

Syllabus

Environmental Science 3131, Environmental Physics, Spring Semester 2015

Professor: David Mulla

Lecture: Tuesday and Thursday 10:15-11:30 am, 375 Borlaug Hall

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Office Hours: Tuesdays 11:30 am - 12:30 pm Borlaug Hall 564

Web Site: <https://ay15.moodle.umn.edu/course/view.php?id=8183>

Required Course Materials

- Text - *An Introduction to Environmental Biophysics* by Campbell and Norman (available at the St. Paul Bookstore 612 624-9200)
- A scientific calculator

Prerequisites: Introductory College Physics such as Physics 1101

Course Overview: The science of environment constitutes many complex processes that may be studied collectively and synergistically from a physical, chemical, biological, or social-economic perspective. The complexity of an even seemingly simple environmental problem can be enormous. In this class we will examine, using basic concepts and principles of classic and modern physics, a broad range of environmental problems arising from the interaction between humans and the natural environment. We will cover various forms of pollution, including anthropogenic greenhouse gas emissions and their effect on global climate change. In addition to the physical principles, we will discuss practical examples involving heat, mass and energy budgets, pollution, and climate change.

Lectures: Classes will be mostly lectures, mixed with some interactive sessions, and group discussions. In lecture we will introduce new materials, discuss key points and broader issues, and analyze sample problems. Assigned reading will be required in advance of class, and class-time will generally work to organize and interpret the knowledge accumulated in your reading and in other course activities. Class attendance is required. It will be very difficult for you to keep up with the work if you miss classes. A detailed lecture schedule will be handed out during the first lecture and a brief description of the topic areas can be found at the end of the syllabus.

Course-Specific Student Learning Outcomes

The specific Student Learning Outcomes (SLOs) for this course are related to the University of Minnesota's SLOs. A few examples of SLOs and their means of assessment are provided below:

- Apply basic principles of physics to environmental science. (3)
 - Assessment:
 - Application of principles of conservation of energy to an energy balance at the land surface

- Use principles of forced convection to estimate boundary layer conductances for heat and gas transport across leaf surfaces
 - Estimate radiant energy fluxes from the atmosphere to plants and animals
- Estimate changes in temperature, wind and gas concentration with height above the land surface (1)
 - Assessment:
 - Use log-linear transformations and linear regression in Excel based calculations of the temperature, wind and gas profiles above the land surface

Homework: Homework problems will be assigned and graded almost every week.

Tests: A total of three tests (two mid-terms and a final exam) will be given during the semester. There will be a mix of simple conceptual questions (multiple choice), short-answer problems that require some quantitative skills and questions that involve mathematical calculations. On short-answer problems you need to make your solutions complete and understandable. It is also important to show the steps you took in calculating your answers. All exams (including final exam) are to be taken home, and will require some calculations. Take home exams are open book exams. It is not allowable to work with others on exam questions. Graduate students taking the course will have a few extra questions on the exams that undergraduate students don't have to answer.

Grading: The class grades will use the +/- grading system. A = 90-100, A- = 85-89, B+ = 80-84, B = 75-79, B- = 70-74, C+ = 65-69, C = 60-64, C- = 55-59, D+ = 50-54, D = 40-49, F < 40. If grades run high, grades will be assigned on an absolute basis. If exams prove more difficult than the scale above, I will curve the grades to give everyone a decent credit for the effort and progress you have made in the class. Final grades will be based on: class/discussion participation 10%, homework 20%, two mid-term exams 40% (20% each), and final exam 30%. This course abides by university grading policies: <http://www.policy.umn.edu/Policies/Education/Education/GRADINGTRANSCRIPTS.html>.

Academic dishonesty in any portion of the academic work (especially take home exams) for a course shall be grounds for awarding a grade of F or N for the entire course.

Course Topics

- Environmental Temperature and Thermal Regimes
- Environmental Moisture
- Transport of Environmental Pollutants

- Matter and Energy Exchange
- Energy Budget of Crops, Humans and Animals
- Environmental Measurements
- Environmental Issues

Student Mental Health and Stress Management

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. University of Minnesota services are available to assist you with addressing these and other concerns you may be experiencing. You can learn more about the broad range of confidential mental health services available on campus via <http://www.mentalhealth.umn.edu/>.