ENSP 305 Applied Quantitative Methods in Environmental Science and Policy
Spring 2016
Tuesday/Thursday 12:30 – 1:45pm
PLS 1129

Syllabus

Instructor:
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Office Hours:
By appointment

Course Overview:

This course is intended for students interested in pursuing career or graduate research opportunities that will include management of environmental databases, detailed analysis of environmental data, and/or application of predictive environmental models. The course is also designed to be accessible to non-science majors interested in practical quantitative analysis of environmental data as a component of environmental policy development and environmental law. Students will learn necessary skills to manage and analyze environmental data through hands-on training in commonly used software and a series of topical case studies. Data analysis and data management will be taught using publically available real-world environmental data sets.

Applied topics covered in this course will supplement previous coursework in introductory statistics and mathematics. However, this course is not intended for students with significant previous advanced data analysis/statistical experience or coursework. Credit will only be given for ENSP 305 or AREC 382.

Learning Outcomes

By the end of the course, students will be able to:

- Perform advanced quantitative data analysis using Microsoft Excel, including simple and complex functions, array functions, data filtering, application of lookup tables, importing and exporting data from/to specified file formats and illustrate complex data sets in charts and tables
- Perform statistical analysis using Microsoft Excel and the U.S. EPA software package ProUCL. Statistical analyses will include regression analysis, trend analysis, frequency distributions, correlation analysis, measures of central tendency and variability, and hypothesis testing
- Develop, manage and query environmental databases using Microsoft Access
- Identify common sources of publically available environmental data, including from the USGS, NOAA, U.S. EPA, and DOE

- Understand basic concepts in environmental modeling, including model parameterization, calibration and sensitivity analysis. Develop and apply environmental models using the Microsoft Excel Solver package and selected U.S.EPA-developed environmental modeling platforms.
- Prepare a professional-level environmental report including reporting of raw environmental data, summary tables, quantitative and statistical analyses, descriptive charts, and supplementary text to describe the data and associated analyses.

Required Reading Material:

**Reading materials are available for free on the internet and PDFs will be made available through ELMS Canvas*

James, E.A. et al., 2013. Effect of Weekly Hunting Frequency on Duck Abundances in Mississippi Wildlife Management Areas. Journal of Fish and Wildlife Management, Vol 4, 144-150.

Ofungwu, J. 2014. Statistical Applications for Environmental Analysis and Risk Assessment. John Wiley & Sons, Inc.

Microsoft Excel and Microsoft Access training courses
https://support.office.com/en-ca/article/Excel-2013-training-courses-videos-and-tutorials-aaae974d-3f47-41d9-895e-97a71c2e8a4a

*U.S. EPA, 2004. User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings.

*U.S. EPA, 2009. Guidance on the Development, Evaluation, and Application of Environmental Models. EPA/100/K-09/003. March 2009.

*U.S. EPA, 2013b. Chesapeake Bay Program, 2013.

*U.S. EPA, 2014. AQUATOX (Release 3.1 plus) Modeling Environmental Fate and Ecological Effects in Aquatic Ecosystems. Volume 1: User's Manual.

Evaluation and Grading Criteria

A total of 100 points is possible from four cumulative sources; (a) Mid-term test 20%; (b) Final examination 30%; (c) Project Report 25%; (d) In-class assignments 25%

Grades will be determined based on the following distribution: 100-98% = A+, 97-92 = A, 91-90 = A-; 89-88 = B+, 87-82 = B, 81-80 = B-; 79-78 = C+, 77-72 = C, 71-70 = C-; 69-68 = D+, 67-62= D, 61-60 = D-; ≤ 59 = F.

Course Policies

Late Policy

Unless you see me in advance of the due date and obtain an approved excuse, 5 percent of the total possible points will be deducted from your score for every day the assignment is late, including weekend days. (So, for example, on a 100-point scale, a student who would have earned a 94 on a timely paper will earn 89 if the same paper is turned in one date late, 84 if turned in 2 days late, etc.).

Attendance and Absences:

In accordance with University policy, students are expected to attend classes regularly and on-time. Attendance will not be taken on a regular basis, but failure to attend class is likely to impact your grade because the lecture materials will be a primary source of exam material.

An absence will only be considered excused under the circumstances described by the University's attendance policy, available at: http://www.umd.edu/catalog/index.cfm/show/content.section/c/27/ss/1584/s/1540.

Academic Accommodations:

If you have a documented disability, please contact Disability Support Services 0126 Shoemaker Hall. Each semester students with documented disabilities should apply to DSS for accommodation request forms which you can provide to your instructors as proof of your eligibility for accommodations. The rules for eligibility and the types of accommodations a student may request can be reviewed on the DSS website at http://www.counseling.umd.edu/DSS. Please provide your documentation to me well in advance of any scheduled due dates or exams so that I can be sure that all of your accommodation needs are satisfied.

Religious Observances

The University System of Maryland policy provides that students should not be penalized because of observances of their religious beliefs. Students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances. *It is the responsibility of the student to inform the instructor of any intended absences for religious observances in advance*. Notice should be provided as soon as possible but no later than the end of the schedule adjustment (drop/add) period.

Code of Academic Integrity

Academic dishonesty (such as cheating on exams, plagiarism from the internet or other students, submitting the same paper for credit in two courses without authorization, buying papers, submitting fraudulent documents and forging signatures) is unacceptable and will result in referral to the Student Honor Council after which a determination of a violation will result in a failing grade in the course and a note on your transcript indicating a violation of the rules of academic integrity. The University's Code of Academic Integrity sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student, you are responsible for upholding these standards for this course:

1. No cheating ("intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise");
2. No fabrication ("intentional and unauthorized falsification or invention of any information or citation in an academic exercise");

3. No facilitating academic dishonesty ("intentionally or knowingly helping or attempting to help another to violate any provision of this Code");
4. No plagiarism ("intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise").

For more information on the Code of Academic Integrity or the Student Honor Council, visit www.shc.umd.edu.

Copyright Protection for Class Materials

Commercial firms have been paying students to take notes and collect course materials, which are then copied and sold. Course materials that exist in a tangible medium, such as written or recorded lectures, Power Point presentations, handouts and tests, are copyright protected. Students **may not** copy and distribute such materials except for personal use and with the instructor's permission.

Course Evaluation

Your participation in the evaluation of courses through CourseEvalUM is a responsibility you hold as a student member of our academic community. Your feedback is confidential and important to the improvement of teaching and learning at the University. By completing all of your evaluations each semester, you will have the privilege of accessing online, at Testudo, the evaluation reports for the thousands of courses online at Testudo. Evaluations can be completed at www.courseevalum.umd.edu.

Course Agenda

Part I: Quantitative Software and Environmental Statistics

January 26/28. Working in Microsoft Excel (importing data, data filtering, functions, unit conversions)
Preparation: Complete Excel "Beginner" training courses [86 minutes]
Reading: Ofungwu Ch. 1-2
Lab 1: CASTNET Sulfur Deposition for Beltsville Station

February 2/4. Data Analysis in Microsoft Excel (descriptive statistics, array functions, developing charts, pivot tables)
Preparation: Complete Excel "Intermediate" training courses [76 minutes] (Optional - "Webinar: Simplifying your Excel Data", "Take conditional formatting to the next level")
Reading: Ofungwu, Chapters 5-6 [skim "examples"]
Lab 2: CASTNET Ozone Data – Descriptive Statistics and Charts

February 9/11. Environmental Statistics: Regression analysis, trend analysis, correlation analysis
Reading: Ofungwu, Chapter 10 [skim "examples"]
Lab 3: Hinkley California Chromium Data

February 16/18. Environmental Statistics: Regression analysis, trend analysis, correlation analysis (cont.)
Reading: Ofungwu, Chapter 11 [skim "examples"]
Lab 4: Orange County, California Reservoir/Groundwater Level Data

February 23/25. Environmental Statistics: Hypothesis testing, comparing populations
Reading: Ofungwu, Chapters 8-9 [skim "examples"]
Lab 5: Hypothesis Testing Examples from Ofungwu, 2014

March 3. Case Study: Evaluating wildlife management techniques
March 1: No class
Reading: James et al., 2013
Lab 6: Effect of Weekly Hunting Frequency on Duck Abundances in Mississippi Wildlife Management Area

March 8/10. Case Study: Evaluating Trends of Environmental Indicators in the Chesapeake Bay
Reading: U.S. EPA, 2013. Chesapeake Bay Program, 2013.
Due March 10: Monitoring Report Proposal
Lab 7: Chesapeake Bay Environmental Indicator Trends

March 22/24. Mid-Term Review and Mid-Term

Part II. Environmental Databases

March 29/March 31. Working in Microsoft Access (importing data, data querying, cross-tab queries)
Preparation: Microsoft Access basic tutorials (included with software)

April 5/7. Case Study: SDWA Six-Year Review Contaminant Occurrence Data
Reading: TBD
Lab 8: Safe Drinking Water Act Contaminant Occurrence Data

Part III: Environmental Models

April 12/14. Environmental Modeling Concepts (Parameters, Calibration, Sensitivity Analysis)
Reading: U.S. EPA CREM 2009 Guidance

April 19/21. Developing Environmental Models in Microsoft Excel
Preparation: Excel Solver Help Tutorial
Lab 9: Model calibration to pesticide degradation data

April 26/28. Case Study: U.S. EPA Johnson/Ettinger Model for Vapor Intrusion
Reading: U.S. EPA, 2004. J/E User's Guide.
Lab 10: Johnson/Ettinger Model for Vapor Intrusion

May 3/5. Case Study: U.S. EPA AQUATOX Model for Environmental Fate and Ecological Effects in Aquatic Ecosystems
Reading: U.S. EPA, 2014. AQUATOX User's Manual.
Lab 11: AQUATOX Lake Onodaga Simulation

May 10. Final Examination Review
Due: Final Monitoring Report