**BIOS 4428 Population Dynamics (Summer 2019)**

MWF 8 am, CULC 131

**Instructors**: Dr. Chrissy Spencer, CULC 474C, 404.385.0539

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Office hours: by appt.

**Course description:** This course examines the ecological factors that cause fluctuation and regulation of natural populations and emphasizes the utility of mathematical models to assess the dynamics of populations. Topics include demographic and environmental stochasticity, metapopulation dynamics, structured populations, the role of species interactions, and micro-evolutionary processes such as population genetics, quantitative genetics, and evolution of life histories. Classroom discussion of primary scientific literature (journal articles) will be a major component of the course. As scientists, you need to effectively read, share, and critique research. This course can fulfill a Biology elective. Students who have received credit for BIOL 4803 Population Biology may not take this course for credit.

**Pre-requisite:** Ecology (BIOS 2300 or 2310)

**Course goals:** By the end of this course, you should

1. Understand ecological and evolutionary processes occurring at the population level, including
   * The factors influencing the dynamics of single species populations
   * The causes and consequences of variation in populations
   * Interspecific interactions
2. Further your scientific skills, including
   * Critical evaluation of primary literature
   * Identifying interesting questions and evaluating hypothesis tests
   * Interpreting and using mathematical models in biology
   * Presenting scientific ideas through verbal, visual, and written form

**Materials:**

* L.L. Rockwood, 2006. An Introduction to Population Ecology. Blackwell Publishing. *NOTE also available as an e-book from www.wiley.com (ISBN: 978-1-4443-0910-2 E-book)*
* J.K. Connor & D.L. Hartl. 2004. A Primer of Ecological Genetics. Sinauer Assoc.
* Primary literature articles that will be distributed primarily through Canvas. If you would prefer to purchase a course reader with print versions of the papers at an estimated cost of $5, please confirm your order with Dr. Spencer by the end of the first week of classes.

**Expectations:**

*Grading*: In-class exercises 20%

Discussion leading\* 15%

Final Presentation\* 15%

Midterm exams (2) 30%

Participation: in-class 10%

pre-class questions 5%

TOTAL 95%

\*Either your Discussion Leading or Final Presentation grade will be increased to 20% - more weight will be given to the higher of the two grades. This gives some flexibility in how the grading scheme reflects your personal presentation strengths.

*Attendance***:** Success in this class is dependent on attendance and active participation. 100% attendance is expected. The exercises in-class will be graded and will also be used as a measure of your attendance in class. In general, I do not excuse you from these daily assignments, unless you have a University-sanctioned absence.

*Discussion Leading*: You will be expected to lead a discussion once during the semester on the assigned primary research article for that day. This will involve giving a short summary of the article to the class (10 minutes max), providing several questions for the class to discuss, and fostering discussion in the classroom. I am available to help you prepare for this assignment. Your grade will be based on three components: your summary of the papers, the quality of your discussion questions (in terms of their ability to generate and sustain discussion), and additional insight material, such as information on the study system, pictures of the organisms, in-class activities related to the readings.

Everyone is also expected to fully participate in the discussions that you do not lead. To ensure this, you will prepare a question for each reading, submit these on Canvas before coming to class, and bring them to class. These Canvas assignments will be 5% of your participation grade.

*Final Project (White Paper and Presentation)*: You will select a topic of clear and obvious connection to this course for a presentation during the final exam period. These presentations should be structured around a central question and provide a summary of the relevant research addressing this question. Speculative ideas for a new research project are welcome as long as they are substantiated with published evidence. These presentations may not be a summary of or directly related to your current or past research. Your presentation will be approximately 12 minutes with 3 minutes for questions. Before the project workday, you must submit a White Paper, a 1-2 page summary statement of the topics in the project. Here is a guideline for your White Paper and Presentation:

State the question: What is the topic of your talk and why is it interesting/important?

Conceptual framework: What theory or observations are motivating this work?

System: What is the focal species, system, habitat, or theory? Give background.

Data: What are the data that support and contribute to this idea? Use images of figures, tables, or diagrams to support or evaluate your ideas.

Analysis: Present your interpretation of how the data are connected to your question. Be specific with suggestions for new directions or future research.

References: You should rely on a diversity of resources, not just one author, school of thought, or type of journal. Rely on primary literature in your final presentation, not secondary sources such as textbooks. WEBSITES are not permitted as references. If you don’t know how to properly cite a journal article that you found electronically, ASK!

*In-class exams*: Two written exams will be distributed for completion in class. Each exam will begin at 8:05 am and will last 60 minutes. These exams will focus on your comprehension of the concepts from the texts and their application to the journal articles. Class will run as normal from 9:10-9:45 on exam days.

*Participation*: Regular and insightful participation in classroom discussions is expected. This comprises 10% of your final grade: A=regular participation, usually well thought out, useful contributions (10%); B=regular participation, sometimes useful, sometimes not (8%); C= occasional participation, but generally useful (6%); D = occasional participation, but generally non-substantive, adding little new information (4%); F = present by rarely contributed (2%). I reserve the right to assign + or – grades (e.g., B+ may equal 9%). You may ask me at any time where you stand (i.e., what grade I’d assign if it was the end of the term).

**Academic Integrity**: Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit [www.catalog.gatech.edu/policies/honor-code/](http://www.catalog.gatech.edu/policies/honor-code/) or [www.catalog.gatech.edu/rules/18/](http://www.catalog.gatech.edu/rules/18/).

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, which will investigate the incident and identify the appropriate penalty for violations.

Note that plagiarism is the unattributed use of the words or ideas of others; plagiarism on any assignment, from discussion leading to the final project, will be referred to the Office of Student Integrity for adjudication. If you have any questions regarding your assignments and plagiarism, we encourage you to consult with any of us before you submit the assignment.

**Learning Accommodations**: If you have learning needs that require some accommodations for you to succeed in this course, please contact The Office of Disability Services as soon as possible ([disabilityservices.gatech.edu](http://disabilityservices.gatech.edu/)) to make an appointment to discuss your needs and to obtain an accommodations letter. We will arrange to accommodate your learning needs based on their recommendations.

**Course Schedule** (subject to modification)

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| Summer | Topic | Readings | Discussion Leader |
| 14-May | Designing ecological studies | R p1-3, C&H p1-8 Hurlbert 1984 | CS |
| 16-May | DI growth | R Ch 1 Grafe et al. 2004 | CS |
| 21-May | DD growth | R Ch 2 Flockhart et al. 2012 |  |
| 23-May | DD growth | Hamilton et al. 2009 |  |
| 28-May | Population Regulation | R Ch 3 Elliott et al. 2011 |  |
| 30-May | Age-structured Populations | R Ch 4 Bohn et al. 2010 |  |
| 4-Jun | Life history strategies | R Ch 6.1-6.4 Fujiwara & Caswell 2001 |  |
| 6-Jun | Life history strategies | R Ch 6.5-6.10 (skip 6.11) Wilbur & Rudolf 2006 END OF EXAM 1 MATERIAL |  |
| 11-Jun | Metapopulations | R Ch 5 Bahl et al 2011 |  |
| 13-Jun | Population Genetics I | EXAM 1 DUE in class at 8:00 AM C&H Ch 2 | CS |
| 18-Jun | Population Genetics II | C&H Ch 3 p 47–71.5 Oliver & Piertney 2012 |  |
| 20-Jun | Population Genetics II | C&H Ch 3 p 71.5–90 Wade & Goodnight 1991 |  |
| 25-Jun | Quantitative Genetics | C&H Ch 4 Kruuk et al 2000 |  |
| 27-Jun | Quantitative Genetics | C&H Ch 5 Fischer et al 2011 |  |
| 2-Jul | Competition | R p 155–158 & Ch 7 TBA reading |  |
| *4-Jul* | *HOLIDAY* |  | *-* |
| 9-Jul | Predation | R Ch 10 TBA reading Project Topics and Groups due by email |  |
| 11-Jul | Parasitism | R ch. 9 TBA reading END OF EXAM 2 MATERIAL |  |
| 16-Jul | Phenotypic Evolution | C&H Ch 6 TBA reading |  |
| 18-Jul | Applied Ecological Genetics | C&H Ch 7 EXAM 2 DUE IN CLASS AT 8 AM | CS |
| 23-Jul | Conservation Population Biology | TBA reading |  |
| *24-Jul* | *-* | *White Paper due at noon on Canvas* | *-* |
| 25-Jul | Final Presentation Workday |  |  |
| 30-Jul | 8:00 - 10:50 am Presentations |  | All |