University of Florida
College of Public Health & Health Professions Syllabus
PHC 6099: Programming Basics for Biostatistics (3 credit hours)
Fall, 2023
Delivery Format: on-campus
Course Website and E-Learning

Instructor Name: Zhiguang Huo
Classroom Number: HPNPG105
Phone Number: (352)-294-5929
Email Address: zhuo@ufl.edu
Lecture time: Tuesday 3:00pm – 3:50pm
                        Thursday 1:55pm – 3:50pm
Teaching Assistants: TBD
Office Hours: HZ: Monday 3-4:30pm, CTRB, Room 5230
                        TA: TBD
Preferred course communication: In-class lectures.
Course material distribution: Lecture notes will be distributed on https://caleb-huo.github.io/teaching/2023FALL/ProgrammingBasics.html and assignments will be distributed through the canvas system at http://elearning.ufl.edu/.

Prerequisites
- An introductory course in statistics that covers inference, such as PHC6052 Introduction to Biostatistical Methods, or permission of the instructor.

PURPOSE AND OUTCOME

Course Description:
The Introduction to Biostatistical Computing course is intended to develop your programming skills to perform biostatistical computing. The course will include both R programming language using the RStudio interface and Python programming language using the Anaconda interface. Topics include data structure, file input/output, visualization, data manipulation, basic statistical inference, and reproducible reports using markdown languages.

Course Overview
The Introduction to Biostatistical Computing course is intended to develop your programming skills to perform statistical computing. The course will focus on both R programming language (using RStudio interface) and Python programming language (using Anaconda interface), both of which are free and open-source software programs. The R language part will cover programming topics including vectorization, data input and output, data visualization (ggplot2), data manipulation (tidyverse), building R packages, and building R Shiny applications. R markdown will be used for direct integration and dynamic reporting. The Python language part will cover programming topics including objective oriented programming, scientific computing (numpy), data manipulation (pandas), data visualization (matplotlib), and text mining. The Jupitor notebook will be used for direct integration and dynamic reporting. In addition, this course will introduce GitHub as the version control system and will also 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 biostatistical ideas and methods into workable software, interface with diverse data structures and objects, and write functions to implement biostatistical methods. These computational skills are essential for health data science.

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. Use R tidyverse package or Python Pandas package to manipulate data from public health databases and other data collection to a format that is more readily usable for visualization and analysis.
3. Use R (ggplot2) and Python (matplotlib) to visualize data.
4. Learn reproducible biomedical scientific analyses using R markdown and Python Jupiter.
5. Build R packages, R Shiny apps, and upload to the GitHub.

DESCRIPTION OF COURSE CONTENT

Topical Outline/Course Schedule

Week	Date(s)	Topic(s)	Assignments release	Assignments due
1	8/21/23 – 8/25/23	Overview		
2	8/28/23 – 9/1/23	Basics of R programming Writing functions in R	Homework1, 8/29/23	
3	9/4/23 – 9/8/23	Vectorized calculations Data manipulation (Tidyverse)		
4	9/11/23 – 9/15/23	R graphics (basic) R graphics (advanced)	Homework2, 9/12/23	Homework1, 9/12/23
5	9/18/23 – 9/22/23	Using HiPerGator R Shiny		
6	9/25/23 – 9/29/23	R packages	Midterm on R (Take home), 9/28/23	Homework2, 9/28/23
7	10/2/23 – 10/6/23	Rcpp GitHub	Final project, 10/3/23	Midterm, 10/3/23
8	10/9/23 – 10/13/23	Writing functions in Python String manipulation		
9	10/16/23 – 10/20/23	Data structure and Python functions	Homework3, 10/17/23	
10	10/23/23 – 10/27/23	Objective oriented programming Python GUI		
11	10/30/23 – 11/3/23	Numpy	Homework4, 10/31/23	Homework3, 10/31/23
12	11/6/23 – 11/10/23	Data manipulation (Pandas)		
13	11/13/23 – 11/17/23	Pandas Python graphics	Homework5, 11/14/23	Homework4, 11/14/23
14	11/20/23 – 11/24/23	Special topics: Database (sqlite3) or Machine learning (scikit-learn) Thanks giving break!		
15	11/27/23 – 12/1/23	Basic statistical inference Database (sqlite3) or Machine learning (scikit-learn)		Homework5, 11/28/23
16	12/4/23 – 12/8/23	Final exam (Take home)	Final exam on Python (Take home), 12/5/23	Final project, 12/5/23
17	12/11/23 – 12/15/23	No Class		Final exam due, 12/12/23

Course Materials and Technology
Required software. The required software for this class is free to download:
1. R core: https://www.r-project.org/
2. R integrated development environment (IDE): https://www.rstudio.com
3. Python core: https://www.python.org
4. Python integrated development environment (IDE): https://www.anaconda.com

There is no required text. You are also referred to the following texts as supplemental resources.
1. Hadley Wickham (2014). *Advanced R*. Taylor & Francis. http://adv-r.had.co.nz
2. Hadley Wickham (2016). R for Data Science. http://r4ds.had.co.nz/

3. Wes McKinney (2012). Python for Data Analysis. https://www.oreilly.com/library/view/python-for-data/9781449323592/
4. Jake VanderPlas (2016). Python Data Science Handbook. https://jakevdp.github.io/PythonDataScienceHandbook/

The primary mechanism for communication in this course, other than class meetings, is conducted through the course website https://caleb-huo.github.io/teaching/2023FALL/ProgrammingBasics.html to post lecture notes and Canvas system https://ufl.instructure.com/ to deliver in class labs, assignments, final exams and grades. 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

Resources for troubleshooting
*   You may ask questions during the office hours.
    o   Instructor, HZ: Monday 3:00-4:30pm
    o   TA: TBD
*   You may ask/answer questions in the canvas discussion section.
    o   If you have a question, other students are likely to have similar questions, so posting your question in the canvas discussion section will benefit other students.
    o   The instructor and the TA will also frequently check the canvas discussions.

ACADEMIC REQUIREMENTS AND GRADING

Final project:

The goal of the final project is to develop an R package/Shiny app that will be useful to other statisticians and R users. The topic can be any functions or procedures you feel useful or interesting. This could be a method/model, a tool, a game, etc. The project topics in previous years can be found here https://caleb-huo.github.io/teaching/finalProject/finalProject_all.html. Students can either form teams (at most 3 people) themselves or work individually. One team only need to submit one copy of report (e.g., html file). They should be submitted electronically via canvas https://elearning.ufl.edu. All members in one team will have the same grade for the final project. Students will be encouraged to use higher level knowledge from the class to create the R package. (E.g. Rcpp, vignette, github). Detailed instructions about the final project will be released on Mon Oct 3. The final R package and a short report of how to use the R package is due on the date specified in the table above.

Exam Policy

Both the midterm exam and the final exam will be "take home exams". You will have about a week to work on each exam. You must work alone and may only ask clarification questions from the instructor/TA; you may not ask for hints to the questions since these are exam, not a homework assignment. Exams will be delivered in R Markdown/Python Jupiter format. All the exams must be submitted electronically via Canvas. **No hard copy is required.** Your responses must be supported by both textual explanations and the code you generate to produce your result.

Homework

All five the homework problems will require R/Python 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 homework will be delivered in R Markdown/Python Jupiter format. All the homework assignments must be submitted electronically via Canvas. **No hard copy is required.** Your responses must be supported by both textual explanations and the code you generate to produce your result.

You are allowed to discuss with your classmates, but you need to write your own code. The topics and dates of the homework assignments are provided in the previous table, and the submission schedules and credit distributions are provided below.

Late Homework policy:

Full credit will be possible for assignments turned in by the due date (by 11:59pm). Assignments turned in the next business day after the due date will have a maximum possible credit of 80%; assignment turned in two school days after the due date will have a maximum credit of 50%. NO credit is given after two days late. If you are out sick, no deduction will be taken if you inform me before the homework is due. Please stay home and do not get other people sick. Just turn in your homework as soon as you can. If you are going to miss school on the day the homework is due (going out of town, family emergency, etc.) please turn your homework in early. Each student is granted for two days of grace-period, which can be applied to any homework (not exam or final project). For example, if a homework submission misses the deadline but is less than 1 day late, the student could apply a one-day grace toward that homework so that no late submission penalty will be triggered. For all 5 homework, the total grace periods cannot exceed 2 days. Each time at least one day of grace period will be used. The instructor and the TA will check the last submission date and determine if you use the grace periods.

Grading

Assignment	Due date	Points or % of final grade (% must sum to 100%)
Homework 1	09/12/2022	5%
Homework 2	09/26/2022	5%
Mid-term exam	10/03/2022	25%
Homework 3	10/31/2022	5%
Homework 4	11/14/2022	5%
Homework 5	11/30/2022	5%
Final project	12/07/2022	25%
Final exam	12/12/2022	25%

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

Percentage Earned	Letter Grade
94-100	A
90-93	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
73-76	C
70-72	C-
67-69	D+
63-66	D
60-62	D-
Below 60	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.

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

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.

All faculty are bound by the UF policy for excused absences. Excused absences must be consistent with university policies in the Graduate Catalog (https://catalog.ufl.edu/graduate/regulations/#text). Additional information can be found here: 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 3 hours of in-class time per week and 6 hours out of class time per week. This time includes but is not limited to reading, research, preparations for class, team or group meetings (electronic or otherwise), and course deliverables. Students are highly encouraged to bring their own laptop during class, so they could follow the instructor's demonstration and practice on their own.

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 professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

Recording Within the Course:

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any

media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

Policy Related to Guests Attending Class:
Only registered students are permitted to attend class. However, we recognize that students who are caretakers may face occasional unexpected challenges creating attendance barriers. Therefore, by exception, a department chair or his or her designee (e.g., instructors) may grant a student permission to bring a guest(s) for a total of two class sessions per semester. This is two sessions total across all courses. No further extensions will be granted. Please note that guests are not permitted to attend either cadaver or wet labs. Students are responsible for course material regardless of attendance. For additional information, please review the Classroom Guests of Students policy in its entirety. Link to full policy: http://facstaff.phhp.ufl.edu/services/resourceguide/getstarted.htm

SUPPORT SERVICES

Accommodations for Students with Disabilities
If you require classroom accommodation because of a disability, it is strongly recommended you register with the Dean of Students Office http://www.dso.ufl.edu within the first week of class or as soon as you believe you might be eligible for accommodations. The Dean of Students Office will provide documentation of accommodations to you, which you must then give to me as the instructor of the course to receive accommodations. Please do this as soon as possible after you receive the letter. Students with disabilities should follow this procedure as early as possible in the semester. The College is committed to providing reasonable accommodations to assist students in their coursework.

Students in UF Health Sciences programs should be mindful that unique course accommodations may not be applicable in a clinical, fieldwork or practicum setting. Thus, planning a semester in advance with the DRC Health Sciences Learning Specialist, Lisa Diekow ldiekow@ufsa.ufl.edu , is highly encouraged.

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.

- **U 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

- **University Police Department**: Visit UF Police Department website or call 352-392-1111 (or 9-1-1 for emergencies).

- **UF Health Shands Emergency Room / Trauma Center:** For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the UF Health Emergency Room and Trauma Center website.

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.

Inclusive Learning Environment
Public health and health professions are based on the belief in human dignity and on respect for the individual. As we share our personal beliefs inside or outside of the classroom, it is always with the understanding that we value and respect diversity of background, experience, and opinion, where every individual feels valued. We believe in, and promote, openness and tolerance of differences in ethnicity and culture, and we respect differing personal, spiritual, religious and political values. We further believe that celebrating such diversity enriches the quality of the educational experiences we provide our students and enhances our own personal and professional relationships. We embrace The University of Florida's Non-Discrimination Policy, which reads, "The University shall actively promote equal opportunity policies and practices conforming to laws against discrimination. The University is committed to non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information and veteran status as protected under the Vietnam Era Veterans' Readjustment Assistance Act." If you have questions or concerns about your rights and responsibilities for inclusive learning environment, please see your instructor or refer to the Office of Multicultural & Diversity Affairs website: www.multicultural.ufl.edu