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Fall 2019

### BIOS 9135– Advanced Survival Analysis

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Georgia Southern University  
Jiann-Ping Hsu College of Public Health  
**BIOS 9135– Advanced Survival Analysis**  
Fall 2019

**Instructor:** Dr. Lili Yu  
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**Grading Assistant:** TBA  
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**Office Hours:** Wednesday, 9AM-12PM; Thursday, 10:00AM-12:00PM

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

**Prerequisites:** BIOS 6131, BIOS 6531 and BIOS 7131

**FOLIO Access:** <https://my.georgiasouthern.edu/portal/portal.php>

*Access to course materials are available for up to one year after graduation.*

**Catalog Description**

This course will be placed on the theory on survival data. Counting processes and martingale method will be introduced. Emphasis will be place on the applications of the theory on the methodologies for survival data, such as Kaplan-Meier estimate, log-rank test, Cox model, etc. The students will learn how to use R language to setup survival dataset and perform analysis.

**Required Textbook:**

1. Xian Liu. Survival Analysis: Models and Applications 1st Edition. Wiley. ISBN-13: 978-0470977156. ISBN-10: 0470977159

2. John D. Kalbfleisch and Ross L. Prentice (2002). *The Statistical Analysis of Failure Time Data*. Second Edition. Wiley. ISBN: 978-0471363576.
3. Thomas R. Fleming and David P. Harrington (1991). *Counting Processes and Survival Analysis*. Wiley.

**Reference Textbook:** *Design and Analysis of Clinical Trials with Time-to-Event Endpoints (2009)* [Peace, KE (Ed.)]. Chapman & Hall/CRC Biostatistics Series; ISBN: 9781420066395.

**Dr.P.H Biostatistics Concentration Competencies:**

Upon graduation a Biostatistics student with a Dr.P.H should be able to...

1. Demonstrate skills for translating objectives of a public health and biomedical research question into the appropriate biostatistical questions.
2. Design a public health and biomedical investigation in terms of the experimental design, data to be collected to reflect research objectives, number of subjects needed to address the objectives, and specification of appropriate methods for analysis.
3. Develop a theoretical foundation for commonly used topics in inferential statistics such as probability, sampling, discrete and continuous distributions and their moment generating functions, point and interval estimation, likelihood ratio tests, hypothesis testing, and nonparametrics found in advanced analyses of public health and biomedical studies.
4. Compare Bayesian methods to frequentist methods for analyzing data.
5. Evaluate a public health and biomedical research proposal to determine the more appropriate biostatistical analysis methodology, including Bayesian and frequentist approaches.
6. Analyze public health and biomedical data via classical and Bayesian approaches using statistical software packages such as SAS, R/S-plus, and WinBUGS.
7. Develop a protocol for performing meta-analyses of data to be collected to address a question requiring collection of summary data across several sources.
8. Demonstrate use of meta-analytic methods for combining information across public health and biomedical studies.
9. Apply meta-analysis to estimate the sources and magnitude of heterogeneity across public health and biomedical studies.
10. Explain underlying theory in longitudinal data analyses of public health and biomedical studies.
11. Analyze longitudinal data in public health and biomedical studies with appropriate longitudinal data analysis methods.
12. Interpret analytic methods used throughout the literature in biostatistical and public health journals.
13. Interpret results of classical and Bayesian biostatistical analyses so that valid and reliable conclusions regarding a public health and biomedical research question may be drawn from the analyses.
14. Develop new ideas for applying existing biostatistical methods to applications in public health.

15. Develop statistical reasoning skills to work independently on ideas for research in public health and biomedicine.
16. Develop written and oral reports to communicate effectively to research investigators pivotal aspects of a study, including its design, objectives, data, analysis methods, results, and conclusions.
17. Create a collaborative environment for working on written and oral reports and developing critical thinking skills.

## **CEPH DrPH Competencies**

### **Data & Analysis**

1. Explain qualitative, quantitative, mixed methods and policy analysis research and evaluation methods to address health issues at multiple (individual, group, organization, community and population) levels
2. Design a qualitative, quantitative, mixed methods, policy analysis or evaluation project to address a public health issue
3. Explain the use and limitations of surveillance systems and national surveys in assessing, monitoring and evaluating policies and programs and to address a population's health

### **Leadership, Management & Governance**

4. Propose strategies for health improvement and elimination of health inequities by organizing stakeholders, including researchers, practitioners, community leaders and other partners
5. Communicate public health science to diverse stakeholders, including individuals at all levels of health literacy, for purposes of influencing behavior and policies
6. Integrate knowledge, approaches, methods, values and potential contributions from multiple professions and systems in addressing public health problems
7. Create a strategic plan
8. Facilitate shared decision making through negotiation and consensus-building methods
9. Create organizational change strategies
10. Propose strategies to promote inclusion and equity within public health programs, policies and systems
11. Assess one's own strengths and weaknesses in leadership capacities including cultural proficiency
12. Propose human, fiscal and other resources to achieve a strategic goal
13. Cultivate new resources and revenue streams to achieve a strategic goal

### **Policy & Programs**

14. Design a system-level intervention to address a public health issue
15. Integrate knowledge of cultural values and practices in the design of public health policies and programs
16. Integrate scientific information, legal and regulatory approaches, ethical frameworks and varied stakeholder interests in policy development and analysis
17. Propose interprofessional team approaches to improving public health

### **Education & Workforce Development**

18. Assess an audience's knowledge and learning needs

19. Deliver training or educational experiences that promote learning in academic, organizational or community settings
20. Use best practice modalities in pedagogical practices

**Performance-Based Objectives Linked to Course Activities (Note: Assessment Activities Described in Next Section)**

1. Distinguish survival type data from other data types; (competency 1,2,6,12,13,17)
2. Understand and use counting process to express survival data; (competency 1,2,6,12,13,14,15,16,17)
3. Understand stochastic integrals, martingale, submartingale, supermartingale, filtration, predictable process and compensator; (competency 1,2,6,12,13,14,15,16,17)
4. Understand Doob-Meyer decomposition; (competency 1,2,6,12,13,14,15,16,17)
5. Apply stochastic processes, martingals and Doob-Meyere decomposition to local square integrable martingales; (competency 1,2,6,12,13,14,15,16,17)
6. Counting process and martingale representation for Nelson cumulative hazard estimator, logrank test statisitics, and Cox model; (competency 1,2,6,12,13,14,15,16,17)
7. Proof of the consistency of the Kaplan-Meier Estimator;
8. Understand Martingale central limit theorem; and(competency 1,2,6,12,13,14,15,16,17)
9. Understand the distribution theory for propotional hazards regression. (competency 1,2,6,12,13,14,15,16,17)

**Assessment of Student Learning**

Activity 1: homework

Activity 2: exam

Activity 3: presentation

*Students may vary in their ability to achieve levels of competence in this course. Students can expect to achieve course competence only if they honor all course policies, attend classes regularly, complete all assigned work in good faith and on time, and meet all other course expectations of them as students.*

**Overview of the content to be covered the semester:**

Week	Topic	Readings	Assignment
1	Review of the basic concepts for survival data	Chapter 0: The applied setting	
2-3	The Counting Process and	Chapter 5: A.S.A.	TBA

	Martingale Framework		
4-5	Local Square Integrable Martingales	Chapter 5: A.S.A	TBA
6-8	Finite sample moments and large sample consistency of tests and estimators	Chapter 5 : A.S.A.	TBA
9-10	Likelihood construction and Further results	Chapter 6: A.S.A.	TBA
11-12	Rank regression and the AFT model	Chapter 7: A.S.A.	TBA
13-14	Competing risks and multistate models	Chapter 8: A.S.A.	TBA

### **Portfolio Inclusion**

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 active participation. Computer-generated presentations will be used in the lecture portion of this course. Prior to each lecture, the student is encouraged to complete the recommended readings and actively participate in class discussions. In this way, it is hoped that the learner will be better prepared to successfully accomplish the learning objective of each lecture experience.*

### **Exam Schedule and Final Examination:**

Midterm Examination: October 30, 2019  
Final Examination: December 9, 2019 by 5pm

### **Grading Scheme:**

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

Midterm Exam (30%)  
(competency 4,5,6,7,8,9,10,11)  
Final Exam (40%)  
(competency 4,5,6,7,8,9,10,11,12,13,14)

Assignments (30%)

Note: 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.

**Grading Scale:** The following point scale will be utilized in grading:

(90%-100%) A

(80%-90%) B

(70%-80%) C

(60%-70%) D

(0%-59%) F

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.

### **General Expectations**

1. For every one-credit hour, you should expect to work roughly two hours outside the classroom each week. For example, for a three credit hour course, during a regular fifteen week semester, you should expect approximately ninety hours of work outside of class.
2. Students are expected to keep up with the class, to read the required material, and to submit assignments and activities by due dates and times.
3. Students are expected to independently complete all activities, exercises, assignments, and assessments including exams.
4. Students are expected to produce quality work. Typos and grammar errors should be kept to a minimum. The format and readability of submissions will be taken into consideration when assigning a grade.

- Remember to check when assignments are due. It is recommended that you stay ahead of schedule on the assignments, so if an emergency happens, your assignment will be completed and ready to submit within the designated time frame. It is your responsibility to keep track of the due dates for each assignment.

### **Response Times**

During a normal work week (i.e., Monday 9:00 AM through Friday 5:00 PM) students can expect responses as follows:

- Email: within 48 hours
- Discussion posts: within 72 hours
- Assignment grades: within 72 hours of submission date.

Exceptions: I may not check FOLIO or GSU email over the weekends. If you send me an email after 5:00 PM on Friday, please do not expect a response until the following Monday.

All assignments will be graded 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. Extensions are not guaranteed and will be granted solely at the discretion of the instructor.

### **Course Expectations**

#### **Texting and Use of Cell Phones (and Other Technologies)**

Please do not text in class or use your cell phone during class! Texting during class (or in a meeting) is disruptive and rude...at least to me. My preference is that you put cell phones away during class meetings so they are not a source of temptation. Offenders will be asked to leave.

#### **Class Attendance and Participation Policy**

Federal regulations require attendance be verified prior to distribution of financial aid allotments. Regular attendance is expected. Your attendance will be verified at the first regular class session.

It is the policy of the University to permit students, faculty, and staff to observe those holidays set aside by their chosen religious faith. The faculty should be sensitive to the observance of these holidays so that students who choose to observe these holidays are not seriously disadvantaged. It is the responsibility of those who wish to be absent to make arrangements in advance with their instructors.

Students participating in authorized activities as an official representative of the University (i.e., athletic events, delegate to regional or national meetings or conferences, participation in



university-sponsored performances, and **JPHCOPH funded**) will not receive academic penalties and, in consultation with the instructor of record, will be given reasonable opportunities to complete assignments and exams or given compensatory assignment(s) if needed. The student must provide written confirmation from a faculty or staff advisor to the course instructor(s) at least 10 days prior to the date for which the student will be absent from the class. The student is responsible for all material presented in class and for all announcements and assignments. When possible, students are expected to complete these assignments before their absences. In the event of a disagreement regarding this policy, an appeal may be made by either the student or the instructor of record to the corresponding college dean. (*University Graduate Catalog*)

### **Academic Misconduct**

As a student registered at this University, it is expected that you will adhere to only the strictest standards of conduct. It is recommended that you review the latest edition of the *Student Conduct Code* book, as well as the latest *Undergraduate & Graduate Catalog* to familiarize yourself with the University's policies in this regard. Your continued enrollment in this course is an implied contract between you and the instructor on this issue; from this point forward, it is assumed that you will conduct yourself appropriately.

### **Plagiarism:**

According to the Academic Dishonesty Policy of Georgia Southern University, 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 student's 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 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 Dean's level will ensure that the student's work is evaluated in an appropriate manner.

### **CONFIDENTIALITY**

In accordance with provisions of the Family Educational Rights and Privacy Act of 1974 and the Georgia Open Records Act, any information related to a violation of academic dishonesty or the outcome of a judicial hearing regarding academic dishonesty, is prohibited and must be treated as confidential by members of the faculty."

### **Accommodations for Individuals with Disabilities**

In compliance with the Americans with Disabilities Act (ADA), Georgia Southern University will honor requests for reasonable accommodations made by individuals with disabilities. Students must self disclose any disability for which an accommodation is being sought to the

Student Disability Resource Center (SDRC) before academic or other accommodations can be implemented. For additional information, please call the Director of EEO and Title IX at (912) 478-5136 / TDD (912) 478-0273 or the SDRC Director at (912) 478-1566 / TDD (912) 478-0666. The TDD phone numbers are intended for individuals with hearing impairments.

### **University Calendar for the Semester**

The University Calendar is located with the semester schedule, and can be found at:  
<http://em.georgiasouthern.edu/registrar/resources/calendars/>

### **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 to ensure better student learning. The instructor will announce any such changes in class. It is the responsibility of the student to know what changes have been made in order to successfully complete the requirements of the course.

This syllabus, my lecture notes, and all materials distributed and presented during this course are protected by copyright law. You are authorized to take notes in this class but that authorization extends to only making one set of notes for your personal use and no other use. You are not authorized to sell, license, commercially publish, distribute, transmit, display, or record notes from this class unless you have my written consent to do so.

## **STUDENT CONDUCT CODE**

The Student Conduct Code is the official University publication governing student conduct and behavior. It is the responsibility of each student to become familiar with the rules and regulations governing student life. Student conduct procedures, appeal procedures, and disciplinary sanctions are found in the Student Conduct Code at <http://students.georgiasouthern.edu/conduct>. I acknowledge that I have read and understand this statement referencing the Student Conduct Code.

## **ACADEMIC DISHONESTY**

The University goal is to foster an intellectual atmosphere that produces educated, literate people. Because cheating and plagiarism are at odds with that goal, they shall not be tolerated in any form. Students are expected to adhere to the rules and regulations as set forth in the Student Conduct Code. Therefore, all work submitted by a student must represent that student's own ideas and effort; when the work does not, the student has engaged in academic dishonesty. Plagiarism occurs when a person passes in another person's work as his or her own, borrows directly from another person's work without proper documentation, and resubmits his or her own work that has been previously submitted without explicit approval from the instructor. For example, academic dishonesty occurs whenever a student participates in any of the following: Cheating submitting material that is not yours as part of your course performance; using information or devices that are not allowed by the faculty; obtaining and/or using unauthorized materials; fabricating information, research, and/or results; violating procedures prescribed to protect the integrity of an assignment, test, or other evaluation; collaborating with others on assignments without the faculty's consent; cooperating with and/or helping another student to cheat; demonstrating any other forms of dishonest behavior. Plagiarism directly quoting the words of others without using quotation marks or indented format to identify them; using sources of information (published or unpublished) without identifying them; paraphrasing materials or ideas without identifying the source; self-plagiarism - resubmitting work previously submitted without explicit approval from the instructor; unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic material. NOTICE: The list above is intended only to provide general guidelines for recognizing and avoiding common types of academic dishonesty. It is in no way an exhaustive or comprehensive list of all the types of academic dishonesty. For more information about academic honesty, see the Student Conduct Code at <http://students.georgiasouthern.edu/conduct>. I acknowledge that I have read and understand the Academic Dishonesty Policy.

I have read the syllabus and understand the contents and course requirements.

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Student Name (print)

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Student Signature

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Date