BIOS 6640
R for Data Science
Fall 2019
Course Syllabus

PREREQUISITES:	BIOS 6601 prior or concurrent (or equivalent)
CREDITS:	2
FORMAT:	Lecture (Research 1 North 1004)
HOURS:	Tues/Thurs, 10:30 AM - 11:20 AM
INSTRUCTOR:	Debashis Ghosh Biostatistics and Informatics Address: W4134, Building 500 Email: debashis.ghosh@cuanschutz.edu
OFFICE HOURS:	By appointment
CLASS WEBPAGE:	available through Canvas; check regularly for updated announcements, materials and assignments
HOMEWORK:	Given out every Thursday, due the following Thursday, with potential exceptions for holidays. Late homework assignments will not be accepted, unless the student obtains the permission of the instructor. You may work on the problem sets in groups; however, you must write up the assignment on your own. Please also include the names of those with whom you worked on your assignment. Plagiarism on any assignments will be dealt with as per the policy of the University.

TEXTBOOKS: Wickham, Hadley (2015). *Advanced R*
New York: CRC-Press. `http://adv-r.had.co.nz/`

Grolemund, Garrett & Wickham, Hadley (2017). *R for Data Science*
O'Reilly. `http://r4ds.had.co.nz/`

EVALUATION:

Homework assignments: 70%
Analysis Project in R: 30%

GRADING:

A (100-93.00%), A- (92.99-90.00%), B+ (89.99-88.00%), B (87.99-83.00%), B- (82.99-80.00%), C+ (79.99-78.00%), C (77.99-73.00%), C- (72.99-70.00%), F (69.99% and below).

COMPUTER: Most of the methods we talk about in class have been implemented in the software package R (http://www.r-project.org/) with user interface RStudio (https://www.rstudio.com/). For the homework assignments, I will ask you to write programs and analyze datasets. It will be very important to have R and RStudio available on either a work or home computer.

Learning Objectives

After completing the course, the student can ordinarily expect to be able to:

1. Understand the fundamental data types and data structures in R.
2. Understand the concepts of functional programming, expression evaluation, and related topics as it pertains to R.
3. Understand the basic functions and commands available for fetching data, wrangling data and managing data as it pertains to R.
4. Gain hands-on experience in terms of importing, plotting, visualizing and running basic analyses using R.

BIOS Educational Competencies Addressed or Reinforced in this Course:

MS-BIOS 3: Carry out exploratory and descriptive analyses of complex data using standard statistical software and methods of data summary and visualization. Assessed through homework and both projects.

MS-BIOS 5: Demonstrate statistical programming proficiency, good coding style and use of reproducible research principles using leading statistical software. Assessed through homework and both projects.

MPH-BIOS 5: Use computer software for data management (data entry, access, and data manipulations), as well as for summarizing, analyzing and displaying research results.

ACADEMIC INTEGRITY:

The conduct of a student registered or taking this course should be consistent with that of a professional person. Courtesy, honesty and respect should be shown by students toward faculty members, guest lecturers, administrative support staff and fellow students. Similarly, students should expect faculty to treat them fairly, showing respect for their ideas and opinions and striving to help them achieve maximum benefits from their experience in the course.
Student academic misconduct refers to behavior that may include plagiarism, cheating, fabrication, falsification of records or official documents, intentional misuse of equipment or materials (including library materials), and aiding and abetting the perpetration of such acts. The preparation of reports, papers, and examinations, assigned on an individual basis, must represent each student's own effort. Reference sources should be indicated clearly. The use of assistance from other students or aids of any kind during a written examination, except when the use of aids such as electronic devices, books or notes has been approved by an instructor, is a violation of the standard of academic conduct. All violations of academic integrity will be assessed and dealt with based on university policy. Further details can be found at `http://catalog.ucdenver.edu/content.php?catoid=7\&navoid=812`

ACCOMODATIONS FOR STUDENTS WITH DISABILITIES:

Students requesting accommodations for a disability must contact one of the following:

Sherry Holden — Coordinator
University of Colorado Anschutz Medical Campus Disability Resources & Services
Bldg. 500, Room Q20-EG 305A
Phone: (303) 724-5640, Fax (303) 724-5641
Part-time: Monday, Tuesday and Thursday
sherry.holden@ucdenver.edu

Selim Özi — Assistive Technology Specialist, Accommodation Coordinator
University of Colorado Anschutz Medical Campus Disability Resources & Services

Mail Stop A010, Building 500, Room Q20-EG 306
Phone: (303) 724 8428, Fax: (303) 724 5641
selim.ozi@ucdenver.edu

Be aware that the determination of accommodations can take a long period of time. No accommodations will be made for the course until written documentation is provided by the Disability resources and services office to the course directors. It is the student?s responsibility to coordinate approved accommodations with the Disability Resources and Services office in advance. Further general Information regarding disability resources and services can be found at:
`http://www.ucdenver.edu/student-services/resources/disability-resources-services/accommodations/Pages/accommodations.aspx`

Students can set up an appointment at:
`http://www.ucdenver.edu/student-services/resources/disability-resources-services/about-office/contact-us-CUAnschutz/Pages/form.aspx`

Course Outline

Dates	**Topics**	**Reading**
Week 1 (8/27,8/29)	Intro/Data structures	AR, Ch 1-2
Week 2 (9/3,9/5)	Subsetting, R Markdown	
Week 3 (9/10,9/12)	Functions	AR, Ch. 3-4
Week 4 (9/17,9/19)	Objects	AR, Ch. 6-7
Week 5 (9/24,9/26)	Environments	AR, Ch. 8
Week 6 (10/1,10/3)	`ggplot2`	
Week 7 (10/8,10/10)	Data transformation/wrangling	RDS: Ch. 3, 5
Week 8 (10/15,10/17)	Base R graphics	
	Exploratory Data Analysis	RDS, Ch. 7
	Assign Project	
Week 9 (10/22,10/24)	Workflow/Data import	RDS: Ch. 8,11
	Tidy data	RDS: Ch. 12
Week 10 (10/29,10/31)	Relational Data	RDS: Ch. 13
Week 11 (11/5,11/7)	Github/Version Control	
Week 12 (11/12,11/14)	RCpp/High Performance Computing	
Week 13 (11/19,11/21)	Working with text data	
Week 14 (11/26)	R Shiny	
Week 15 (12/3,12/5)	API	

AR: Advanced R; RDS: R for Data Science