# Ecosystem Ecology ENST 360

## Spring Semester 2014 - Syllabus

**Instructor:** Dr. Peter May
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**Office Hours:** Meetings may be scheduled by appointment at any time and I will always be available prior to and immediately after class.

**Class meetings:**

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|---|---|
| Section 0101 | Mondays, 12pm-12:50pm LECTURE |
| | Mondays, 1pm-1:50pm DISCUSSION |
| Section 0101 | Tuesdays, 2pm-5:50pm LAB |

Lecture will be held in ANS 0422
Lab will be held in ANS 0538

**Required Textbook:**
Eugene P. Odum and Gary W. Barrett. 2005. *Fundamentals of Ecology* (5th edition). Thompson, Brooks/Cole. 598pp.

**Supporting Texts and Papers:**
The following texts are considered good additional readings but you will *not* be required to purchase them. Chapters from these and digitally uploaded papers will be distributed as needed.

Daly, H. E. and K. N. Townsend. 1994.*Valuing the Earth:Economics,Ecology,Ethics*. MIT press.

Golly, F.B. 1993. *A History of the Ecosystem Concept in Ecology: More Than the Sum of It's Parts.* Yale University Press.

Hagen, J.B. 1992. *An Entangled Bank: The Origins of Ecosystem Ecology*. Rutgers University

Kangas, P.C. 2004. *Ecological Engineering: Principles and Practice*. Lewis Publishing.

Odum, E.P. 1971. *Fundamentals of Ecology* (3rd edition). W.B. Saunders Co.

Odum, H.T. 1971. *Environment, Power, and Society*. John Wiley and Sons, Inc.

Odum , H.T. and E.C. Odum. 2000. *Modeling for All Scales: An Introduction to System Simulation.* Academic Press.

Odum , H.T. and E.C. Odum. 2001. *A Prosporous Way Down: Principles and Policies*. University Press of Colorado.

Wennerston, J.R. 2008. Anacostia, *The Death and Life of an American River*. The Chesapeake Book Co.

**Course description**
The study of ecology has a long and interesting history, from early society's efforts to understand and alter their environment as a matter of survival to the challenges the modern world is facing that are global in scale. Through the course text, distributed supplemental chapter readings and an understanding of selected papers from the scientific literature, this course will cover the essential concepts and principles of ecosystem ecology as well as its history and past and present controversies. Several of the basic methods and tools of field research and the applied management of ecosystems will be discussed and demonstrated with several field excursions in the natural environs of the DC area. Central to this course will be the understanding that modern human society is an integral part of nature, with the power to impact and influence elements of the natural world at multiple scales. An analysis of economic and social policy implications for the biosphere will be discussed.

**Lectures**
Each weeks lecture topics will follow the broad outline of the course text but will also include additional readings or other media. Readings from the text and other material provided the previous week will be assigned to accompany each lecture. Be sure to complete the relevant readings before each week's lecture. Exams will be based on the lecture material and additional topics as they arise in lecture discussion. If you cannot make a lecture or a lab please notify me in advance if at all possible so that other arrangements to cover the material can be made.

**Discussions**
A large part of each class session will be devoted to discussion of one or more papers from the scientific literature and additional chapter readings that will provided. Papers for discussion will be selected to reinforce understanding of the concepts introduced in lecture. This is an important part of the class and participation in discussions will be graded (10% of the overall grade), so make sure you read the paper(s) beforehand and come prepared to discuss them.

**Field trips**
There will be two field trips during lab. Each trip will profile a separate natural and restored ecosystem (freshwater tidal marsh and non-tidal Piedmont and Coastal Plain streams) where particular methods of field research and ecological assessment will be demonstrated.

**Grading**
Attendance at all field trips and class/lab sessions is mandatory. If you miss more than two classes it will affect your grade.

Grading will be calculated as follows:

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|---|---|
| Mid-term exam | 30% |
| Final exam | 30% |
| Lecture and Lab Reports/Quizzes | 20% |
| Paper assignments | 10% |
| Participation in discussions | 5% |
| Class and lab attendance | 5% |

**Code of Conduct**
Academic Integrity: Because the University of Maryland is an academic community in which commitment to the principles of truth and academic honesty are essential, the Code of Academic Integrity prohibits students from committing the following acts of academic dishonesty:

1) Cheating – intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
2) Fabrication – intentional and unauthorized falsification or invention of any information or citation in any academic exercise.
3) Facilitating academic dishonesty – intentionally or knowingly helping or attempting to help another violate any provision of the Academic Code.
4) Plagiarism – intentionally or knowingly representing the works or ideas of another as one's own in any academic exercise.

Students with Disabilities: If you have a documented disability and wish to discuss academic accommodations, please contact me as soon as possible.

A note about course evaluations from the administration: "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 as well as to the tenure and promotion process. You can go directly to the website (www.courseevalum.umd.edu) to complete your evaluations. By completing all of your evaluations each semester, you will have the privilege of accessing the summary reports for thousands of courses online at Testudo."

| **Date** | **Scheduled Topics & Relevant Reading for Lectures and Lab** |
|---|---|
| Sept. 3 | Lecture: Introductions and course expectations, syllabus review |
| Sept. 8 | Lab: Overview of lab requirements and ecosystem paper research |
| Sept. 10 | Lecture: Chapters 1 and 2 of Odum and Barrett: The Scope of Ecology<br>History of ecology and the ecosystem concept<br>Levels of ecological organization hierarchy<br>Reductionism vs. holism |
| Sept. 15 | Lab: Calculation of different methods of urban water treatment |
| Sept. 17 | Lecture: Chapter 6: Individuals and population ecology<br>Rate of natural increase<br>Concept of productivity<br>Energy partitioning in food chains and food webs<br>Carrying capacity and population fluctuations<br>Population regulation and metapopulation dynamics<br>Energy partitioning and optimization: r and K selection<br>Life history traits and tactics |
| Sept. 22 | Lab: Tour of LEED Platinum DC School |
| Sept. 24 | Lecture: Chapter 7: Community ecology<br>Species interactions<br>Coevolution, cooperation, competition, commensalism, mutualism and coexistence<br>Predation, herbivory, parasitism and allelopathy |

Concepts of habitat, ecological niche and guild
Concept of biodiversity
Populations and communities to ecosystems and landscapes

Sept. 29 Lab: Light-dark bottles, ecosystem metabolism

Oct. 1 Lecture: Chapter 8: Ecosystem development
Strategy of ecosystem development
Concept of the climax
Evolution of the biosphere
Relevance of ccosystem development to human ecology
Artificial selection and genetic engineering
Relevance of ecosystem development to human ecology

Oct. 6 Lab: Litter decomposition, field deployment

Oct. 8 Lecture: Chapter 9: Landscape Ecology
Definition and relation to levels of organization concept
Landscape elements
Biodiversity at the community and landscape levels
Island biogeography
Neutral theory
Temporal and spatial scale
Landscape geometry
Concept of landscape sustainability
Domesticated landscapes and new ecosystems

Oct. 13 Field Trip 1, restored urban headwater stream systems

Oct. 15 Lecture: Chapter 10: Regional Ecology
Major Ecosystem Types and Biomes
Marine / estuarine ecosystems
Freshwater ecosystems
Terrestrial biomes
Human designed and managed systems

Oct. 20 Lab: Mid-Term Exam

Oct. 22 Spring Break No Class

Oct. 27 Spring Break No Class

Oct. 29 Lecture: Chapter 5: Limiting and Regulatory Factors
Concept of limiting factors in populations
Factor compensation and ecotypes
Conditions of existence as regulatory factors
Review of other physical limiting factors
Biological magnification of toxic substances
Anthropogenic stress as a limiting factor

Nov. 3 Lab: Forest structure

Nov. 5 Lecture: Chapter 4: Biogeochemical Cycles
Basic types of biogeochemical cycles
Cycling of nitrogen, phosphorus, sulfur, carbon
The hydrologic cycle
Turnover and residence times
Watershed biogoechemistry
Recycling pathways, regeneration and global climate change

Nov. 10 Lab: Marsh and stream sampling methods and analysis

Nov. 12 Lecture: Guest lecture
Chapter 3: Energy in Ecological Systems
Fundamental concepts related to energy: the laws of thermodynamics
Solar radiation and the energy environment
Energy quality: emergy
Metabolism and individuals
Complexity theory, energetics of scale
Concepts of carrying capacity and sustainability
Net energy concept
An energy based classification of sustainable and unsustainable ecosystems
Energy futures, energy and money

Nov. 5 Lab: Field Trip 2, restored tidal and non-tidal wetlands boat trip

Nov. 10 Lecture: Chapter 11: Global ecology
Toward sustainable civilizations: why collapse historically happens
Ecological-societal gaps in achieving sustainability
Global sustainability scenarios: A prosperous way down
Long-term transitions, energy and sustainability in future systems

Nov. 12 Lab: Greenbelt Lake field surveys

Nov. 17 Lecture: Ecological Engineering: Principles and Practice
Relationship to ecology and engineering
Principles of ecological engineering
Ecology as the source of inspiration in sustainable design
Restoration ecology

Nov. 19 Lab: Lake Artemesia field surveys

Nov. 24 Lecture: Exotic species and their management implications
New ecosystems and self-organization
Biotechnology and technoecosystems
The use of high and low technology in the built environment to achieve sustainability goals

Nov. 26 Lab: Leaf litter decomposition analysis

Dec. 1 Lecture: Valuing the Earth: Economics, Ecology, Ethics
Ultimate Means and Biophysical Constraints in Sustainable Systems
Ethics: The Ultimate End and Value Constraints
Economics: Interaction of Ends and Means in Sustainable vs. Collapse Economy

Dec. 3 Lab: Future Planet Sustainable Design

Dec. 8 Wrap up for the semester and final thoughts on ecology, environment, power and society in the future

Dec. 10 Lab: Course review for Final Exam.

Dec. 15-20 Final Exam Week, Exam date and time TBD