2019

Introductory R for Water Resources - Fall 2019 - University of North Carolina at Chapel Hill

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ENVR 890-001: R for Researchers (1 credit)
Fall 2019

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Office: MHRC 0024, Rosenau 139 (office hours by request)

Room: Rosenau 230
Time: Fridays 10:10-11:25am

Description: This course will mainly address problems related to water scarcity and reallocation of water rights using engineering and economic principles. To do so, a working knowledge of computer programming is useful. Students will learn the basics of programming and data analysis using the R programming language in order to gain insights to issues in water resource management. Emphasis will be placed on general principles of computer programming in R, developing a working knowledge of available tools and analysis strategies, becoming familiar with a number of base and advanced software packages, and applying skills to real-world scenarios in resource management. In all, students will be provided with numerous ways and means to address any type of quantitative question through data analysis, programming, and visualization. Students taking this course are encouraged to co-enroll in ENVR 755 for context on applications in water resource management.

Expectations: This class is not intended for students comfortable with computer programming. Students will be expected to spend time outside of class practicing analysis techniques and developing programming scripts to complete assignments. There will be two main homework assignments, one on programming basics and another on water resources applications. In-class time will be split between lectures, individual exercises, and group work in practice problem solving. Grading will be based on quality of assigned work and in-class participation.

Lecture	Topic (subject to change)
1	Basics of programming: brief on R, variable types, memory and precision
2	Basics of programming: data types and management, indexing
3	Introduction to R: data import/export and basic querying
4	Introduction to R: functions, loops, if statements, and logical operations
5	Introduction to R: functions, loops, if statements, and logical operations
6	Data analysis: in-class exercise on data management, **homework 1 assigned**
7	Data analysis: basics of figures and plotting
8	Special topics: advanced visualization in R, **homework 1 due**
9	Special topics: solving systems of equations
10	Special topics: systems of equations and reservoir mass balance
11	Special topics: mass balance and Monte Carlo analysis, **homework 2 assigned**
12	Special topics: Monte Carlo and timeseries analysis
13	Special topics: introduction to GIS analysis in R
14	Special topics: multi-objective optimization, **homework 2 due**