BIOL 76001: ECOLOGY LECTURE (FOR CUNY GC AND CONSORTIUM STUDENTS)
BIO V9006: SEMINAR IN ECOLOGY (FOR CCNY STUDENTS)

FALL TERM 2017

Class Meeting: Tuesdays 1:00-4:00 p.m. **Location:** CUNY Graduate Center Room 9116

Hours/Credits: 3 hours per week, 3 credits

Course Instructors

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Catalog Description
Introduction to the theoretical underpinnings of population and community ecology and in-depth discussion of recent conceptual and empirical advances in the field.

Course objectives
Population and community ecologists document the dynamics and patterns of abundance and distribution of individual species or groups of interacting species and provide mechanistic explanations for those patterns. We will examine the historical development of the fields, some mathematical underpinnings of basic population and community ecological theory, and contemporary areas of research. Emphasis will be placed on mechanistic explanations for species gradients and on methods that incorporate phylogenetics into community ecology. The instructors will draw heavily on their own research experience in polar and tropical regions.

Learning Objectives
1. Examine the differences between continuous and discrete time models
2. Examine the effects of density on model projections
3. Examine the effects of age and stage structure on population dynamics
4. Explore the effects of transients and momentum on populations
5. Examine the use of sensitivity and elasticity in model evaluation
6. Explore the unlikelihood of equilibrium states
7. Understand various ways of delimiting biological communities
8. Describe and differentiate various measures for measuring and comparing biodiversity
9. Understand models and empirical studies of competition, predation, and mutualism
10. Understand important diversity patterns that community ecologists have documented
11 Describe and differentiate theories for the latitudinal species gradient
12. Describe and/or develop methods for incorporating macro- and microevolution into mechanistic explanations of community patterns

Readings (do not purchase texts until after the 1st day of class)

Caswell, H. 2000. Prospective and retrospective perturbation analyses: their roles in conservation biology. *Ecology* 81:619-627.

Gotelli, N.J. 2008. *A Primer of Ecology, 4th Edition*. Sunderland, MA: Sinauer Associates.

Koons, D.N., R.F. Rockwell & J.B. Grand. 2006. Population momentum: implications for wildlife management. *Journal of Wildlife Management* 70:19-26.

Koons, D.N., J.B. Grand, B. Zinner and R.F. Rockwell. 2005. Transient population dynamics: relations to life history and initial population state. *Ecological Modeling* 185:283-297.

Mittelbach, G.G. 2012. *Community Ecology*. Sunderland, MA: Sinauer Associates. 400 pp.

and other readings to be assigned

Software

Poptools: http://www.poptools.org
EstimateS: http://viceroy.eeb.uconn.edu/estimates
R (including BiodiversityR, phangorn, picante, and vegan packages): http://www.r-project.org/

Week	Date	Topic
1	29 Aug	Introduction & abundance & its estimation
2	5 Sept	Exponential & geometric growth
3	12 Sept	Density-dependent models of continuous & discrete-time population growth
4	26 Sept	Age & stage structured models – the basics; projections; eigen values & vectors; Perron/Frobenius
5	3 Oct	Age & stage structured models – adding complexity with stochasticity & density-dependence
6	10 Oct	Age & stage structured models – transients, momentum & even more complexity
7	17 Oct	Sensitivity & elasticity analyses of population growth; prospective & retrospective models
8	24 Oct	Patterns of species richness & abundance in communities; ecosystem functioning
9	31 Oct	Predator-prey interactions
10	7 Nov	Interspecific competition
11	14 Nov	Mutualism & facilitation
12	28 Nov	Ecological networks & food webs
13	5 Dec	Phylogenetics & community ecology
14	12 Dec	Metapopulations, metacommunities, & neutral theory

This schedule is subject to change at the instructors' discretion.

Course format

The population ecology portion of this course is designed to review basic mathematical modeling tools and theory underlying modern demographic analysis. It will equip graduate students with the skills to examine and project the dynamics of populations under increasingly realistic situations. Simple exponential and geometric models will be expanded to consider density-dependence, age and stage structure, stochasticity transience, and momentum. The responsiveness of populations to perturbations will be investigated using sensitivity and elasticity analyses, and applications to conservation and management will be discussed. The material will be covered via lectures and discussion and will draw on relevant literature. Full

participation in discussions is required, and understanding of lecture material will be gauged with weekly assessments that comprise 20% of the final grade. Students are expected to work examples on their own using Poptools or other modeling software.

Class sessions on community ecology will be similar in format. This portion of the course will first discuss fundamental concepts of pattern and process in biological communities before discussion of current research themes based on readings from the primary literature. These discussions will be punctuated by computer exercises to calculate/compare diversity and ordination of different communities.

As a final course project, each student will prepare a 5-page paper on a topic covered in the course. The paper should develop and cite concepts from the recent literature.

Relationship of course to program outcomes

The outcomes of this course reinforce these important scientific skills:

- reading and evaluating primary research literature
- explaining the empirical basis for current theory
- identifying new areas of research
- organizing, formatting, and presenting data effectively in written form

Grading Criteria		
Discussion participation		30%
Weekly assessment		20 %
Paper outline	**Due November 14**	10 %
Paper first draft	**Due November 28**	10 %
Paper final draft	**Due December 12**	30 %

Academic Integrity

The CUNY Policy on plagiarism says the following about plagiarism (the CUNY Policy can be found in Appendix B.3 of the CCNY Undergraduate Bulletin 2009 -2011; http://www.ccny.cuny.edu/about/upload/academic_integrity.pdf):

"Plagiarism is the act of presenting another person's ideas, research or writings as your own. The following are some examples of plagiarism, but by no means is it an exhaustive list:

1. Copying another person's actual words without the use of quotation marks and footnotes attributing the words to their source.
2. Presenting another person's ideas or theories in your own words without acknowledging the source.
3. Using information that is not common knowledge without acknowledging the source.
4. Failing to acknowledge collaborators on homework and laboratory assignments.
5. Internet plagiarism includes submitting downloaded term papers or parts of term papers, paraphrasing or copying information from the internet without citing the source, and "cutting and pasting from various sources without proper attribution."

The City College Faculty Senate has approved a procedure for addressing violations of academic integrity, which can also be found in Appendix B.3 of the CCNY Undergraduate Bulletin."

Be aware that if we suspect plagiarism we will report your conduct to the College's Academic Integrity Official. Disciplinary sanctions range from failing the class to expulsion from the college.

Attendance Policy: Attendance is required. Every student is allowed one unexcused absence for any reason. Second and subsequent absences will only be excused with a doctor's note, the obituary of a family member, or other similarly substantive reason. Lectures will begin promptly at the beginning of class, and students should finish assigned readings and preparation before class.

Disability Policy for CCNY students: In compliance with CCNY policy and equal access laws, appropriate accommodations are administered by the AccessAbility Center. Students who register with AccessAbility, and are entitled to specific accommodations, must request a letter from AccessAbility to present to the Professor that states what their accommodations are. If specific accommodations are required for a test, students must present an "Exam Administration Request Form" from AccessAbility, **at least one week prior** to the test date in order to receive their accommodations.

Date Prepared
18 August 2017