

# Syllabus: Introduction to Quantitative Ecology

Michael France Nelson

Spring 2023

## Course Information

### Instructor

Michael France Nelson

- Office: Holdsworth Hall, room 311
- Office Hours: Wednesdays 1:30 - 2:30PM (in my office or via Zoom - see Zoom link in Moodle)

### Teaching Assistant

Anastasia Ivanova

- Office Hours: Fridays 4:00 - 5:00 PM via Zoom (link in Moodle)

### Class Meetings

- Synchronous meetings: Tuesday and Thursday at 10:00AM - 11:15AM, beginning Tuesday, February 7th. Meetings are in Flint Hall, room 201.

### Class Echo360 Page

If you have to miss a lecture, you can find a recording on the course Echo360 page. The link is available in Moodle. I will endeavor to make the recordings available within 2 days of the lecture.

## Course Readings

### Required Textbook

- Gardener, M. (2017). *Statistics for ecologists using R and Excel: Data collection, exploration, analysis and presentation* (Second Edition). Pelagic Publishing.

## Additional Required Readings

UMass students can access these resources through the UMass libraries website.

- Bang, Megan; Marin, Ananda; and Medin, Douglas (2018). If Indigenous Peoples Stand with the Sciences, Will Scientists Stand with Us? *Daedalus* 147, no. 2 (March 1, 2018): 148–59.
- DOI: [https://doi.org/10.1162/DAED\\_a\\_00498](https://doi.org/10.1162/DAED_a_00498)
- Barraquand et al. (2014), Lack of quantitative training among early-career ecologists: a survey of the problem and potential solutions. *PeerJ* 2:e285
- DOI: <https://doi.org/10.7717/peerj.285>

## Optional Readings

This is a list of optional readings that may be of interest to reused in the lectures, class discussions, etc.

- Beckmann, J.P., and Berger, J. (2003). Using Black Bears to Test Ideal-Free Distribution Models Experimentally. *Journal of Mammalogy* 84, 594–606.
- Davis, S.M., Childers, D.L., Lorenz, J.J., Wanless, H.R., and Hopkins, T.E. (2005). A conceptual model of ecological interactions in the mangrove estuaries of the Florida Everglades. *Wetlands* 25, 832.
- Fischer, J., Lindenmayer, D.B., and Fazey, I. (2004). Appreciating Ecological Complexity: Habitat Contours as a Conceptual Landscape Model. *Conservation Biology* 18, 1245–1253.
- Ray, C., and Collinge, S.K. (2014). Quantifying the dominance of local control and the sources of regional control in the assembly of a metacommunity. *Ecology* 95, 2096–2108.

## Computer Resources

Detailed information on setting up the course software is available on the course GitHub site and the Software Setup assignment.

### Access to a Computer

You'll need access to a computing platform that can run R, RStudio, and GitHub Desktop. All of these will run smoothly on newer Windows, MacOS, or Linux systems.

If you don't have your own computer, or if you are unable to run the software on your machine, there are several options. Please contact me ASAP if you run into problems.

### R and RStudio

We'll use the free and open-source R programming language. You can download an appropriate version of R here: <https://cran.r-project.org/>

We'll use the RStudio Integrated Development Environment (IDE) to edit and run our R code. Download RStudio here: <https://posit.co/downloads/>. Select the *RStudio Desktop (Free)* version.

## DataCamp

We'll use DataCamp materials for R training. You'll find an invite link in the course Moodle.

- Follow the invite link to create a free academic account that will give you access to lots of R training materials during the spring semester.

## Other Software

In addition, you'll need word processing software, as well as software that can easily display comma separated values (CSV) files.

All UMass students are eligible for a free license of Microsoft Office 365, a suite of programs including Word, Excel, and PowerPoint. Visit the Information Technology page for more info: <https://www.umass.edu/it/software/microsoft-office-365-education>

## Course Overview:

Ecology, the study of the relationships between organisms and their environment, is a discipline concerned with quantifying relationships observe in nature.

This introductory statistics course aims to provide students with a supportive, encouraging, and comfortable environment for developing an appreciation that ecology is a quantitative science while developing a sound knowledge of essential statistical concepts. My hope is to demystify statistics and help develop the basic level of quantitative understanding that all future ecologists and environmental scientists should possess.

Statistics is but one of many tools we use to understand the world from a Western scientific perspective.

Rather than focus on statistics in isolation, statistical analysis will be presented as one component of the scientific process - a very important component! Of course you will learn how to apply a range of common statistical tools to environmental data sets, but emphasis will be placed on understanding *why* different statistics are used to answer important ecological questions. This understanding will be achieved through two modes:

1. **In-class** learning using a combination of mini-lectures, group discussion sessions and group problem solving exercises, all aimed at reinforcing quantitative concepts
2. **Out-of-class** learning through assigned readings and individual assessments to prepare you for in-class sessions, and take home assignments that are also aimed at reinforcing quantitative concepts

## Course Objectives:

The overall aim of this course is to develop the core quantitative knowledge and skills required of a modern ecologist:

1. An appreciation of the scientific process
2. Data collection, organization, cleaning, and management.
3. Numerical and graphical data exploration
4. Select appropriate statistical tools when presented with an ecological question and data.
5. Interpret statistical results in the context of ecological questions.
6. A working knowledge of the *R* statistical software

## Course Structure & Expectations

We are living in a time of crisis, on many levels. So, my priority for the course structure is to support your (all students) learning, as best I can, given the challenges we face. I have redesigned the course this semester to try to provide as much flexibility for you as possible, while also ensuring you leave this course with a full understanding of some of the quantitative skills used by ecologists and some useful quantitative tools to help you in your future career. Given our remoteness, it may be harder for me to identify if you are struggling (and if you are struggling, you are most likely not alone), so please reach out if something about the course is not working for you – I am very open to suggestions of how to make the course and concepts more accessible.

I have also set a predictable structure throughout the semester so that deadlines and tasks remain consistent. I will make any deviations from this clear on Moodle (should it turn out we need more time on a specific topic or we encounter an imposed disruption to our schedule) but I will endeavor not to deviate. Hopefully the regularity and consistency of the submissions and requirements will help you organize your time and workload for the semester. Given that we are all facing unique challenges, please try to meet all deadlines, but if you are unable to, be sure to make arrangements with me before the deadline has passed.

Please write to me to let me know if you will miss a class session, no explanation is necessary, but communication before the missed class is preferable.

- I want to make sure you are keeping up with the material and will likely ask if you need any support in understanding what we covered.
- We will also make arrangements for you to complete any of the missed work.

## Course Schedule

You can view the weekly course schedule on the course GitHub site.

## Assessment & Grading

A note on grades:

All grading will be completed in Moodle. I aim to have all assignments graded within 1 week of the due date, but grading may occasionally take a bit longer.

It is **your responsibility** to monitor the status of your course grade in the Moodle gradebook regularly.

If you feel that a grade is incorrect, missing, or is not visible/accessible, let me know ASAP so that I can investigate the problem!

## Late Assignment Policy

Assignments will be penalized by 25% if submitted up to one week after the due date. After one week, late assignments will not be accepted unless arrangements have been made.

If you need extra time on an assignment, let us know right away. Life happens and we're happy to extend deadlines when needed.

## Course Components

Your final grade will be made up of weighted contributions of each of the following:

Component	Weight
Pre-Class Exercises	15%
Individual Assignments	25%
Group Assignments	25%
In-Class Activities	15%
Final Project	15%
Office Hours	5%

See the following for descriptions of the individual course components:

### Individual Assignments

Short weekly online assignments based on the assigned readings.

The assignment must be completed on Moodle by 11:55 pm on Monday (the night before Tuesday’s synchronous meeting).

### Office hours

Office hours will be held in my office and/or on Zoom.

You are required to attend at least one office hours session during the semester.

- During the first week of the semester, we’ll conduct a survey to make sure that at least one of either my or the TA’s office hours works for everybody’s schedule.

I encourage you attend office hours regularly, even if you don’t have specific questions.

### Group Assignments

Group assignments will consist of take-home problem-solving assignments

- Individual instructions will be provided for each assignment.

### R Function List

Learning R can seem overwhelming at first because there are a lot of commands you have to learn in the beginning!

One of the best ways to help learn how to use new R functions is to write short code examples, accompanied by documentation written in your own words.

As you learn new R functions and syntax, you should keep a running list of code examples and explanations.

### Grading Scale

Grades will be calculated as percentages and be regularly updated and displayed in the “Grades” section of Moodle (please allow 1-2 weeks for grading). Final letter grades will be assigned as follows:

Range	Letter Grade
93-100%	A
90-92.99%	A-
87-89.99%	B+
83-86.99%	B
80-82.99%	B-
77-79.99%	C+
73-76.99%	C
70-72.99%	C-
67-69.99%	D+
60-66.99%	D
0-59.99%	F

Grades will be regularly updated and displayed in the “Grades” section of *Moodle*, but please allow for a 1-2 week lag for marking and grade processing. Grades will be calculated as percentages and a final *letter grade* will be awarded.

## Responsibilities & Course Courtesies

To create a supportive, encouraging, and comfortable environment for learning quantitative ecology, there are some shared responsibilities and expectations.

By enrolling in this class, you agree to:

- Attend all class sessions (or let me know if you can't)
- Keep up to date with all readings and recorded mini-lectures.
- Complete all assigned readings and team exercises
- Complete all scheduled evaluations
- Make meaningful contributions to classroom discussions and exercises
- Be respectful of your fellow participants, and mindful that we are learning in a time of crisis.
- Speak up (in class, or via email) if something doesn't make sense! If you're struggling with a concept, it means others in the course are too.

## Attendance

- Extenuating circumstances sometimes mean that we cannot attend a synchronous session. Please make every effort to let me know **before** the session you will miss so that you can make-up any graded in-class activities.
- Attendance is recorded indirectly via in-class quizzes or polls. These cannot be made up, unless you have an excused absence (see above).
- You are expected to participate in each synchronous meeting time.
- You will be responsible for completing all of the work from the missed class, including contributions to group assignments.

## Timeliness

I will ensure that classes begin promptly and end on-time. I ask that you please be punctual; late arrivals to and early departures can be disrupting and impact the learning experience for all students.

## **Office Hours**

If you have any questions that were not addressed in class, or would just like to chat, I will always be available during office hours, and you can request another time slot in advance.

The best way to reach me is via email to set up a time to chat (contact info is available in Moodle and at the top of the syllabus).

## **Covid 19 and Other Challenges**

It's a pandemic, economic crisis, and cultural revolution in one.

This semester will be unique and challenging; each of us, including me, will struggle in our own ways.

If you tell me you are having trouble or struggling at the moment, I will not judge you or think less of you.

You do not owe me any personal information or even an explanation of why you might miss a class (but please let me know that you will so I can check in with you)

However, you are more than welcome to tell me what is going on and I will listen with care and respect.

If I can't help you, I usually know someone who can.

If you need extra support, extra time, or anything else, please do not hesitate to ask – I will work with you.

I hope we can use our class time as a place to learn with kindness and respect for each other and build a community of support in a time of instability.

## **Academic Honesty and Accommodations**

For additional details please visit: [http://www.umass.edu/dean\\_students/codeofconduct/acadhonesty/](http://www.umass.edu/dean_students/codeofconduct/acadhonesty/)

### **Accommodation Statement**

The University of Massachusetts Amherst is committed to providing an equal educational opportunity for all students. If you have a documented physical, psychological, or learning disability on file with Disability Services (DS), you may be eligible for reasonable academic accommodations to help you succeed in this course. If you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we may make appropriate arrangements.

### **Academic Honesty Statement**

Since the integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, academic honesty is required of all students at the University of Massachusetts Amherst. Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. Instructors should take reasonable steps to address academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department Head or Chair. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent