BSC6939:

Intro to Cancer Statistical Analysis and Data Visualization in R

CRN# 52552, Section 002, 1 Credit Hour

CAS / CMMB

COURSE SYLLABUS

Last Updated: 3/26/2024

Instructor Name:	Mingxiang Teng, Ph.D.	Semester/Term & Year:	Summer C 2024
Office Number:	MRC (2nd Fl)	Class Meeting Days:	Wednesdays
Phone Number:	813-745-7734	Class Meeting Time:	3:00pm – 3:50pm
E-Mail:	Mingxiang.Teng@moffitt.org	Class Meeting Location:	Virtual
Website:	https://github.com/tenglab/Intro_to_R_2024		
Office Hours:	Email for Appointment		

I. Welcome!

II. University Course Description

Introduction to programming and data analysis in R/Rstudio will be presented. The participants will learn basics and hand-on practical skills for cancer data analysis.

III. Course Purpose

The goal of this class is to introduce participants to the basics of the R programming language for downstream data analysis and visualization for cancer research using RStudio.

IV. Course Objectives

Cancer research is becoming highly computational in nature. The course objectives are:

- To provide an overview and introduction to R/Rstudio programming for individuals with limited exposure to programming and statistics.
- To learn practical skills through a number of topics with hands-on computing problems.
- To learn basic analysis of cancer datasets such as data cleaning, statistical testing and regression.
- To visualize cancer datasets toward data interpretation and reporting.

V. Student Learning Outcomes

After successful completion of this course, students will be able to:

- Perform basic R programming using R/Rstudio
- Identify basic data structures for R data analysis and visualization
- Understand the rationale for reproducible data analysis
- Perform statistical testing and regression for multiple types of cancer datasets
- Visualize data results with multiple plotting approaches for scientific communications
- Prepare skillsets for prospective advanced R data analysis

VI.   Major Topics
Basic concepts related to data manipulation using Tidyverse; generation of visual plots using ggplot2; statistical testing and regression in R; Best practices in coding and reproducible research.

VII.   Required Texts and/or Readings and Course Materials
- N/A

VIII.   Basis for Final Grade
Every week there will be a homework assignment (3 question quiz) for each lecture, and this will be considered a test that engages if the student understood the material. Students who successfully achieve a score of 70% on 7 out of 8 quizzes will receive a passing grade for the course.

IX.   Grade Dissemination
Students can view their homework assignment/quiz scores online (https://bio2.moffitt.org) or contact the course administrator for their current grade during the course (bio2admin@moffitt.org). Final grades will be emailed to the students at the completion of the course.

X.   Course Policies: Grades
Late Work Policy: Quiz/homework will be available electronically from the start of the week's lecture for exactly one week (2:59PM of the following week). No late work will be accepted. One "free" quiz will be given to students (i.e., one quiz score will be dropped). Students should contact the Course Director in the case of illness or other circumstances beyond their control.

Extra Credit Policy: N/A

Grades of "Incomplete": An Incomplete grade ("I") is exceptional and granted at the instructor's discretion only when students are unable to complete course requirements due to illness or other circumstances beyond their control. The course instructor and student must complete and sign the "I" Grade Contract Form that describes the work to be completed, the date it is due, and the grade the student would earn factoring in a zero for all incomplete assignments. The due date can be negotiated and extended by student/instructor as long as it does not exceed two semesters for undergraduate courses and one semester for graduate courses from the original date grades were due for that course. An "I" grade not cleared within the two semesters for undergraduate courses and one semester for graduate courses (including summer semester) will revert to the grade noted on the contract.

Rewrite Policy: N/A

Essay Commentary Policy: Commentary on exam papers will be delivered in written format subsequent to grading.
Group Work Policy: N/A

Final Examinations Policy: All final exams are to be scheduled in accordance with the University's final examination policy.

XI. **Course Policies: Technology and Media**

Email: E-mail will be used a method of communication from the Course Director and Coordinator to the students regarding the dissemination of information pertaining to the course. Students can also contact the Director and or Coordinator via this method. Response times will be within a 24-hour period, Monday to Friday.

Canvas: Final pass/fail grades will be available within Canvas. Lecture material and quizzes will be available at the https://bio2.moffitt.org site.

Online Proctoring: N/A

Panopto: N/A

Laptop Usage: Laptop computer and tablet are required for the participation in the course. It is expected that each student has a laptop with connection to the internet for each class to enable hands-on computing of exercises presented in the lecture.

Classroom Devices: Use of technology for audio recording is permitted provided; 1) the student has the consent of each instructor and their classmates and; 2) that the recording is expressly for their personal use only and will not be disseminated to other students or uploaded to any platform that would allow other persons to hear the recording. Visual recording or photography is not permitted.

Phone Usage: Phone usage is strictly forbidden during class with the exception of use for audio recording as stated above.

Classroom Response Clickers: N/A

Course Blog: https://github.com/tenglab/Intro_to_R_2024

Course Wiki: N/A

XII. **Course Policies: Policies about disability access, religious observances, academic grievances, academic misconduct, and several other topics are governed by a central set of policies that apply to all classes at USF. These may be accessed at:**
   https://www.usf.edu/provost/faculty/core-syllabus-policy-statements.aspx

Attendance Policy: All students have a right to expect that the University will reasonably accommodate their religious observances, practices and beliefs. If you observe religious holidays, you should plan your allowed absences to include those dates.

Professionalism Policy: Per university policy and classroom etiquette; mobile phones, iPods, etc. **must be silenced** during all classroom and lab lectures. Those not heeding this rule will be asked to leave the classroom/lab immediately so as to not disrupt the learning environment. Please arrive on time for all class meetings. Students who habitually disturb the class by talking, arriving late, etc., and have been warned may suffer a reduction in their final class grade.

End of Semester Student Evaluations: This course will make use of an evaluation for students to provide feedback to the instructor, program and University regarding the course. These surveys will be made available at intervals during the semester. Your participation is highly encouraged and valued.

Campus Emergencies: In the event of an emergency, it may be necessary for USF to suspend normal operations. During this time, USF may opt to continue delivery of instruction through methods that include but are not limited to: Canvas, Elluminate, Skype, and email messaging and/or an alternate schedule. It's the responsibility of the student to monitor the Canvas site for each class for course specific communication, and the main USF, college, and department websites, emails, and MoBull messages for important general information.

XIII. **Important Dates to Remember**

All the dates and assignments are tentative, and can be changed at the discretion of the professor.

First Day of Summer C Semester:	May 13
Drop/Add Deadline:	May 17
Memorial Day (no class)	May 27
Independence Day (no class)	July 4
Last Day of Summer C Semester:	July 19

Religious Observances: All students have a right to expect that the University will reasonably accommodate their religious observances, practices and beliefs. If you observe religious holidays, you should plan your allowed absences to include those dates.

XIV. Course Schedule

Day/Date	Instructor	Contents	Goals
Lecture #1 May 22	Jordan Creed	Installing R/Rstudio, Introduction to R/Rstudio, Introduction to GitHub for course materials.	Get familiar with the R/Rstudio and GitHub environments, and understand basic R code structure (packages, data structures)
Lecture #2 May 29	Jordan Creed	Reading in data and data manipulation	To be able to import various data types, explain the fundamentals of "tidy data" and the `tidyverse`, and clean data sets using `dplyr` verbs
Lecture #3 June 5	Jordan Creed	Data manipulation with Tidyverse	To be able to merge data sets, transform data and create and implement functions
Lecture #4 June 12	Ram Thapa	Data visualization with ggplot2	Understand the principles of `ggplot2` and determine appropriate visualizations
Lecture #5 June 19	Ram Thapa	Statistical testing of means and visualizations	Understand and be able to complete tests for means (ANOVA, two-sample t-tests) and visualizaitons (boxplots, violin plots, heatmaps)
Lecture #6 June 26	Zachary Thompson	Regression modeling and visualizations	Understand and be able to complete simple linear regression, multiple regression, correlation and visualization (scatterplots)
Lecture #7 July 10	Zachary Thompson	Categorial data analysis and survival analysis	Understand and be able to complete in R Chi-square/Fisher's Exact test and survival analysis with log-rank tests and Kaplain Meier curves
Lecture #8 July 17	Jordan Creed	Introduction to Rmarkdown and best coding practices	Familiarization with using Rmarkdown for reporting and understand some "best practices" for coding

* Note: The Schedule is subject to revision

XV. Essay and Project Assignments
Lab Exercises/Homework (Specific Times and Locations TBD)
• Quizzes will be available on the https://bio2.moffitt.org from the start of the week's lecture for exactly one week (2:59PM of the following week).

XVI. Standard University Policies
Policies about disability access, religious observances, academic grievances, academic integrity and misconduct, academic continuity, food insecurity, and sexual harassment are governed by a central set of policies that apply to all classes at USF. These may be accessed at: https://www.usf.edu/provost/faculty/core-syllabus-policy-statements.aspx

XVII. Core Syllabus Policy Statements
The following policy statements apply to all syllabi at all USF campuses. These policy statements are in effect even if not reproduced on the official course syllabus.

Additional details are available on the University's Core Syllabus Policy Statements page: https://www.usf.edu/provost/faculty/core-syllabus-policy-statements.aspx

The instructor reserves the right to change this syllabus at any time.