PCB 5338: PRINCIPLES OF ECOSYSTEM ECOLOGY

SYLLABUS-FALL 2016

CREDIT DESCRIPTION:

This course will explore the basic principles that govern structure and function across all ecosystems. We will begin by examining the exchange of energy and materials between ecosystems and the atmosphere, focusing much of our attention on ecosystem carbon cycling and nutrient constraints over the carbon cycle. We will examine transfers of energy from primary producers to higher trophic levels and how herbivory and disturbances such as fire affect carbon and nutrient cycling. We will examine how elevated atmospheric CO₂, changing climate, increased atmospheric nitrogen deposition, biological invasions, and losses of biodiversity alter ecosystem processes. We will also discuss human dependence on ecosystems and how our activities are altering systems at local, regional, and global scales.

This semester, the course is scheduled for one 55 minute period on Monday and one 75 minute periods on Monday and Wednesday. Discussions of current papers will be dispersed throughout the course to expose you to a wide range of literature and to give you the opportunity to practice the language of ecosystem ecology. Participation in both the lecture and discussion portions of the course is key, and you will be graded on your effort.

PRE-REQUISITES AND CO-REQUISITES:

Biology, General Ecology, Chemistry

COURSE OBJECTIVES:

- Teach the basic principles and concepts of ecosystem ecology
- Introduce current uncertainties and controversies in ecosystem ecology
- Increase awareness of human-induced global changes and how they are affecting ecosystem processes
- Increase awareness of human dependency on ecosystem processes
- Apply understanding of ecosystem ecology to environmental problem solving

CREDIT HOURS: 3 credits

COURSE FEES: None

MEETING TIMES:

Monday Period 7 1:55 pm-2:45 pm

Wednesday Period 7 & 8 1:55 pm-3:50 pm

MEETING PLACE:

McCarty A (MCCA) room 2186

INSTRUCTOR:

Jennie DeMarco, Ph.D. Department of Biology Office: 417 Carr Hall Email: jennied@ufl.edu Website: www.jenniedemarco.com

OFFICE HOURS:

Monday 9:30 am-10:30 am

Wednesday 10:30 am-12:30 pm

and by appointment

COURSE WEBSITE:

Course materials and related information will be posted on the course E-Learning (CANVAS) website. You are responsible for all announcements made in class and/or posted on the course website for this course at http://lss.at.ufl.edu

REQUIRED MATERIALS:

The required text for the course is a textbook written by F. Stuart Chapin, Pamela Matson, and Peter Vitousek, Principles of Terrestrial Ecosystem Ecology, second edition. **This text is available for a free download via a UF library purchase of packaged materials.** To access it, you must be logged into your Gatorlink account on an on-campus computer or a VPN link. Click on this link: <u>http://link.springer.com/book/10.1007/978-1-4419-9504-9/page/1</u>. You can then download the text. Please contact your instructor if you have any difficulties. Readings from this text are required and you will be quizzed on their content in class.

There will also be required readings from the primary literature that will supplement lecture materials. These will be posted on this website. The purpose of these papers is to expose you to both classic and current ideas and to promote your understanding of ideas through discussion. Weekly readings and video lectures will be posted on the course website.

COURSE OVERVEIW:

Welcome to Ecosystem Ecology. I hope that you will come away from this course with a better understanding of the basic principles that govern structure and function across all ecosystems. At the same time, I hope that you will come away with a better appreciation of the unique nature of the ecosystems where you work and live. My goal is to give you the conceptual tools that will help you understand both the processes that underlie similarities among all ecological systems, and the processes that generate unique aspects of individual systems. We will also tackle some of the grand challenges of our time: global warming, rising atmospheric CO₂, loss of biodiversity, invasions by non-native species, pollution of lakes, rivers, and coastal waters—and how these environmental problems affect ecological systems. My goal for the course is not necessarily to turn all of you into ecosystem ecologists (although that would be great!). Rather, I hope to provide you with a basic understanding of the principles of ecosystem ecology that will help you progress in your own studies of ecological systems.

The course is roughly divided into halves over the course of the semester. The first half will provide some background on the history of ecosystem ecology and on climate and soils, but will focus primarily on element cycling, particularly carbon and nutrient cycles. We will examine the energy base of ecosystems—what controls carbon fixation by plants and what is the fate of that fixed carbon. We will also study nutrient inputs to, cycling through, and losses from ecosystems. The second half will focus on interactions and perturbations, including those resulting from human-induced global changes. We will examine transfers of energy from primary producers to higher trophic levels and how herbivory and disturbances such as fire affect primary production and nutrient cycling. We will examine how elevated atmospheric CO₂, changing climate, increased atmospheric nitrogen deposition, biological invasions, and losses of biodiversity alter ecosystem processes. We will also discuss human dependence on ecosystems and how our activities are altering systems at local, regional, and global scales.

COURSE POLICIES:

CONDUCT IN CLASS:

Only approved electronic devices may be used in class. Approved electronic devices are laptop computers (when used to take notes or otherwise participate in classroom activities) and voice recording devices. Unapproved electronic devices include cell phones, video recorders, digital cameras and MP3 players.

ATTENDANCE POLICY:

Attendance is required of all registered students. The instructor should be notified in advance of planned absences and as soon as possible for unplanned absences.

MAKE-UP POLICY:

Make-up work (lecture and discussion participation, quizzes, discussion leadership, etc.) will not be given unless student has an illness documented by a doctor's note or the student notifies the instructor of a conflict prior to the absence and makes an alternative plan to complete the work.

UF POLICIES:

UNIVERSITY POLICY ON ACCOMMODATING STUDENTS WITH DISABILITIES:

Students requesting accommodation for disabilities must first register with the Dean of Students Office (<u>http://www.dso.ufl.edu/drc/</u>). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive, therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

UNIVERSITY POLICY ON ACADEMIC MISCONDUCT:

All students registered at the University of Florida have agreed to comply with the following statement: "I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University."

In addition, on all work submitted for credit the following pledge is either required or implied: "On my honor I have neither given nor received unauthorized aid in doing this assignment."

If you witness any instances of academic dishonesty in this class, please notify the instructor or contact the Student Honor Court (392-1631) or Cheating Hotline (392-6999). For additional information on Academic Honesty, please refer to the University of Florida Academic Honesty Guidelines at: <u>http://www.dso.ufl.edu/judicial/procedures/academicguide.html</u>.

NETIQUETTE: All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions and chats.

GETTING HELP:

UF Counseling Services

Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.

Career Resource Center, Reitz Union, 392-1601, career and job search services.

Many students experience test anxiety and other stress related problems. "A Self Help Guide for Students" is available through the Counseling Center (301 Peabody Hall, 392-1575) and at their web site: <u>http://www.counsel.ufl.edu/</u>.

GRADING:

In-class assignments (10 assignments = 10 % of course grade): The purpose of these problem sets is to exercise your quantitative skills and keep you thinking actively about the material. They may include short-answer questions, short-essay questions, and calculations. Essay questions will require approximately a paragraph-length answer. Complete, well-structured paragraphs are unnecessary. Phrases, sentences or "bullet points" that show what you know about a topic are sufficient. Possible kinds of questions that might be included on an exam are "What are the major factors that control rates of X in an ecosystem?" or "Given what you know about the controls over process X, how would you expect that process to

differ in Ecosystem A and Ecosystem B?" or "Given a litter pool size of x and a litter fall input rate of y, calculate the decomposition constant for an ecosystem at steady state." These problems will be completed in class in groups and will be collected at the end of the class and graded. **Note**: *Each student must turn in their own assignment in order to receive full credit.*

Online quizzes (10 quizzes = 10 % of course grade): These will be taken in CANVAS and will be due weekly before class on Monday. The purpose of the quizzes is to test your comprehension of the assigned reading in the text book and the video lectures.

Discussion participation (10 discussions = 10 % of course grade): You grade for discussion participation will be a combination of your grade on your pre-class summary of the paper and your in-class participation in class discussions. My expectation is that you will keep abreast of readings and lecture materials, and that you will come to each class prepared with questions and a mindset that will enable you to interact with me and your peers in a lively way. The pre-class summary will be submitted in CANVAS prior to class on Wednesday.

In class discussion participation will be graded on the following scale:

<u>High (full credit)</u>: many contributions, prepared questions, animated responses to peers or instructor, participation in multiple topics, "active listening."

<u>Medium (Half credit)</u>: some contributions, prepared questions, responses to direct questions from peers or instructor, participation in a few topics, "active listening."

Low (1/4 credit): few contributions, no prepared questions, few responses to direct questions, lack of eye contact or "active listening."

Discussion leadership (1 assignment = 10 % of course grade): Each student will be in charge of leading lively discussions of primary literature. Weekly readings will be selected by your instructor.

Discussion leadership will be graded on the following components:

<u>Preparation</u>: organization and clarity of presentation, evidence that a format for discussion has been planned.

<u>Familiarity with readings</u>: careful reading of paper evidenced by ability to locate specific information in paper, ability to explain goals, results and conclusions, and identification of problems or difficult areas.

<u>Background knowledge of the paper</u>: Who are the authors'? What else have they published? How "important" are they to ecosystem ecology? Does the paper have web appendices? Were there "News and Views" published about the paper? Was there press coverage? How many times has it been cited? Have retractions or errata been published?

<u>Ability to draw peers into discussion</u>: this could take many forms, including questions posed, written responses required, brainstorming, debates, games, drawing "mind-maps..." The goal is to have a lively discussion where most students participate.

The biome project (1 assignment x 20 % of course grade): Students will work in teams to construct estimates of pools, fluxes and flows for a chosen biome and to assess vulnerability of your biome to climate change. Each student will submit a final report at the end of the semester. In addition, each student will peer-review another student's biome report.

Exams (2 exams = 40 % of your course grade): You will be required to take a mid-term and final exam to assess your knowledge and comprehension of the material.

GRADING SCALE:

Point Range (%)	Letter Grade	GPA equivalent
≥ 90.00	А	4.0
86.7 - 89.9	A-	3.67
83.3 - 86.6	B+	3.33
80.0-83.2	В	3.0
76.7 – 79.9	B-	2.67
73.3 - 76.6	C+	2.33
70.0 - 73.2	С	2.0
66.7 - 69.9	C-	1.67
63.3 - 66.6	D+	1.33
60.0 - 36.2	D	1.0
56.7 – 59.9	D-	0.67
< 56.7	E	0

COURSE OUTLINE:

Week	Торіс
1	Intro to Ecosystem Ecology; Geology and Climate
2	Ecosystem energy balance and water cycling
3	Carbon cycling: productivity
4	Carbon cycling: decomposition and soil organic matter dynamics
5	Carbon cycling: net ecosystem carbon dynamics
6	Biome Projects
7	Nutrient cycling: plant uptake and use
8	Nutrient cycling: nitrogen dynamics
9	Nutrient cycling: nitrogen versus phosphorus
10	Diversity and ecosystem processes
11	Trophic dynamics
12	Global biogeochemical cycles and the carbon-climate connection
13	Reactive nitrogen in the biosphere
14	Earth stewardship: from ecosystems to ecosphere
15	Biome projects due

<u>Disclaimer</u>: This syllabus represents my current plans and objectives. As we go through the semester, those plans may need to change to enhance the class learning opportunity. Such changes, communicated clearly, are not unusual and should be expected.