Department of Public Health Sciences
University of Miami Miller School of Medicine

COURSE SYLLABUS
BST 650
Topics in Biostatistical Research
3 credits
Wednesdays 11:30 am - 12:30 pm
Zoom

Course Instructor(s):	Daniel Diaz
Tel:	305-243-4797
E-mail:	Ddiaz3@miami.edu
Office:	CRB 1057
Office Hours:	At this point, by appointment (might change)

Course Prerequisites:
Acceptance to MS or PhD in Biostatistics.

Course Description:
The course consists of a series of presentations in the foundations of contemporary science. The emphasis will be on the underpinnings of several scientific disciplines and of science itself.

Course Learning Objectives:
- To have a basic understanding of different modern probabilistic concepts
- To learn to think of probability philosophically, more than as a recipe.
- To enhance the student's public speaking and presentation skills.

Course Format:
Lectures, group discussion, and Biostatistics seminars.

This course is planned as hybrid. That means that there will be some sessions that will be offered remotely/ online, and some sessions that will be in person. In person sessions will also allow the opportunity for students to join remotely and will be recorded. The instructor will define which sessions are to be delivered in person and will specify the location. Additionally, The Department of Public Health Sciences will offer in person Public Health Seminars on relevant current Public Health topics. These seminars will integrate aspects of epidemiology, prevention science, environmental health, health services, biostatistics and methodological topics relevant to this course. These seminars will be held in large rooms following COVID-19 safety precautions and will be recorded. Dates and times will be released two weeks after course begins, and will be posted in the One Stop Shop in Blackboard.

Course Requirements:
Attendance to each lecture, completion of homework problems, examination, participation in discussions.

Grading/Evaluation:

The course grade will be determined by the student's performance on the following as follows: 70% or above = PASS; below 70% = FAIL.

Students will earn a grade for completing the relevant homework from each module of material (equally weighted), in-class participation, and a final report.

Homework 1 is due at September 30, after the end of the first section/ topic. Homework 2 is due at November 18, after the end of the second section/topic. Final report: end of the semester. Each homework consists of an individual summary of the topics treated in each section.

Each class will have its own set of homework assignments, based on textbook exercises. Students will be required to present them in class.

Attendance and participation	34%
Homework	33%
Final project	33%

Course Materials:
Recommended text: *None.*

Holy day policy for absences (University policy)

A recent Faculty Senate decision has been made for how instructors must handle the situation of religious holidays and attendant missed classes by students. The solution adopted by the Faculty Senate and University Administration is to allow students to take off any religious holiday of his or her choice as a matter of right, but only if the student discloses her or his specific intentions to the faculty member in writing within the first three days of class meeting. Students, at the discretion of the instructor, may be required to make up any assignments or examinations missed due to absences for religious holidays.

COVID-19 Expectations for Safety

Per University requirement, all students in the classroom, laboratory, studio, anywhere on campus or during field visits are required to wear face coverings. This is mandated across the campus and in any situation in which physical distancing cannot be continuously guaranteed.

Note- It is important to follow all University guidelines related to COVID- 19 protections and mitigation. These are continually updated. Please monitor closely all messages you receive by email and those posted on this official university website at https://coronavirus.miami.edu/index.html

Expectations for Participation in Online Sessions

There is an expectation/requirement that students will have their camera on if attending a session remotely. If you have any challenges participating in this way, please notify the instructor(s) as soon as possible to trouble-shoot.

Class Recordings

Students are expressly prohibited from recording any part of this course. Meetings of this course might be recorded by the University. Any recordings will be available to students registered for this class as they are intended to supplement the classroom experience. Students are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Recordings may not be reproduced, shared with those not in the class, or uploaded to other online environments. If the instructor or a

University of Miami office plans any other uses for the recordings, beyond this class, students identifiable in the recordings will be notified to request consent prior to such use.

Students will be advised at the beginning of the course that class sessions will be recorded and asked to sign a consent form. Students must upload their signed consent form to Blackboard in the Assignments section under the Content Tab.

Consent may be revoked at any time by emailing the request to the course coordinator. Any student who revokes their consent to be recorded must disable their camera during class and use the following steps to change their name to a pseudonym on Zoom.

1. Go to https://miami.zoom.us/ and log in to the system.
2. Click on the Profile icon in the top right corner.
3. Click "Edit" next to your name.
4. Enter your new pseudonym into the boxes provided. The name must be appropriate for a classroom setting and not be disruptive.

Department policy on scientific misconduct and plagiarism

The Department of Public Health Sciences is committed to fostering an environment that supports the promotion of public health values and is conducive to professionalism and ethical standards for the responsible conduct of science and education.

The University of Miami expects all graduate students to adhere to the highest standards of ethics and academic integrity. All forms of academic fraud are strictly prohibited. These include, but are not limited to, plagiarism and/or cheating (whether it be in an examination, dissertation, thesis, research paper, research project, form of creative expression, experimental data, or any other academic undertaking).

Students found to be in violation of these standards are subject to disciplinary actions through the process described in the University of Miami Graduate Student Honor Code https://grad.miami.edu/_assets/pdf/graduate_student_honor_code_2016_2017.pdf

Plagiarism
Plagiarism is representing the words or ideas of someone else as one's own. Examples include failing to cite direct quotes properly and failing to give credit for someone else's ideas or materials. If students are unsure whether a particular practice is acceptable, they are urged to discuss the issue with the faculty instructor, the UM Writing Center, or refer to the links provided below:

- What It Is and How to Recognize and Avoid It

    ➢ Indiana University Writing Tutorial Services
    ➢ http://www.indiana.edu/~wts/pamphlets/plagiarism.shtml

- Citing Sources and Avoiding Plagiarism: Documentation
    ➢ Duke University Libraries Guide
    ➢ https://library.duke.edu/research/citing

- What are the differences among quoting, paraphrasing, and summarizing?

- ➢ University of Wisconsin Writer's Handbook

  ➢ http://www.wisc.edu/writing/Handbook/QuotingSources.html

- Using Quotations
  - ➢ St. Cloud University
  - ➢ http://leo.stcloudstate.edu/research/usingquotes.html

- Plagiarism tutorial
  - ➢ Vaughan Memorial Library, Acadia University
  - ➢ http://library.acadiau.ca/tutorials/plagiarism/

- Avoiding plagiarism, self-plagiarism, and other questionable writing practices
  - ➢ Michigan State University
  - ➢ https://www.cse.msu.edu/~alexliu/plagiarism.pdf

<u>University of Miami Writing Center</u>

The Writing Center strives to help all members of the university community learn more about writing and become better writers. Their faculty and tutors work one-on-one with students to discuss course papers, dissertations, personal statements, grant proposals, articles for publication and personal writing projects. To make an appointment, call (305) 284-2956 or visit the website www.as.miami.edu/writingcenter.

<u>Fall Course Schedule:</u>

Course Introduction	
1. Aug 19	Discuss syllabus

Topic 1 Chance and randomness	
2. Aug 26	Randomness and chance *Objective: Understand the difference between randomness and chance, computational pseudorandomness.*
3. Sept 2	Randomness in nature: quantum physics *God does play dice!* *Objective: Understand Bell's experiment as a foundational example of true randomness in nature*
4. Sept 9	Randomness in nature: population genetics, Wright-Fisher model, drift *Objective: Understand the Wright-Fisher model as a toy example of randomness as absence of better knowledge*
5. Sept 16	Chance, necessity, and design *Objective: Understand different forms of causation, examples in different areas (search/evolutionary algorithms, monkey type-writer)*
6. Sept 23	Artificial Intelligence vs. Natural Intelligence *Objective: Understand what natural intelligent agents can do that artificial intelligence cannot do. Turing machine. Algorithmic- and non-algorithmic thinking. Creativity*

Topic 2 **Limits of knowledge**	
7. Sep 30	The limits of chance. What can be learned through prob and stats an what cannot *Objective: Understand the uncertainty due to inductive knowledge in inference, compared to deductive knowledge in math... thus probability.*
8. Oct 7	The limits of computation: *Objective: Understand what can be done by computing, Turing tests (Chinese room)*
9. Oct 14	The limits of computation: *Objective: Understand AI vs natural intelligence (mathematical/deductive proof vs. simulations/sampling as inductive proof)*
10. Oct 21	The limits of knowledge and science: *Objective: Understand Gödel as a general version of a Turing test*
11. Oct 28	Inference: hypothesis testing *Objective: Understand hypothesis testing as a statistics version of a proof by contradiction*
12 Nov 4	Inference: hypothesis testing II *Objective: Understand false positives and false negatives, and their relation to all the limits previously explored. Alpha and beta values. Ioannidis paper.*
13. Nov. 11	Inference: Bayesian Statistics *Objective: Understand subjective and objective probabilities, prior and posterior distributions, the principle of indifference and maxent.*

Topic 3 **Information and informatics**

14. Nov 18	Information as a basic entity: Shannon *Objective: Understand bits, entropy, self-information, relative entropy, and active information.*
15. Dec 2	Machine learning I *Objective: Understand supervised and unsupervised learning, training data, computational statistics, and new statistical challenges (like high dimensions and big data).*

Profile of Instructor:

Daniel Díaz has a bachelors in Mathematical Statistics and a PhD in probability theory. He is currently Research Assistant Professor at the Division of Biostatistics of the University of Miami where he first arrived as a postdoc some years ago. His research interests lie in theoretical statistics and foundations of probability.