ENSC250 **Course Outline** **Winter 2020**

Course: Introduction to Environmental Data Analysis

Instructor: Siraj Ul Islam **Email:** sirajul.islam@unbc.ca **Office:** 4-256

Office Hours: Any time after class or by email appointment.

Course Description: This course focuses on the basic training and practical skill in analyzing environmental data using the R programming language. The focus is on the principles and practicality of programming with R, including reading data into R, accessing R packages, writing R functions, debugging and organizing/commenting R code. Topics in environmental data analysis are used as working examples.

Objectives: To develop practical skills of data analysis and computer programming. The lectures will emphasize conceptual understanding, while the labs will facilitate practical understanding i.e. 'learning by doing'. By the end of this course students will know how to apply R programming to perform environmental data analysis.

Format: This course will consist of lectures and labs with emphasis on the lab, in which the students will solve practical problems using R for basic statistical, graphical and spatial analysis of geophysical and environmental data. At the start of each lab, instructor will provide a quick review of the lecture and will introduce a sample dataset that will be used by the students. Students will work individually with assistance and guidance from the instructor.

Resources: Resources related to the course are available at the instructor's homepage (http://web.unbc.ca/~islam) under the "Teaching" tab.

Textbook: Course notes and following text book.

A first course in statistical programming with R - W. John Braun and Duncan J. Murdoch, Cambridge, 2016.

Additional Reading:
An Introduction to R (Notes on R: A Programming Environment for Data Analysis and Graphics - (W. N. Venables, D. M. Smith and the R Core Team), 2019
https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf

Evaluation: There will be labs assignments, class presentations and a final project marked as per percentage given below.

Test 1:	20%
Test 2:	20%
10 Labs:	50% (10 labs x 5%)
Class Presentation:	10%

The labs require a formal, typed write-up R studio notebook, the format of which will be discussed in class. Test 1 will cover first 5 labs and test 2 will cover remaining 5 labs. Plagiarism, being a serious academic offence, will not be tolerated.

Test Format: The exams for this course are to test students' ability in solving practical problems using a R programming language. It is very similar to lab but with more advance questions.

Audit Students: Students registered to audit the course will be expected to attend lectures and participate in all of the lab activities as well. However, they will not be required to submit lab reports nor to set in the tests.

Special Academic Accommodations: If there are students in this course who, because of a disability, may require special academic accommodations, please come and discuss this with the instructor, or contact staff at the Access Resource Centre located in the Teaching and Learning Centre, Room 7-103.

Academic Support Services: The UNBC Academic Success Centre provides access to academic support services for student learning and development. All of the services are absolutely FREE to UNBC students. Information is available at https://www.unbc.ca/academic-success-centre.

Topics: The following topics will be covered as time permits (subject to changes).

Lectures and Labs	Topic
Jan 7 **Lecture & Lab 1**	Course outlines, Introduction to data analysis, importance and application of statistics • Introduction of R and Rstudio • R script files • Objects in R
Jan 14 **Lecture & Lab 2**	• Arithmetic functions • Create and combine vectors • Extract elements from vectors • Vectors arithmetic • Character vectors
Jan 21 **Lecture & Lab 3**	• R data import / export • Manipulate data
Jan 28 **Lecture & Lab 4**	• Statistical Graphics • Types of plots, Bar plot, Histogram etc.
Feb 4 **Lecture & Lab 5**	• Customize Plots • Graphics functions.
Feb 11 **Lecture & test**	• Review of lecture 1-5 • **TEST 1**

Feb 18	•	No classes. Mid Semester break
Feb 25 **Lecture & Lab 6**	• • • • •	Controlling the logic flow Iteration loop "FOR" loop If loop Next statement
Mar 3 **Lecture & Lab 7**	• • • •	Break statement While loop Equivalence of "for" loop and "while" loop Newton's methods for root finding
Mar 10 **Lecture & Lab 8**	• • • •	Moving Scripts to function Using arguments -- the smart way Advanced Programming Coding tips
Mar 17 **Lecture & Lab 9**	• • •	Computational linear algebra Matrix operation Solving linear systems
Mar 24 **Lecture & Lab**	•	Student project presentations
Mar 31 **Lecture & Lab 10**	• • •	Advance Environmental data analysis Code automations Spatial Analysis using gridded data
Apr 7 **Lecture & test**	• •	Review of lecture 6-10 **TEST2**