

**PUBHBIO 8235 – Advanced Regression Modeling of Time-to-Event Data**  
**3 credit hours – Spring, 2026**

**Lectures:** Wednesdays and Fridays, 9:35-10:55 am in University Hall room 066 (basement)  
Zoom link:  
<https://osu.zoom.us/j/8202455595?pwd=Y3ZERFp3cHA2ZGFYbmNlM0dWNW13dz09>

**Instructor:** Andy Ni, PhD in Biostatistics, University of North Carolina at Chapel Hill, 2015.

**Office location:** 224 Cunz Hall

**E-mail:** [ni.304@osu.edu](mailto:ni.304@osu.edu)

**Office hours:** Mondays, 1:00-2:00 pm in Cunz Hall room 224

**Faculty Feedback & Response Time:**

The following gives you an idea of my intended availability during the course:

- Grading: You can generally expect feedback within 7 days.
- E-mail: I will reply to e-mails within 24 hours on school days.

**TA:** No TA

**Course Description:** This is a first course in survival analysis intended for students in the Interdisciplinary PhD Program in Biostatistics. This class covers theoretical content in more depth than PUBHBIO 7235 (Applied Survival Analysis), and introduces advanced methods not covered in the earlier course. Statistical models and methods useful for analyzing both univariate and multivariate failure time data are discussed. Topics beyond PUBHBIO 7235 include martingale and asymptotic theory, the accelerated failure time model, and frailty models. Emphasis will be on nonparametric and semiparametric approaches for modeling, estimation, and inference although parametric methods will also be shown.

**Prerequisites:** Stat 6802 and 6950 or permission of the instructor

**Course Learning Objectives:**

Upon successful completion of the course, students will have the knowledge, comprehension and/or skills to be able to use and apply commonly used statistical methods for analyzing univariate and multivariate failure time data. In particular, students will be able to:

1. Construct appropriate models for time to event data using parametric, non-parametric or semi-parametric approaches and both interpret results and verify model assumptions.
2. Explain basic features of counting processes and apply them to obtain asymptotic results for failure time models.
3. Formulate expressions to estimate parameters using likelihood theory for failure time models.

4. Construct models and expressions for parameter estimation for situations involving bivariate/multivariate survival data.

### **Interdisciplinary PhD in Biostatistics Learning Goals Covered:**

- Understands the theoretical foundations of statistical methods (1)
- Can effectively communicate the results of statistical analyses to statistical and non-statistical audiences (5)

**Primary Text:** *Survival and Event History Analysis*, by Aalen, Borgan, and Gjessing.

**Secondary Texts:** *Survival Analysis: Techniques for Censored and Truncated Data*, 2<sup>nd</sup> edition, by Klein & Moeschberger.

Both textbooks are available free by visiting the pages for [Aalen et al.](#) and [Klein and Moeschberger](#) on the OSU libraries website.

### **Carmen**

There is a Carmen site for this course: <https://carmen.osu.edu>. All course materials are available via Carmen.

You will need to use BuckeyePass ([buckeyepass.osu.edu](https://buckeyepass.osu.edu)) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device help article for step-by-step instructions (<https://admin.resources.osu.edu/buckeyepass/adding-a-device>)
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click Enter a Passcode and then click the Text me new codes button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application (<https://admin.resources.osu.edu/buckeyepass/installing-the-duo-mobile-application>) to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service

If none of these options meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357(HELP) and IT support staff will work out a solution with you.

### **Required Statistical Software:**

STATA will be used for all data analysis examples in class. R code for the class examples will be posted on the class website but will not be covered during lecture. You may use whatever software you prefer for homework assignments and the take home exams, but I strongly recommend that you use either STATA or R to ensure you obtain the best computing support from myself and the TA.

STATA is available at a reduced rate for students on the [student purchasing page](#) of the STATA website. If you only plan on using STATA for this class, I recommend purchasing a 6-month license of STATA BE (Basic Edition). STATA may also be accessed for free in the Public Health Informatics Lab (Cunz 230). Please contact me as soon as possible if you would like evening and weekend access to the lab.

**Grading:** Final class grades will be determined as follows:

Homework	30%
In-class Midterm Exam	25%
In-class Final Exam	25%
Take-home Project	20%

Homework: There will be **six** homework assignments. Each homework will consist of 3-5 problem sets (A-E), with one set released per lecture. Each homework spans approximately two weeks. Please refer to the course schedule below for the release dates of problem sets and homework due dates. All assignments must be submitted on Carmen by 11:59 pm Eastern the day it is due. Late homework will not be accepted except under unusual circumstances. You are permitted (and encouraged!) to work together on homework but submitted assignments must be written independently.

Exams: In-class **midterm and final exams: February 27 and April 24.** These exams will be closed-book, but you are allowed to use up to three letter-sized sheets of notes (both sides), which may be handwritten or typed. The exams will consist of derivations/proofs, quick hand calculations, short answers to conceptual questions, and interpretation of results. You will need a calculator during the exams, but you cannot use a calculator app on a phone, tablet, or any device with internet connectivity. You are expected to work independently on the exams with no assistance from others. You are to turn in your note sheets at the end of the exams, but they will be returned to you after all exams have been graded. You must contact me as soon as possible if you are unable to take an exam at the scheduled time. Make-up exams will be offered only under special circumstances.

Take-home Project: **Distributed April 24 and due May 1<sup>st</sup>.** This project will require you to perform an independent analysis of a time-to-event dataset. The project is open book but must be completed independently. The report will be submitted electronically on Carmen and must be completed using a word processing program (e.g., Microsoft Word or LaTeX). You will need access to a statistical analysis software package (e.g., STATA or R) to complete the project.

**Grading Scale:\***

100-93	A
<93-90	A-
<90-87	B+
<87-83	B
<83-80	B-
<80-77	C+
<77-73	C
<73-70	C-
<70-60	D
< 60	E

\*The instructor reserves the right to adjust the grading scale if it appears necessary due to class performance. These adjustments will only raise a student's grade not lower it.

### **Copyright Statement**

This syllabus and all course materials (e.g. lecture notes, video recordings) are under copyright by the instructor and cannot be posted elsewhere without written permission.

### **Generative AI Policy**

In this course, students are welcome to explore innovative tools and technologies including generative artificial intelligence (GenAI) to assist with their homeworks and the take-home project. Your written homeworks and the take-home project should be in your own words.

### **Course technology**

#### *Technology support*

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available at [ocio.osu.edu/help/hours](https://ocio.osu.edu/help/hours), and support for urgent issues is available 24/7.

- **Self-Service and Chat support:** [ocio.osu.edu/help](https://ocio.osu.edu/help)
- **Phone:** 614-688-4357(HELP)
- **Email:** [servicedesk@osu.edu](mailto:servicedesk@osu.edu)
- **TDD:** 614-688-8743

#### *Technology skills needed for this course*

- Basic computer and web-browsing skills

#### *Required equipment*

- Computer: current Mac (MacOs) or PC (Windows 10) with high-speed internet connection
- Other: a mobile device (smartphone or tablet) to use for BuckeyePass authentication

### **Office of Student Life: Disability Services**

Any student who feels they may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Please contact the Office of Student Life: Disability Services at 614-292-3307 in Room 098 Baker Hall 113 W. 12<sup>th</sup> Ave. to coordinate reasonable accommodations for students with documented disabilities (<http://slids.osu.edu/>).

### **Accessibility of Course Technology**

This online course requires use of CarmenCanvas (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please contact me to request accommodations as early as possible.

### **Mental Health Services**

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting <https://ccs.osu.edu/> or calling 614-292-5766. CCS is located on the 4<sup>th</sup> Floor of the Younkin Success Center and 10<sup>th</sup> Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273-TALK or at [suicidepreventionlifeline.org](http://suicidepreventionlifeline.org).

### **Religious Beliefs or Practices Accommodations**

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must

be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the [Civil Rights Compliance Office](#). (Policy: [Religious Holidays, Holy Days and Observances](#))

### **Academic Misconduct**

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee ([Faculty Rule 3335-5-48.7 \(B\)](#)). For additional information, see the [Code of Student Conduct](#).

### **Grievances and Solving Problems**

A student who encounters a problem related to his/her educational program has a variety of avenues available to seek resolution. According to University Policies, if you have a problem with this class, you should seek to resolve the grievance concerning a grade or academic practice by speaking first with the instructor or professor. Then, if necessary, you may take your case to the department chairperson. Specific procedures are outlined in [Faculty Rule 3335-8-23](#), the [CPH Graduate Student Handbook](#), and the [CPH Undergraduate Student Handbook](#). Grievances against graduate, research, and teaching assistants should be submitted first to the supervising instructor, then to the chairperson of the assistant's department.

### **Online Lecture Alternative**

When in-person classes are impossible due to weather, university policy, or other causes, we will meet virtually via Zoom during our regularly scheduled time. The Zoom link is posted at the beginning of the syllabus and on Carmen.

**Course Schedule:**

Week	Date	Lecture*	Topics	Reading <sup>†</sup>	Problem Set	Assignment Due
1	1/14	1	Introduction to Survival Analysis	ABG 1.1	1A	
	1/16	2	Introduction to Counting Processes, Discrete Time Martingales	ABG 1.4.1, 1.4.2, 2.1.1	1B	
2	1/21	3	Discrete Time Martingales (Cont'd)	ABG 2.1	1C	
	1/23	4	Continuous Time Martingales	ABG 2.2.1-2.2.4	1D	
3	1/28	5	Continuous Time Martingales (Cont'd)	ABG 2.2.5-2.2.7	2A	<b>HW 1 Due</b>
	1/30	6	Censoring, Gaussian Martingales, Martingale Central Limit Theorem	ABG 2.2.8, 2.3	2B	
4	2/4	7	Martingale Central Limit Theorem (Cont'd), Nelson-Aalen Estimator	ABG 3.1.1, 3.1.3	2C	
	2/6	8	Nelson-Aalen Estimator (Cont'd), Kaplan-Meier Estimator	ABG 3.1.5, 3.1.6, 3.2.1	2D	
5	2/11	9	Kaplan-Meier Estimator (Cont'd)	ABG 3.2.2, 3.2.3	3A	<b>HW 2 Due</b>
	2/13	10	Kaplan-Meier Estimator (Cont'd) Nonparametric Tests	ABG 3.2.4, 3.2.6, 3.3.1	3B	
6	2/18	11	Nonparametric Tests (Cont'd)	ABG 3.3.1, 3.3.2, 3.3.4	3C	
	2/20	12	Nonparametric Tests (Cont'd), Competing Risks, Cumulative Incidence Function	ABG 3.3.5, 1.2.2, 3.4.1	3D	
7	2/25	13	Cumulative Incidence Function (Cont'd), Midterm Exam Review	ABG 1.2.2, 3.4.1	4A	<b>HW 3 Due</b>
	2/27		<b>In-class Midterm Exam</b>			
8	3/4	14	Cox Regression: estimation & inference	ABG 4.1.1, KM 8.1-8.5	4B	
	3/6	15	Cox Regression: inference & asymptotics	ABG 4.1.5	4C	
9	3/11	16	Cox Regression: estimating cumulative hazard & survival functions, competing risks, martingale residuals	ABG 4.1.2, 4.1.3, KM 8.8, 11.3	4D	
	3/13	17	Cox Regression: assessing linearity, model fit	ABG 4.1.3; KM 11.2	4E	
<b>Spring Break: 3/16-3/20</b>						
10	3/25	18	Cox Regression: assessing proportional hazards	KM 11.4	5A	<b>HW 4 Due</b>
	3/27	19	Modified Cox Models	ABG 4.1.4 KM 9.2-9.3	5B	
11	4/1	20	Model Building Strategies	KM 8.7	5C	
	4/3	21	Model Building Strategies (Cont'd) Parametric Models	ABG 5.1; KM 8.7, 3.5	5C	

Week	Date	Lecture*	Topics	Reading†	Problem Set	Assignment Due
12	4/8	22	Accelerated Failure Time Models	KM 12	6A	<b>HW 5 Due</b>
	4/10	23	Parametric Frailty Models for Multivariate Survival Data	ABG 6.2.1, 6.2.2, 7.1, 7.2;	6B	
13	4/15	24	Semiparametric Frailty Models, Marginal Models, Interval Censored Data	KM 13.3, 13.4	6C	
	4/17	25	Interval Censored Data (Cont'd)	KM 5.2	6C	
14	4/22	26	Final Exam Review			<b>HW 6 Due</b>
	4/24		<b>In-class Final Exam</b>			<b>Take-home Project Release</b>
15	5/1					<b>Take-home Project Due</b>

\*May change depending on course flow.

†ABG = Aalen, Borgan, Gjessing; KM= Klein & Moeschberger;

### Alignment of Course Assignments with Degree Program Learning Goals

	Homework	Exams	Project
Understands the theoretical foundations of statistical methods (1)	X	X	X
Can effectively communicate the results of statistical analyses to statistical and non-statistical audiences (5)	X	X	X