course grade. While attending lab sessions is not mandatory, it is during those lab sessions that you will be able to get the most help from the course instructor(s). It is not guaranteed that the instructors will be available outside of those periods to help you navigate the nitty-gritty details of writing code in R and Python. It is also strongly recommended that you use the lab sessions to complete as much of the lab exercises and lab reports as possible, as this will mean that you have less to do on your own when you leave the classroom.

**Please note that lab reports are due on the indicated date, at the beginning of the lab session (or earlier).

6 Assessments

6.1 Marking Schemes & Distributions

Name	Scheme A (%)
LAB 1	5
LAB 2	5
LAB 3	10
LAB 4	10
LAB 5	10
Midterm	10
LAB 6	10
LAB 7	10
LAB 8	10
LAB 9	20
Total	100

6.2 Assessment Details

For labs 1 through 8, refer to previous pages for details

Lab 9 (final project) will consist in analyzing future weather data from the Ontario Climate Change Data Portal. The lab will be introduced in class on Nov. 20. Students can complete the lab on their own time, knowing that instructor support will be available during lab sessions on Nov. 22 and Nov. 29.

The mid-term will cover all materials covered in semester weeks #1 through 5.

7 Course Statements

7.1 Communication

You are required to check your uoguelph email on a regular basis, as important messages related to this course may be sent from Courselink. You are also required to check the course website (Courselink) regularly for special announcements, new documents to download (including assignments), etc.

Course instructors will do their best to answer emails within 48 hours (weekends and holidays excepted). However, students should remember that the best time to communicate with instructors is during class time, especially for assignment-related questions.

7.2 Group work

With regards to labs, you can work in groups but the written reports that you hand in should be your own.

7.3 Late work

Assignments (i.e., lab reports in this course) are to be submitted to an instructor, in hard copy, by 11:30 am on the due date (i.e., at the beginning of the lab session on the due date). Online submission of assignments, either via email or via Courselink Dropbox, will not be accepted unless agreed upon ahead of time with one of the instructors.

All late assignments will receive a 10% deduction for each day, or part thereof, that they are late, up to a limit of five (5) days. An assignment that is 6 days late or more is guaranteed to receive a failing grade. Extensions will only be considered for medical reasons or other extenuating circumstances, provided that they are discussed with an instructor well before the due date. Extensions will not be granted once the due date has passed.

You should remember that a technical difficulty is not a valid excuse not to turn in an assignment on time. Don't wait until the last minute as you may get behind in your work. Be sure to keep a back-up copy of all your assignments: to avoid any last-minute computer problems, save your assignments to a cloud-based file storage (e.g., Google Docs, Dropbox) or send copies to your email account so that should something happen to your computer, your assignment can still be submitted on time or re-submitted.

Please note that these rules are not designed to be arbitrary, nor are they inflexible: they are designed to keep you organized, to ensure that all students have the same amount of time to work on assignments, and to help instructors in returning marked materials to you in the shortest possible time.

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-reg-regchg.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>
