ECOSYSTEM DYNAMICS - BIOL 5034
Fall 2007
DRAFT

TIME: 2:30-3:45 Monday, Wednesday; Lab: TBA.
ROOM: 3004 Derring Hall, Lab TBA
INSTRUCTORS: Dr. J. R. Webster, 1000 Derring Hall
231-8941, jwebster@vt.edu
Dr. J. E. Barrett, 1010 Derring Hall
231-3827, jebarre@vt.edu

TEXTBOOK: Biogeochemistry. W.H. Schlesinger. 1997. Academic Press, San Diego.

READING ASSIGNMENTS:
Additional readings for this course will come from periodical literature. Copies of the readings will be available from the instructors. About every 5th lecture period will include a discussion of assigned readings.

HOMEWORK:
There will be several homework assignments during the later part of the semester. Homework will be graded and there will be a 10%/wk penalty for late submission.

EXAMS:

19 Sept	Midterm
29 Oct	Midterm
5 Dec	Midterm
12 Dec, 4:45	Final exam (written projects due)

GRADE:

Homework assignments	20%
Midterm exams	50%
Project reports (oral 5%, written 25%)	30%

PREREQUISITES:
Biol 2408 -- a general ecology course
Math 2015 -- some experience with calculus

WHAT YOU'LL NEED FOR THE COURSE:
Access to a computer
A C++ compiler (available from the instructor)

COURSE PROJECTS:
This course will include a number of field and laboratory projects. Each project will be started by the class as a whole and then completed and reported by an individual. All field studies will be done at Webster's Research Park in Giles Co. Oral reports will be 3 Dec, and written reports will be due on 15 Dec. The written report should be in the form of a journal article, 10-15 pages including tables and figures.

Potential Projects:
Comparison of decomposition in various ecosystems
Measurement of primary production in a stream
Comparison of soil nitrogen mineralization and nitrification in several terrestrial ecosystems
Comparison of soil respiration in several terrestrial sites
Measurement of forest biomass
Measure feeding rate and assimilation efficiency of an animal
Determine the effect of temperature on animal or microbial respiration
Measure litterfall in a forest
Compare dead wood in forest and/or stream sites
Monitor meteorlogic and hydrologic variables and estimate a watershed water budget
Measure forest floor and soil organic matter in logged and unlogged areas
Look at changes in stream and/or rain water chemistry during storms
Measure nutrient retention in a stream

Many other topics are possible, as long as they are ecosystem ecology, not population or community studies

LECTURE OUTLINE:

I. Introduction -- Definition of ecosystem
A. Hierarchies of biological systems

II. Energy Flow in Ecosystems (Chapter 5 and parts of chapters 7, 8, and 9)
A. Basic ecological principles
B. Primary production
C. Secondary production
D. Detritus and detritivores

III. Nutrient Cycling in Ecosystems
A. Hydrologic cycle (Chapter 10)
B. Carbon cycle (Chapter 11)
C. Nitrogen cycle (Chapter 6 and 12)
D. Phosphorus cycle (Chapter 12)
E. Watershed nutrient budgets
F. Ecological Stoichiometry

IV. Ecosystem Response to Disturbance

V. The Role of Individual Species in Ecosystems
A. Redundancy
B. The role of consumers

VI. Computer Simulation of Ecosystems using C++
A. Differential equations in ecology
B. Solving differential equations using a computer
C. Developing a simple ecosystem model
D. Adding complexity to the model

VII. The Ecosystem Concept
A. Historical development of the ecosystem concept
B. The past and future of modeling in ecosystem ecology