Instructor:
Dr. Gregory Schnaar, Lecturer, Environmental Science and Policy Program
Symons 0222
gschnaar@umd.edu

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 publicly 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.

Students are required to have a laptop computer that will be brought to class and should install Microsoft Excel and Microsoft Access prior to the first day of class (software can be obtained at terpware.umd.edu).

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*


Evaluation and Grading Criteria

A total of 100 points is possible from four cumulative sources; (a) Mid-term test 30%; (b) Final examination 30%; (c) Project Report 25%; (d) In-class assignments 15%

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: Learning Quantitative Software

January 27/29. Working in Microsoft Excel (importing data, data filtering, functions)
   Preparation: Complete Excel “Beginner” training courses [86 minutes]

February 3/5. Data Analysis in Microsoft Excel (array functions, lookup tables, 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”)

February 10/12. Statistics in Microsoft Excel and U.S. EPA ProUCL (regression analysis, trend analysis, correlation analysis, hypothesis testing, frequency distributions)
   Reading: ProUCL technical guide (U.S. EPA, 2013) Chapter 6, Chapter 10

Part II. Evaluating Environmental Monitoring Data

February 17/19. Case Study: Assessment of DDT levels in human biomonitoring
   Reading: Ritter et al., 2011

February 24/26. Case Study: Evaluating Trends of Environmental Indicators in the Chesapeake Bay

   Due March 5: Monitoring Report Proposal

March 10/12. Case Study: Evaluating Drinking Water Quality (SDWA Consumer Confidence Reports)

March 24/26. Mid-Term and Review

Part III. Environmental Databases

March 31/April 2. Working in Microsoft Access (importing data, data querying, cross-tab queries)
   Preparation: Microsoft Access basic tutorials (included with software)
   Due April 2: Draft Monitoring Reports

April 7/9. Case Study: SDWA Six-Year Review Contaminant Occurrence Data
   Reading: TBD
Part IV: Environmental Models

April 14/16. Environmental Modeling Concepts (Parameters, Calibration, Sensitivity Analysis)
   Reading: U.S. EPA CREM 2009 Guidance

April 21/23. Developing Environmental Models in Microsoft Excel
   Preparation: Excel Solver Help Tutorial
   April 23: Draft Monitoring Reports returned with red-line comments

April 28/30. Case Study: U.S. EPA Johnson/Ettinger Model for Vapor Intrusion

   Model for Environmental Fate and Ecological Effects in Aquatic Ecosystems
   Reading: TBD

May 12. Final Examination Review
   Due: Final Monitoring Report
**Project Assignment – Environmental Monitoring Report**

Students will develop a professional-level environmental report using publically available data or environmental data available to the student. The report will incorporate reporting of raw environmental data in tables/appendices, summary tables, appropriate quantitative and statistical analyses (e.g., trend analysis), descriptive charts, and supplementary text to describe the data and associated analyses.

Students will identify publically-available environmental data of interest for use in their report and coordinate with the instructor for approval of the proposed subject material. Example topics for monitoring reports include evaluation of environmental indicators (e.g., similar to the Chesapeake Bay reading assigned and discussed in class), groundwater or surface water quality for a subject area, air quality trends on a national or regional level, contaminant loading from particular sectors, ecological biodiversity or population analyses, or energy production or consumption trends. Students are encouraged to find a subject area of interest and relevance to their ENSP concentration area.

**Data Sources:**
Potential data sources include the following list, students are encouraged to research additional sources.

- U.S., International, and State-level Energy Consumption, Production, trade, prices, carbon emissions:
  [http://www.eia.gov/totalenergy/data/monthly/index.cfm](http://www.eia.gov/totalenergy/data/monthly/index.cfm)
  [http://www.eia.gov/environment/data.cfm](http://www.eia.gov/environment/data.cfm)
  [http://www.eia.gov/state/](http://www.eia.gov/state/)

- California Groundwater/Hazardous Waste Site Data:
  [http://geotracker.waterboards.ca.gov/](http://geotracker.waterboards.ca.gov/)

- U.S. Geological Survey Water Data for the Nation

- U.S. EPA National Air Quality Monitoring Network (CASTNET):

- Chesapeake Bay Program Data
  [http://www.chesapeakebay.net/data](http://www.chesapeakebay.net/data)

- Food and Agriculture Organization (FAO) of the United Nations - International Water Resources, Agriculture, Fisheries, Aquaculture Data

- NOAA National Oceanographic Data Center
  [http://www.nodc.noaa.gov/access/index.html](http://www.nodc.noaa.gov/access/index.html)

- U.S. EPA Data Finder (Air Quality, Climate Change, Health Risks, Waste, Water)
  [http://www.epa.gov/datafinder/](http://www.epa.gov/datafinder/)

- World Bank international data (e.g., land cover change, climate change, air quality, water quality)

- United Nations Environmental Data Explorer
  [http://geodata.grid.unep.ch/](http://geodata.grid.unep.ch/)
Samples:
Several example monitoring reports will be posted to ELMS.

Report Proposal:
Students will first submit a “Report Proposal” to the instructor by March 5, which can be included within the text of an email message or as a MS-Word or PDF document. The proposal should include the following:

- Proposed subject material, including location of data collected, type of data, time period of data
- Proposed quantitative analysis to be performed with the subject data, including summary statistics and analyses, and the tables/charts that will be developed
- The reason why the student is interested in the subject data
- A link or attachment with the data to be incorporated within the report

Report Format
The monitoring report should include the following sections:

- Executive Summary – 1 pg. summary of report
- Introduction – Explanation and background information
- Data Collection Methods – Brief summary of how environmental data was collected, on what dates, etc.
- Results – Narrative summary of monitoring results, reference to statistical analyses and summary tables/charts
- Conclusions – Any conclusions drawn from monitoring data, recommendations for future work
- References
- Tables/Figures

Schedule and Due Dates
Students will provide their Report Proposal via email to the instructor by March 5. Draft reports are due April 2. Draft reports are expected to be complete and consistent with instructions listed above. The instructor will provide red-line comments on the draft report by April 23. The final version of the report with revisions based on instructor feedback is due May 12.
### Grading Rubric

**ENSP 342 Op/Ed Written Assignment**

<table>
<thead>
<tr>
<th>Report Proposal (10)</th>
<th>Proposal references available data and suggests well thought-out analyses/charts/tables (10)</th>
<th>Proposal references available data and some analyses (8)</th>
<th>Proposal references available data but does not propose appropriate analyses (5)</th>
<th>Proposal does not reference available data or suggest appropriate analyses (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft report – Quantitative Analyses and Charts (18)</td>
<td>Report includes all necessary components, including statistical analyses, tables and charts with no errors (18)</td>
<td>Report includes some of the proposed components, some errors (15)</td>
<td>Report includes few of the proposed components, several errors (11)</td>
<td>Report does not include proposed components, many errors (8)</td>
</tr>
<tr>
<td>Draft report – Format and Organization (18)</td>
<td>Report follows a logical format and includes sections as listed above (18)</td>
<td>Report mostly follows a logical format and includes sections listed above (15)</td>
<td>Report lacks organization in parts and/or also fails to include all necessary sections (11)</td>
<td>Info is not organized and does not follow format set forth in the assignment (8)</td>
</tr>
<tr>
<td>Final report – Quantitative Analyses and Charts (18)</td>
<td>Report includes all necessary components, including statistical analyses, tables and charts with no errors (18)</td>
<td>Report includes some of the proposed components, some errors (15)</td>
<td>Report includes few of the proposed components, several errors (11)</td>
<td>Report does not include proposed components, many errors (8)</td>
</tr>
<tr>
<td>Final report – Format and Organization (18)</td>
<td>Report follows a logical format and includes sections as listed above (18)</td>
<td>Report mostly follows a logical format and includes sections listed above (15)</td>
<td>Report lacks organization in parts and/or also fails to include all necessary sections (11)</td>
<td>Info is not organized and does not follow format set forth in the assignment (8)</td>
</tr>
<tr>
<td>Final report - Writing Quality/Grammar (18)</td>
<td>Report is well written and free from errors in grammar, spelling, and word usage. (18)</td>
<td>Report is generally well written and mostly free from errors in grammar, spelling, and word usage (15)</td>
<td>Report is not strongly written and contains errors in grammar, spelling, and word usage. (11)</td>
<td>Report is not well written and contains many errors in grammar, spelling, and word usage. (8)</td>
</tr>
</tbody>
</table>

**Total Possible Points: 100**