University of Florida
College of Public Health & Health Professions Syllabus
PHC 6068: Biostatistical Computing (credit hours)
Fall, 2017
Delivery Format: On-Campus
Course Website or E-Learning *if applicable*

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Office Hours: TBA
Teaching Assistants: TBA
Preferred Course Communications (e.g. email, office phone): In class lecture as well as distribution of lecture notes and assignments through the canvas system at http://elearning.ufl.edu/.

Prerequisites
PHC 6092: Biostatistical Theory, PHC 6050: Statistical Methods for Health Sciences Research I, PHC 6051: Biostatistical Methods II, or permission of the instructor.

PURPOSE AND OUTCOME

Course Overview
This course is intended to develop your ability to perform statistical computing. The course will focus primarily on the R programming language using the RStudio interface, both of which are free and open-source software programs. The course will cover programming topics (vectorization, data input and output, object-oriented programming, and building R packages), statistical and computational methods (visualization, optimization, simulation, resampling, classification, and modern statistical methods such as LASSO and ElasticNet), and direct integration and dynamic reporting using LaTeX and R through programs such as Sweave and knitr. Additionally, this course will include the use of high-performance computing resources at the University of Florida such as HiPerGator.

Relation to Program Outcomes
Students will develop the knowledge and skills to translate ideas and methods into workable software and interface with diverse data structures and objects, and write functions to implement statistical methods. These computational skills are essential for applied biostatistics.

Course Objectives and/or Goals
Upon successfully completing this course, students should be able to:

1. Convert an algorithm into a workable program and write functions that others can use and understand.
2. Smooth and visualize data, including lattice functions for multi-panel displays.
3. Construct a simulation study and use it to evaluate the size and power of a statistical test or method.
4. Use resampling techniques such as the bootstrap and cross-validation to assess model fit and compare competing models.
5. Implement computational methods for optimization (e.g., Newton-Raphson), numerical integration (e.g., Monte Carlo integration), classification (e.g., LDA, SVM, tree-based methods, random forests), and regression (e.g., LASSO).
6. Build and R package using S4 methods and classes.

Instructional Methods

DESCRIPTION OF COURSE CONTENT

Topical Outline/Course Schedule

Week	Date(s)	Topic(s)	Assignments
1		Overview of statistical computing Basics of R programming	
2		Writing functions in R Using HiPerGator	HW 1
3		R graphics and vectorized calculations	
4		Matrix operations and the singular value decomposition	HW 2
5		Linear models in R	
6		Generalized linear models in R	HW 3
7		Univariate optimization	HW 4
8		Mid-term in-class exam	
9		Simulating random variables	
10		Simulation studies	HW 5
11		S3 and S4 object-oriented programming in R	
12		Building R packages	HW 6
13		Bootstrap resampling and permutation tests	
14		Monte Carlo methods	HW 7
15		Multivariate optimization	

Course Materials and Technology

There is no required text. Instead, handouts will be given out over the course of the semester. You are also referred to the following texts as follow-up resources.

1. J. M. Chambers (2008) *Software for Data Analysis: Programming with R*. Springer.
2. N. Matloff (2011). *The Art of R Programming*. No Starch Press.
3. M. L. Rizzo (2008). *Statistical Computing with R.* Chapman & Hall/CRC.
4. Venables, W.N. and Ripley, B.D. (2002) *Modern Applied Statistics with S*, 4th Edition, Springer-Verlag.

The primary mechanism for communication in this course, other than class meetings, is conducted through the Canvas system through e-learning https://ufl.instructure.com/ and/or the electronic mails to the students. Instructors may use Canvas to make assignments, provide materials, communicate changes or additions to the course materials or course schedule, and to communicate with students about other aspects of the course. It is imperative that students familiarize themselves with Canvas, check Canvas frequently for possible announcements, and make sure that their e-mail account in Canvas is correct and active.

For technical support for this class, please contact the UF Help Desk at:

- Learning-support@ufl.edu
- (352) 392-HELP - select option 2
- https://lss.at.ufl.edu/help.shtml

ACADEMIC REQUIREMENTS AND GRADING

Assignments

All the homework problems will require R programming involving various statistical computational topics outlined before. Students will be required to use their own computers as well as HiPerGator in order to complete the assignments. All the homework assignments must be submitted electronically to the instructor and/or the teaching assistant of the class. The topics of the homework assignments are provided in the previous table and the submission schedules and the credit distributions are provided below.

Grading

Requirement	Due date	Points or % of final grade (% must sum to 100%)
Homework 1	08/30/2017	5%
Homework 2	09/11/2017	5%
Homework 3	09/25/2017	5%
Homework 4	10/09/2017	5%
Mid-term exam	10/18/2017	20%
Homework 5	11/08/2017	5%
Homework 6	11/20/2017	5%
Homework 7	11/29/2017	5%
Final exam	12/9-15/2017	30%
Final project	12/06/2017	10%

Point system used (i.e., how do course points translate into letter grades).

Points earned	94-100%	90-93%	87-89%	83-86%	80-82%	77-79%	73-76%	70-72%	67-69%	63-66%	60-62%	< 60%
Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E

Please be aware that a C- is not an acceptable grade for graduate students. A grade of C counts toward a graduate degree only if an equal number of credits in courses numbered 5000 or higher have been earned with an A. In addition, the Bachelor of Health Science Program does not use C- grades.

You must include the letter grade to grade point conversion table below. Letter grade to grade point conversions are fixed by UF and cannot be changed.

Letter Grade	**A**	**A-**	**B+**	**B**	**B-**	**C+**	**C**	**C-**	**D+**	**D**	**D-**	**E**	**WF**	**I**	**NG**	**S-U**
Grade Points	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0.0	0.0	0.0	0.0	0.0

For greater detail on the meaning of letter grades and university policies related to them, see the Registrar's Grade Policy regulations at:
http://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Exam Policy
The midterm exam will have an in-class component that will be closed-book and closed-notes and a take-home exam. The final exam will be closed-book and closed-notes, and you will need a laptop for R programming.

Policy Related to Make up Exams or Other Work
Please see the instructor as early as possible regarding a possible absence during an exam. Make-up exams due to an excused absence will be handled on an individual basis.

Please note: Any requests for make-ups due to technical issues MUST be accompanied by the ticket number received from LSS when the problem was reported to them. The ticket number will document the time and date of the problem. You MUST e-mail me within 24 hours of the technical difficulty if you wish to request a make-up.

Policy Related to Required Class Attendance
Please see the instructor as early as possible regarding possible absences. All assignments need to be handed in on time. Grading will penalize late assignments, and missed assignments will receive a zero score. Personal issues with respect to class attendance or fulfillment of course requirements (assignments, final presentation, class discussion) will be handled on an individual basis.

All faculty are bound by the UF policy for excused absences. For information regarding the UF Attendance Policy see the Registrar website for additional details:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

STUDENT EXPECTATIONS, ROLES, AND OPPORTUNITIES FOR INPUT

Expectations Regarding Course Behavior
Students are expected to spend an average at least 2-1/2 hours per week per credit hour on the course exclusive of class time. This time includes but is not limited to reading, research, preparations for class, team or group meetings (electronic or otherwise), and course deliverables.

Communication Guidelines
The preferred methods of communication for the course are messages in Canvas (see Course Materials above) or e-mail.

Academic Integrity

Students are expected to act in accordance with the University of Florida policy on academic integrity. As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge:

"**We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity**."

You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied:

"On my honor, I have neither given nor received unauthorized aid in doing this assignment."

It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For additional information regarding Academic Integrity, please see Student Conduct and Honor Code or the Graduate Student Website for additional details:
https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/
http://gradschool.ufl.edu/students/introduction.html

Please remember cheating, lying, misrepresentation, or plagiarism in any form is unacceptable and inexcusable behavior.

Online Faculty Course Evaluation Process
Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

SUPPORT SERVICES

Accommodations for Students with Disabilities

If you require classroom accommodation because of a disability, you must register with the Dean of Students Office http://www.dso.ufl.edu within the first week of class. The Dean of Students Office will provide documentation of accommodations to you, which you then give to me as the instructor of the course to receive accommodations. Please make sure you provide this letter to me by the end of the second week of the course. The College is committed to providing reasonable accommodations to assist students in their coursework.

Counseling and Student Health
Students sometimes experience stress from academic expectations and/or personal and interpersonal issues that may interfere with their academic performance. If you find yourself facing issues that have the potential to or are already negatively affecting your coursework, you are encouraged to talk with an instructor and/or seek help through University resources available to you.

- The Counseling and Wellness Center 352-392-1575 offers a variety of support services such as psychological assessment and intervention and assistance for math and test anxiety. Visit their web site for more information: http://www.counseling.ufl.edu. On line and in person assistance is available.
- You Matter We Care website: http://www.umatter.ufl.edu/. If you are feeling overwhelmed or stressed, you can reach out for help through the You Matter We Care website, which is staffed by Dean of Students and Counseling Center personnel.
- The Student Health Care Center at Shands is a satellite clinic of the main Student Health Care Center located on Fletcher Drive on campus. Student Health at Shands offers a variety of clinical services. The clinic is located on the second floor of the Dental Tower in the Health Science Center. For more information, contact the clinic at 392-0627 or check out the web site at: https://shcc.ufl.edu/
- Crisis intervention is always available 24/7 from:
  Alachua County Crisis Center
  (352) 264-6789
  http://www.alachuacounty.us/DEPTS/CSS/CRISISCENTER/Pages/CrisisCenter.aspx

Do not wait until you reach a crisis to come in and talk with us. We have helped many students through stressful situations impacting their academic performance. You are not alone so do not be afraid to ask for assistance.