NATURAL RESOURCES 775
R PROGRAMMING FOR BIOLOGISTS
SPRING SEMESTER 2019, 3 CREDITS

Instructor: Wesley Larson
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Classroom: TNR 356

Time: Tuesday and Thursday 11:00 AM – 12:15 PM

Objectives: At the completion of the course, students will be able to: (1) understand the basic components of R such as functions and data structures; (2) read in and manipulate data formatted as a .csv file; (3) write functions, loops, and conditionals; (4) create graphs; and (5) code basic statistics that are commonly used in biology. Most importantly, this course will teach students how to think like a programmer and how to obtain and understand help documents. The overall goal of the course is to give students the tools necessary to tackle new tasks in R that were not covered in the course. The course will be split into two main themes: learning the principles of R programing (weeks 1-8), and learning how to code statistical analyses in R (weeks 9-16).

Textbook: Ogle, D. H. 2016. Introductory fisheries analyses with R. CRC Press, New York.

Format: The weekly lecture will discuss programming principles and syntax. Reading assignments will be assigned for some lectures. The weekly lab periods will consist of programming exercises that build on lectures and prepare students for the homework assignments. The grade for this class will be based entirely on homework assignments. There will be one homework assignment each week. Two of the homework assignments will be larger in scope and will serve as a midterm and final. The final homework will require data analysis of the students own data and a short write up formatted like a scientific paper. If the student does not have their own data, I will provide a dataset. Homework assignments will be assigned after lab on Fridays and will be due before class the following Wednesday.

Grading: Assignments will not be accepted if they are turned in after the due date, other than for extenuating circumstances such as a family or health emergency. Final grades for the course will be awarded using the following minimum values: A = 93%; A- = 90%; B+ = 87%; B = 83%; B- = 80%; C+ = 77%; C = 73%; C- = 70%; D+ = 67%; D = 60%; F = <60%. The final class grade will be based entirely on homework assignments. Normal homework assignments will be worth 20 points and the larger homework assignments will be worth 60 points.

Schedule

Date   Lecture/Lab Topic with Required Readings and Assignment Due Dates

Week 1 (1/21) Introduction to R, basic math and objects. Read chapter 1.
Week 2 (1/28) Data input and manipulation part I. Read chapter 2.
Week 3 (2/4)   Data input and manipulation part II.
Week 4 (2/11) Loops, conditionals, and functions part I.
Week 5 (2/18) Wisconsin AFS
Week 6 (2/25)   Loops, conditionals, and functions part II.
Week 7 (3/4)   Introduction to graphing. Read chapter 3.
Week 8 (3/11) Advanced graphing. Large homework 1 assigned.
Week 9 (3/18) Spring break
Week 10 (3/25) Putting it all together: advanced data manipulation and graphing.
Week 11 (4/1) Coding basic statistics
Week 12 (4/8)   Basic regressions. Read chapter 7.
Week 13 (4/15) Advanced regressions.
Week 14 (4/22) Simulations: resampling/bootstrapping.
Week 15 (4/29) Non-linear models part I. Read chapter 12.
Week 16 (5/6)   Non-linear models part II. Read chapter 13.
Week 17 (5/13) Introduction to multivariate statistics. Large homework 2 assigned.