

CHEM 4/ESS 4: Toxic Chemicals, Great Challenges in Environmental Science

Course Description:

This introductory course will research and discuss the challenges associated with detecting, evaluating and remediating the pollution of toxic chemicals in our environment. We will address these environmental challenges from a chemical perspective to understand the risks of water and air pollution, and to evaluate remediation strategies. This course includes a hands-on field/laboratory research project to gain proficiency designing, conducting and communicating scientific research. Prior background in chemistry is not required.

Meeting Time: T 1:15 – 2:35 pm (in Hall of Sciences S-142)
Th 1:15 – 4:15 pm (in Hall of Sciences S-211)

Instructor: Dr. Ryan Z. Hinrichs (rhinrich@drew.edu)
Office: S-210 Phone: 973.408.3853

Office Hours: T 10:00-11:00 am, W 2:00-3:00 pm, or by appointment.
Open door policy: if my door is open, stop by.

Course Materials: Davis, Devra. *When Smoke Ran Like Water: Tales of Environmental Deception and the Battle Against Pollution*, 2002.
Laboratory notebook and laptop computer with Excel.

Community-Based Research Project:

Many communities located near major transportation routes are concerned with the health impacts of air pollutants, including diesel exhaust. This course will focus on the sources, health impacts, and policy issues surround PM_{2.5} and ultrafine particulates in Newark and Morris County, NJ, and will include field research coordinated with the Ironbound Community Corporation, a community service organization located in the Ironbound neighborhood of Newark, NJ. Students will work in teams to design projects to measure and analyze diesel exhaust in Ironbound and Morris County, and will travel to the communities to conduct their experiments. Analyzed results will be written as a Summary Report for Policy Makers and will be presented to interested community members. *Students will be required to participate in at least two field measurement campaigns in the community, which will last a minimum of eight hours including travel time.* (These time blocks may overlap with the three hour lab section.)

Course Learning Goals:

- Understand community concerns regarding environmental health impacts.
- Develop skills and confidence to safely collect, analyze, and interpret data to address an environmental science research question/hypothesis.
- Effectively search scientific databases to select appropriate articles related to your research project.
- Construct effective visual aids (e.g., charts, tables, graphs, figures) and orally present research projects in a clear, organized, and professional manner.
- Write professional quality reports, including extensive referencing and supporting conclusions with original data and reasoned arguments, for presentation to interested community members.

Your work in this course will be evaluated on the following:

Attendance & participation	5%
Minor assignments	10%
Exam	10%
Laboratory	20%
Research Report	30%
Public Communication Tool	15%
Research Presentations	10%

Attendance & participation:

Given the collaborative nature of this course, which essentially involves one major research project, attendance and participation are mandatory. Three missed classes, for any reason, will result in a maximum participation grade of 2.5%. Four or more missed classes will result in a zero for attendance and participation.

Minor assignments:

Weekly assignments will involve homework problems, reading summaries, and literature searches. Each assignment will be worth approximately 1% of your final grade. Please see policy for late assignments included below.

Exam:

The exam is scheduled for Tuesday, March 15. The content will include quantitative problems and data analysis and interpretation as discussed in this course. There will be **no make-up exams** except in cases of severe illness or family emergency. You must contact me within 24 hours of the scheduled exam time to reschedule; failure to do so will result in a zero for the exam.

Laboratory:

Thursday classes will meet in the laboratory to allow for data collection and analysis associated with the diesel exhaust research project, and on several occasions to complete laboratory experiments (e.g., statistical analysis and fluorescence detection of PAHs). You are expected to keep a laboratory notebook to record procedures, data, and analysis calculations. For laboratory experiments, reports will be due one week following the lab; these reports will account for approximately 10% of your grade. Your laboratory notebook will account for 5% of your grade. Self, peer, and instructor evaluations of your participation and performance in lab will account for 5% of your grade.

Research Report:

Analyzed results will be written as a Summary Report for Policy Makers to be presented to collaborators and interested community members. You will be assigned a specific section of this report (e.g., background information, research project design, data analysis and discussion) for which you will write the initial draft; this assignment will account for 10% of your grade. The complete report will be the result of collation of all drafts, which will require substantial revisions; comments and revisions of the complete report will account for 10% of your grade. Self, peer, and instructor evaluations of your contributions to your research team and final report will account for 10% of your grade.

Public Communication Tool:

The assignment: You are a graphic designer / copy writer at an advertising agency. A community organization has contacted your agency to design a campaign to inform its community citizens about the science and public health impacts of PM_{2.5}. Your specific assignment is to create a communication tool that illustrates one aspect of this research. The communication tool may take on many forms including, but not limited to, a magazine ad, an elementary school educational activity, a t-shirt, etc. The goal for the communication tool is to take what can be complicated scientific concepts and translate them visually so that they may be easily understood by someone with little or no science background. A two page formal description of your project must accompany your public communication tool. A formal proposal, worth 5% of your grade, is due on Thursday, March 3. The final product and report, worth 10% of your grade, will be presented to the class on Tuesday, March 29. A rubric for the public communication tool is attached to the complete assignment description.

Research Presentations:

An oral presentation of your research team's data, analysis, conclusions and recommendations will be given by your team during the final weeks of the semester. 5% of your grade will be based on the quality of your group's presentation, and 5% will be based on your contributions to the group presentation as assessed by a self and peer evaluation.

Writing Assignment Formatting:

All written assignments must be 12 pt font, double-spaced, with 1" margins. All written assignments must be uploaded to Moodle by the start of class (1:15 pm) on the due date; assignments posted after this time will be considered one day late and subject to the Policy for Late Assignments detailed below.

Policy for Late Assignments:

Unless you receive written permission from the course instructor at least 24 hours before an assignment is due, the following policy is in effect:

Assignments turned in **one day** late will be graded with a maximum grade of **90%**.

Assignments turned in **two weekdays** late will be graded with a maximum grade of **80%**.

Assignments turned in **three weekdays** late will be graded with a maximum grade of **70%**.

Assignments turned in **four weekdays** late will be graded with a maximum grade of **60%**.

Assignments turned in **five or more weekdays** late will be graded with a maximum grade of **50%**.

Academic Accommodations:

Should you require academic accommodations, you must file a request with the Office of Educational Affairs (BC 114, extension 3327). It is your responsibility to self-identify with the Office of Educational Affairs and to provide me with the appropriate documentation from that office at least one week prior to any request for specific course accommodations. There are no retroactive accommodations.

Tentative Schedule

Class	Topics, Readings & Assignments
Tuesday, January 25	Syllabus / Introduction. Diesel exhaust in the Ironbound neighborhood.
Thursday, January 27	Read: Davis, <i>When Smoke Ran Like Water</i> , pp. xi – xx, 1 – 88. Lab: Using statistics to differentiate between samples.
Tuesday, February 1	Experimental statistics and causation vs. correlation. Read: Davis, <i>When Smoke Ran Like Water</i> , pp. 89 – 158. Assignment: Environmental statistics problem set.
Thursday, February 3	Environmental Justice Tour, Ana Barptista, Ironbound Community Corp. Please arrive at 1:00 pm. In case of inclement weather, snow date will be 2/10/2011. Read: Davis, <i>When Smoke Ran Like Water</i> , pp. 159 – 222.
Tuesday, February 8	Experimental design – what is a testable question? Research Projects: group selection and planning Read: Pope III et al., “Fine-particulate air pollution and life expectancy in the United States.” Available on Moodle – you must print it out and bring hardcopy to class. Assignment: Complete article critical thinking questions.
Thursday, February 10	Introduction to PM _{2.5} and ultrafine particulate handheld monitors. Research project planning for Morris County. Read: Kinney et al., “Airborne concentrations of PM _{2.5} and diesel exhaust particles on Harlem sidewalks.” Bring hardcopy to class. Assignment: Complete article critical thinking questions.
Tuesday, February 15	Robert Laumbach, UMDNJ – Robert Wood Johnson Medical School Assessing health impacts of atmospheric pollutants Read: EPA Star Grant Proposal Group selection of article for presentation (see 2/22) from list below: 1. Highwood & Kinnersley, “When smoke gets in our eyes: The multiple impacts of atmospheric black carbon on climate, air quality & health.” 2. Houston et al., “Diesel truck traffic in low-income and minority communities adjacent to ports.” 3. Levy et al., “Fine particulate matter and PAH concentration patterns in Roxbury, MA.” 4. Patel et al., “Ambient metals, elemental carbon, and wheeze and cough in NYC children through 24 months of age.”
Thursday, February 17	Lab A: Morris County field measurements. Lab B: Fluorescence detection of polycyclic aromatic hydrocarbons. Read: Finlayson-Pitts and Pitts, <i>Chemistry of the Upper and Lower Atmosphere</i> , Chap. 10 abbr., “Airborne polycyclic aromatic hydrocarbons.”

Tuesday, February 22	Literature presentations: your group will be assigned an article to present on 2/15. You must read all selected articles, not just the one you're presenting. Four 15 minute presentations.
Thursday, February 24	Lab A: Fluorescence detection of polycyclic aromatic hydrocarbons. Lab B: Morris County field measurements.
Tuesday, March 1	Possible fieldtrip: NJDEP monitoring site, Elizabeth, NJ. Assignment: Literature search article and summary due (in hardcopy).
Thursday, March 3	Lab: Morris County field measurement data analysis. Assignment: Proposals for Public Communication Tool due.
Tuesday, March 8	Spring break.
Thursday, March 10	Spring break.
Tuesday, March 15	Exam.
Thursday, March 17	Lab A: Ironbound field measurements. Lab B: Fluorescence detection of polycyclic aromatic hydrocarbons.
Tuesday, March 22	Discussion of Morris County data. Read: Davis, <i>When Smoke Ran Like Water</i> , pp. 223 – 282.
Thursday, March 24	Lab A: Fluorescence detection of polycyclic aromatic hydrocarbons. Lab B: Ironbound field measurements.
Tuesday, March 29	Discussion of field measurement experiences. Presentation of Public Communication Tools. Assignment: Final Public Communication Tools due.
Thursday, March 31	Lab A: Ironbound field measurements. Lab B: Data analysis. Assignment: PAH laboratory report due.
Tuesday, April 5	Discussion of Ironbound data. Discussion of Research Report structure and content.
Thursday, April 7	Lab A: Data analysis. Lab B: Ironbound field measurements.
Tuesday, April 12	Nicky Sheats, Director Center for Urban Policy, Thomas Edison State College Environmental justice and policy goals. Read: tbd Assignment: Research Report: Individual section drafts due.
Thursday, April 14	Presentation and collation of research project findings. Research Report: Section group discussions.
Tuesday, April 19	Policy options surrounding particulate pollution continued. Read: tbd
Thursday, April 21	Research Report: Section group revisions – final draft due at end of lab.
Tuesday, April 26	Final discussion of research project and experience.
Thursday, April 28	Final discussion of research project and experience.