

BIOL 3295: Population and Evolutionary
Ecology, Winter 2023

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Chapter 1

Syllabus

1.1 Instructor Information

Instructor: Dr. Amy Hurford

Office: CSF 4338

Email: ahurford@mun.ca

I will try to reply to emails within 24 hours (excluding evenings, weekends and holidays). Office hours: Tuesday 1-2pm; Thursday 1-2pm

1.2 Course Information

TR 12.00-12.50pm

F 1-1.50pm

Classroom: SN3060

All Course Announcements will be made on BrightSpace. Should lectures be remote a WebEx link will be provided on BrightSpace.

Course description:

Population and Evolutionary Ecology is an introduction to the theory and principles of evolutionary ecology and population dynamics. Pre-requisites: BIOL 2600; at least one of BIOL 2010, 2122 or 2210.

Course format:

The course consists of lectures, 4 data analysis assignments, 2 exams and a final exam.

Course expectations:

Please attend lectures and respect the learning environment of other students.

Learning goals:

The course content emphasizes a deeper understanding of fewer concepts. You have seen much of the course material in pre-requisite courses. In this course, I will revisit the models, clarify the assumptions and when they are appropriate, and we will fit the models to data to estimate parameters. By the end of the course, I hope that if you were given population data, that you would know the key quantities that you might estimate, and could do the analysis.

Required Text and Resources:

The course materials are online at <https://ahurford.github.io/BIOL-3295-Winter-2023/>.

If you wish to use your own computer for assignments you should install R and RStudio (see also here).

1.3 Method of Evaluation

- 4 Assignments - 20%
- 2 Exams - 40%
- Final Exam - 40%

Late assignments, labs, and missed midterms, and final exams will be accommodated as described by University Regulation 6.7.3 and 6.7.5 (see <https://www.mun.ca/regoff/calendar/sectionNo=REGS-0474> for Regulations).

1.4 Additional Policies

1.4.1 Accommodation of students with disabilities

Memorial University of Newfoundland is committed to supporting inclusive education based on the principles of equity, accessibility and collaboration. Accommodations are provided within the scope of the University Policies for the Accommodations for Students with Disabilities see www.mun.ca/policy/site/policy.php?id=239. Students who may need an academic accommodation are asked to initiate the request with the Glenn Roy Blundon Centre at the earliest opportunity (see www.mun.ca/blundon for more information).

1.4.2 Academic misconduct

Students are expected to adhere to those principles, which constitute proper academic conduct. A student has the responsibility to know which actions, as described under Academic Offences in the University Regulations, could be construed as dishonest or improper. Students found guilty of an academic offence may be subject to a number of penalties commensurate with the offence including reprimand, reduction of grade, probation, suspension or expulsion from the

University. For more information regarding this policy, students should refer to University Regulation 6.12.

1.4.3 Equity and Diversity

A safe learning environment will be provided for all students regardless of race, colour, nationality, ethnic origin, social origin, religious creed, religion, age, disability, disfigurement, sex (including pregnancy), sexual orientation, gender identity, gender expression, marital status, family status, source of income or political opinion.

You should not photograph or record myself, teaching assistants, or other students in the class without first obtaining permission. Accommodation will be made for students with special needs.

The sound should be turned off on phones and computers during class.

1.5 Additional Supports

Resources for additional support can be found at:

- www.mun.ca/currentstudents/student/
- <https://munsu.ca/resource-centres/>

Chapter 2

Schedule

- Thurs Jan 5: Introduction
- Fri Jan 6: Population biology with discrete and continuous variables
- Tues Jan 10: Introduction to Rmarkdown and tidyverse **Assignment 1 is assigned**
- Thurs Jan 12: Geometric growth
- Fri Jan 13: Geometric growth
- Tues Jan 17: Numerical solutions and graphing population data **Assignment 1 is due & Assignment 2 is assigned**
- Thurs Jan 19: Exponential growth
- Fri Jan 20: Exponential growth
- Tues Jan 24: Density dependence and logistic growth **Assignment 2 is due**
- Thurs Jan 26: Density dependence and logistic growth
- Fri Jan 27: Density dependence and logistic growth
- Tues Jan 31: Discrete time density dependence
- Thurs Feb 2: **EXAM I**
- Fri Feb 3: Age-structured models
- Tues Feb 7: Stage-structured models
- Thurs Feb 9: Stage-structured models
- Fri Feb 10: Stage-structured models
- Tues Feb 14: Numerical analysis of stage-structured models **Assignment 3 is assigned**
- Thurs Feb 16: Density dependence in stage-structured models
- Fri Feb 17: Metapopulation models WINTER BREAK
- Tues Feb 28: Continuous space models **Assignment 3 is due**
- Thurs Mar 2: Spatially explicit models in population biology
- Fri Mar 3: Population dynamics in a warming world
- Tues Mar 7: Spatially explicit population dynamics in a warming world
- Thurs Mar 9: Disease dynamics

- Fri Mar 10: The net reproduction number
- Tues Mar 14: Overview of models in population biology
- Thurs Mar 16: **EXAM II**
- Fri Mar 17: What is evolutionary ecology?
- Tues Mar 21: Haploid selection model
- Thur Mar 23: Selection coefficients for COVID-19 variants
- Fri Mar 24: Estimating selection coefficients **Assignment 4 is assigned**
- Tues Mar 28: The evolutionary ecology of pathogens
- Thurs Mar 30: The evolutionary ecology of COVID-19
- Fri Mar 31: The evolutionary ecology of hosts **Assignment 4 is due**
- Tues Apr 3: The evolution of reproductive effort in plants
- Thurs Apr 5: Evolutionarily stable and convergent stable strategies
- Fri Apr 6: Review