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BIOS 9131 – Advanced Statistical Theory for Biostatistics I

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Georgia Southern University
Jiann-Ping Hsu College of Public Health

BIOS 9131 – Advanced Statistical Theory for Biostatistics I
Fall 2018

<u>Instructor:</u>	Hani M. Samawi
<u>Office:</u>	1012 Hendricks Building
<u>Phone:</u>	478-1345
<u>E-Mail Address:</u>	hsamawi@georgiasouthern.edu
<u>Office Hours:</u>	Monday 10-12, Tuesday and Thursday –1:00 pm-to-2:00 pm, Wednesday 1 pm to 2 pm. Other times by appointment
<u>Class Meets:</u>	Tuesdays and Thursdays: 11:00 AM – 12:15 PM; Hendricks Hall 2020

Course Catalog available at:
<http://em.georgiasouthern.edu/registrar/resources/catalogs/>
under Jiann-Ping Hsu College of Public Health Programs

Prerequisites: None

FOLIO Access: <https://my.georgiasouthern.edu/portal/portal.php>
Course Credit: This is a three-credit hour course designed for the DrPH core curriculum.

Course Structure: This course is an in-person meeting class.

Catalog Description: This course provides an advanced study of theoretical statistics. Topics include: an introduction probability and sample space, conditional probability and Bayes Theorem, probability distribution of a random variable, discrete and continuous random variables, functions of random variables, moments and moment generating functions, order statistics and their distributions, discrete distributions, continuous distributions, bivariate and multivariate normal distribution, modes of convergence, limiting moment generating functions, and the central limit theorems. 3 hours

Required Textbook: Vijay K. Rohatgi and A. K. Md. Ehsanes Saleh (2000). *An Introduction to Probability and Statistics*, Second edition. John Wiley & Sons, INC.

Secondary Text: Peter J. Bickel and, Kjell A. Doksum (2006). *Mathematical Statistics*, 2nd Edition, by Prentice Hall.

Cross-cutting

1. Demonstrate their readiness to work with communities to address public health problems.
2. Select and apply theoretically based interventions to address public health problems.
3. Apply appropriate research methods to address community health problems, particularly among rural and underserved populations.

Biostatistics Concentration

1. Construct a public health and biomedical research question from ideas, conditions, and events that exist in a rural and urban community, region, state, and nation using critical thinking skills.
2. Demonstrate required skills for translating public health practice objectives to the appropriate biostatistical framework for analysis and interpretation of results.
3. Illustrate sufficient substantive knowledge of advanced biostatistical methods such as multiple regression, logistic regression, survival analysis, longitudinal data analysis, and Bayesian and adaptive methods to interact with biostatisticians and related public health researchers in a meaningful and productive fashion.
4. Communicate biostatistical principles and concepts to lay and professional audiences through both oral and written communication.

Performance Based Objectives:

1. Understand and use probability concepts which include sample space, probability axioms, combinatorics (finite sample space), conditional probability and Bayes theorem, and independent events.
2. Understand random variables and be able to differentiate between discrete and continuous types. Learn probability distribution functions of random variables (continuous and discrete), find distribution of a function of a random variable, find moments and moments generating of a distribution function and some moment's inequalities.
3. Understand and use multiple random variables concepts which include independent random variables, functions of several random variables, covariance, correlation and moments, conditional expectations and order statistics and their distributions. Understand and use some special distributions, discrete and continuous, bivariate and multivariate normal distribution, and the exponential family of distributions.
4. Understand and use limits theorems which include modes of convergence, Weak Law of Large Numbers, Strong Law of Large Numbers and Central Limit Theorem.

Overview of the Content to be Covered During the Semester:

Week	Topic	Readings	Assignment: Due within 1 week of completion of topic
1-2	Probability (Learning Objectives: 1)	Chapter 1	1.2.2, 1.3.1, 1.3.2, 1.3.7, 1.3.10, 1.4.1, 1.4.12, 1.4.13, 1.5.10, 1.5.13, 1.6.1, 1.6.5, 1.6.11
3-4	Random Variables and Their Probability Distributions (Learning Objectives: 2)	Chapter 2	2.2.1, 2.2.4, 2.2.5, 2.3.3, 2.4.3, 2.4.5, 2.4.6, 2.5.1, 2.5.2, 2.5.6, , 2.5.10
5-6	Moments and Generating Functions (Learning Objectives: 3)	Chapter 3	3.2.3, 3.2.6, 3.2.14, 3.3.1, 3.3.4, 3.3.7, 3.4.1, 3.4.4, 3.4.8
7-10	Multiple Random Variables (Learning Objectives: 4)	Chapter 4	4.2.1, 4.2.4, 4.2.9, 4.3.2, 4.3.3, , 4.3.14, 4.4.2, 4.4.13, 4.4.17, 4.5.1, 4.5.3, 4.6.3, 4.6.4, 4.6.5, 4.7.4
11-13	Some Special Distributions (Learning Objectives: 5)	Chapter 5	5.2.3, 5.2.7, 5.2.8, 5.2.10, 5.3.3, 5.3.4, 5.3.8, 5.4.1, 5.4.6, 5.5.1, 5.5.3
14-16	Limit Theorems (Learning Objectives: 6)	Chapter 6	6.2.2, 6.2.5, 6.2.9, 6.2.11, 6.3.5, 6.3.8, 6.4.1, 6.4.7, 6.5.1, 6.5.2, 6.5.5, 6.6.1, 6.6.2, 6.6.5

Samples of your work may be reproduced for search purposes and/or inclusion in the professor's teaching portfolio. You have the right to review anything selected for use, and subsequently ask for its removal.

Instructional Methods: Class meetings will be a combination of lecture, class discussion, and computer software demonstration. Written homework assignments and examinations constitute the basis of student evaluation.

Exam Schedule and Final Examination:

Midterm Examination: October 16, 2018

Final Examination: December 6, 2018; 10:00 am -12:00 pm

Grading:

Weighting of assignments for purposes of grading will be as follows:

Midterm Exam (Learning Objectives: 1, 2, 3) 150 points (30%)

Final Exam	(Learning Objectives: 4, 5, 6)	200 points (40%)
Assignments	(Learning Objectives: 1-6)	150 points (30%)
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Total Possible Points		500 points (100%)
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The following point scale will be utilized in grading:

- 450-to-500 points (90%) A
- 400-to-449 points (80%) B
- 350-to-399 points (70%) C
- 300-to-349 points (60%) D

A cumulative total of 299 points or less will be considered as failing.

For calculation of your final grade, all grades above will be included.

Your grades ***will not*** be posted. All exams and assignments will be graded and returned promptly so that students may accurately calculate their grades at any point in time during the semester.

There are times when extraordinary circumstances occur (e.g., serious illness, death in the family, etc.). In such circumstances, and/or if you need additional time to satisfactorily complete any course requirement, please consult with the instructor within a reasonable amount of time.

Nota Bene: Extensions are not guaranteed and will be granted solely at the discretion of the instructor.

NO EXTRA CREDIT PROJECTS WILL BE ASSIGNED!

Academic Misconduct: "According to the Academic Dishonesty Policy of GSU, Plagiarism includes (but is not limited to):

- A. Directly quoting the words of others without using quotation marks or indented format to identify them.
- B. Using published or unpublished sources of information without identifying them.
- C. Paraphrasing material or ideas without identifying the source.
- D. Unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic material.

If you are accused of plagiarism by a JPHCOPH, the following policy, as per the Judicial Affairs website (<http://students.georgiasouthern.edu/judicial/faculty.htm>) will be enforced:

PROCEDURES FOR ADJUDICATING ACADEMIC DISHONESTY CASES

First Offense - In Violation Plea

1. If the professor and the Dean of Students agree that the evidence is sufficient to warrant a charge of academic dishonesty, the professor should contact the Office of Judicial Affairs to determine if this is a first violation of academic dishonesty. The incident will be reported via the following website:
<http://students.georgiasouthern.edu/judicial/faculty.htm>
2. If it is a first violation, the professor should talk with the student about the violation. If the student accepts responsibility in writing and the professor decides to adjudicate the case, the following procedures will be followed:
 - a. The student will be placed on disciplinary probation for a minimum of one semester by the Office of Judicial Affairs.
 - b. The student will be subject to any academic sanctions imposed by the professor (from receiving a 0 on the assignment to receiving a failing grade in the class).
 - c. A copy of all the material involved in the case (Academic Dishonesty Report Form and the Request For Instructor to Adjudicate Form) and a brief statement from the professor concerning the facts of the case and the course syllabus should be mailed to the Office of Judicial Affairs for inclusion in the students discipline record.

First Offense - Not In Violation Plea (student does not admit the violation)

If the professor and the Dean of Students agree that the evidence is sufficient to warrant a charge of academic dishonesty, the professor should contact the Office of Judicial Affairs to determine if this is the first or second violation of academic dishonesty. The student will be charged with academic dishonesty and the University Judicial Board or a University Hearing Officer would hear the case. If the student is found responsible, the following penalty will normally be imposed:

- a. The student will be placed on Disciplinary Probation for a minimum of one semester by the Office of Judicial Affairs.
- b. The student will be subject to any academic sanctions imposed by the professor.

Second Violation of Academic Dishonesty

If the professor and the Dean of Students agree that the evidence is sufficient to warrant a charge of academic dishonesty, and if it is determined this is the second violation, the student will be charged with academic dishonesty and the University Judicial Board or a University Hearing Officer would hear the case.

If the student is found responsible, the following penalty will normally

be imposed:

- a. Suspension for a minimum of one semester or expulsion.
- b. The student will be subject to any academic sanctions imposed by the professor.

NOT RESPONSIBLE FINDING

When a student is found not responsible of academic dishonesty, the work in question (assignment, paper, test, etc.) would be forwarded to the Department Chair. It is the responsibility of the Department Chair to ensure that the work is evaluated by a faculty member other than the individual who brought the charge and, if necessary, submit a final grade to the Registrar. For the protection of the faculty member and the student, the work in question should not be referred back to the faculty member who charged the student with academic dishonesty.

In the case of a Department Chair bringing charges against a student, an administrator at the Deans level will ensure that the students work is evaluated in an appropriate manner.

Academic Handbook: Students are expected to abide by the Academic Handbook, located at <http://students.georgiasouthern.edu/sta/guide/>. Your failure to comply with any part of this Handbook may be a violation and thus, you may receive an F in the course and/or be referred for disciplinary action.

University Calendar for the Semester:

The University Calendar is located with the semester schedule, and can be found at: <http://www.collegesource.org/displayinfo/catalink.asp>.

Attendance Policy:

Federal regulations require attendance be verified prior to distribution of financial aid allotments. Attendance will not be recorded after this initial period.

One Final Note:

The contents of this syllabus are as complete and accurate as possible. The instructor reserves the right to make any changes necessary to the syllabus and course material. The instructor will make every effort to inform students of changes as they occur. It is the responsibility of the student to know what changes have been made in order to successfully complete the requirements of the course.