

**University of Florida**  
**College of Public Health & Health Professions Syllabus**  
**PHC6059: Introduction to Applied Survival Analysis (3 credits)**  
Fall: 2019  
Delivery Format: *On-Campus*  
Course Website: [elearning.ufl.edu](http://elearning.ufl.edu)

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Instructor Name: Natalie E. Dean, PhD  
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Office Hours: Tuesdays 10:00-11:00am and by appointment  
Preferred Course Communications: Email or Canvas Message

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### **Prerequisites**

Prior training in statistics (PHC 6052 or equivalent) and knowledge of multiple regression (PHC 6053 or equivalent). R programming experience will also be helpful.

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## **PURPOSE AND OUTCOME**

### **Course Overview**

Survival analysis is about the analysis of time-to-event data. The goal of this course is to help you understand the fundamental concepts of survival analysis and their applications in epidemiology and biomedical sciences. Basic concepts from probability and introductory statistics will be reviewed as needed.

### **Relation to Program Outcomes**

Survival analysis is one of the most widely applied branches of statistics. In public health and medicine, it is the theoretical foundation for the design and analysis of cohort and case-control studies.

### **Course Objectives and/or Goals**

Upon successful completion of the course, students should be able to:

1. Discuss the purpose and role of survival analysis in the field of Biostatistics
2. Utilize analytical methods to produce numerical and graphical summaries of time-to-event data
3. Conduct hypothesis testing to make inference on key survival analysis parameters
4. Formulate parametric and semi-parametric regression models for time-to-event data
5. Execute these functions in R software
6. Interpret results from studies in the literature that use survival analytic methods

### **Instructional Methods**

Tuesday will be one period of lecture. Each lecture will review the material in that week's lecture notes. Students are expected to prepare by reading the lecture notes before class. Weekly quizzes due by 3pm on Tuesday will be used to assess comprehension of the week's material. You are encouraged to bring a printed or virtual copy of the lecture notes to class, and laptops are allowed.

Thursday will be a two period problem-solving session where we work on the problem sets. This will be crucial for reviewing concepts, learning to apply them, and preparing for the exams. Laptops are allowed and encouraged for activities involving R computing.

## DESCRIPTION OF COURSE CONTENT

### Topical Outline/Course Schedule

Date(s)		Topic(s)
August	20	Lecture 1: <i>Introduction to time-to-event data</i>
	22	Problem Set 1
	27	Lecture 2: <i>Key functions in survival analysis</i>
	29	Problem Set 2
	3	Lecture 3: <i>Parametric survival distributions</i>
	5	Problem Set 3
September	10	Lecture 4: <i>Kaplan-Meier and Nelson-Aalen estimators</i>
	12	Problem Set 4
	17	Lecture 5: <i>Log-rank test</i>
	19	Problem Set 5
	24	Midterm exam 1 review
	26	<b>Midterm exam 1</b>
October	1	Lecture 6: <i>Introduction to Cox proportional hazards regression</i>
	3	Problem Set 6
	8	Lecture 7: <i>Building Cox proportional hazards models</i>
	10	Problem Set 7
	15	Lecture 8: <i>Cox model extensions</i>
	17	Problem Set 8
	22	Lecture 9: <i>Residuals and model diagnostics</i>
	24	Problem Set 9
	29	Midterm exam 2 review
	31	<b>Midterm exam 2</b>
	5	Lecture 10: <i>Alternative data structures in survival analysis</i>
	7	Problem Set 10
	12	Lecture 11: <i>Accelerated failure time models</i>
	14	Problem Set 11
	19	Lecture 12: <i>Survival analysis in clinical trials</i>
	21	Problem Set 12
	26	Lecture 13 (online): <i>Survey of recent examples in the literature</i>
	28	<b>Thanksgiving – No class</b>
December	3	Final exam review, final exam distributed
	5	<b>Reading day – No class</b>
	10	<b>Final exam due</b>

### Course Materials and Technology

There is no required textbook for the course. The primary readings will be lecture notes.

Good basic textbooks on survival analysis are: *Applied Survival Analysis, 2<sup>nd</sup> edition* by David W. Hosmer, Stanley Lemeshow, and Susanne May (Wiley-Interscience, 2008) and *Modelling Survival Data in Medical Research, 3<sup>rd</sup> edition* by David Collett (Chapman and Hall/CRC, 2014).

All statistical computing in the class will be done in R (<https://cran.r-project.org/>). The free Open Source Edition of RStudio (<https://www.rstudio.com/products/rstudio/>) is recommended for its easy to use graphical interface. An introduction to R is available online (<https://cran.r-project.org/doc/manuals/R->

[intro.pdf](#)). Many of the functions we use will be in the `survival` package (<https://cran.r-project.org/web/packages/survival/survival.pdf>). From within R, this can be installed using the command: `install.packages("survival")`.

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

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

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## ACADMIC REQUIREMENTS AND GRADING

### Grading

The assessment will include class participation, two midterm exams, and one final exam. Students are responsible for all course material, including reading required materials prior to each class.

- 15% Class participation
- 5% Weekly quizzes
- 25% Midterm exam 1 (in class September 26)
- 25% Midterm exam 2 (in class October 31)
- 30% Final exam (due December 10)

The point system used for this course consists of the standard scale:

<b>Points Earned</b>	<b>93-100</b>	<b>90-92</b>	<b>87-89</b>	<b>83-86</b>	<b>80-82</b>	<b>77-79</b>	<b>73-76</b>	<b>70-72</b>	<b>67-69</b>	<b>63-66</b>	<b>60-62</b>	<b>Below 60</b>
<b>Letter Grade</b>	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E

### Class Participation

Student class participation grade will be determined by attendance (10 points possible) and professionalism (5 points possible). Attendance at all class sessions is required. Attendance will be collected by sign-in at the start of each class. Record of attendance will equally weighted across the term.

Please email the instructor as early as possible regarding potential excused absences. Please note 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>

Students exhibiting superior professionalism will come to class prepared, actively participate in class discussions, ask questions, and listen actively to lectures. A professionalism rubric is provided in Canvas.

### Quizzes (Weekly, Online)

Students are asked to review the lecture notes prior to attending class on Tuesday. There will be weekly quizzes to assess your comprehension of concepts and knowledge of requisite information needed to be successful in this course. The quizzes are in the Canvas course site and are directly related to each week's required readings. You will have 2 attempts to complete each quiz and the highest score will be recorded. Quizzes are due by 3pm on Tuesday providing the instructor time to review quiz results and

address any common questions about the material in that day's lecture. These quizzes will help you evaluate your understanding of course content by providing you feedback on your performance.

### **Problem Sets**

Problem sets will be given each week unless there is an exam. You are encouraged to work together, but you should write up your own results. They will not be graded, but they will be important for learning the material and preparing for the exams. Solutions will be posted online.

### **Midterm Exams**

There will be two midterm exams. The midterm exams will be in class with open notes. Calculators are allowed, but laptops and cell phones are not. Exams are cumulative with greatest focus on material not covered in a previous exam.

### **Final Exam**

The final exam will be a take-home exam. The exam will be cumulative with greatest focus on material not covered in previous exams. This exam will require some short answer and R computing. Students will prepare neatly typed exams in Word or LaTeX that can be submitted online in Canvas or delivered to the instructor's office. Students are not allowed to work together on the final exam. Students will be asked to include an honor code statement at the beginning of their exam. Questions about the final exam should be directed to the instructor as early as possible, at least 24 hours before the exam is due.

### **Policy Related to Make-Up Exams**

All students are expected to take the exams at the time and place communicated by the instructor. Make-up exams will not be considered except for an excused absence, per UF policy noted above. Students should contact the instructor as early as possible regarding a potential make-up exam.

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.

### **Bonus Points**

In order to maintain high quality course materials, the instructor invites students to review the materials for errors. The instructor will award 0.5 bonus points for each "substantive" error found in the lecture notes, problem sets, solutions, or exams. Points will be applied to the next exam. Points will only be awarded to the first person to detect the error (who emails the instructor or notifies the instructor in class), and the error must be identified by the student before it is identified by the instructor.

The instructor reserves the right to determine what is "substantive." Examples include (i) improperly interpreted results (e.g. wrong effect size, wrong direction), (ii) incorrect calculations, derivations, or notation, (iii) text that is significantly misleading, and (iv) content that is obviously missing, such as through accidental deletion. Small typos, like a missed or incorrect word, are unlikely to be considered substantive errors.

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## **STUDENT EXPECTATIONS, ROLES, AND OPPORTUNITIES FOR INPUT**

### **Expectations Regarding Course Behavior**

Students are expected to show up for class prepared and on time. Cell phones are to be silenced during class unless there is an emergency, in which case please inform the instructor.

### **Communications Guidelines**

Course discussions (online and in-class) should be respectful, thoughtful, and courteous. Please review and follow the UF *Netiquette Guidelines*:

<http://teach.ufl.edu/wp-content/uploads/2012/08/NetiquetteGuideforOnlineCourses.pdf>

### **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/>.

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## **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.

## 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.

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## 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](http://www.multicultural.ufl.edu).