STA 506: Mathematical Statistics II

STA 506 **SYLLABUS AND COURSE POLICIES** Spring 2022

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Office Hours: Monday: 3-5 PM
Tuesday: 1-3 PM
Thursday: 1-2 PM

Course Web Page: This course has a D2L website. I will be using it quite heavily so please make sure to check it often!

Lectures: Section 80 - Mo 5:45-8:30, 25 University Ave. 120
Section 90 - Online

Text: *Mathematical Statistics with Applications*, **7th edition**
Wackerly, Mendenhall and Scheaffer (required)

OVERVIEW & COURSE DESCRIPTION

In recent years, the growth of statistics has made itself felt in almost every phase of human activity. Statistics no longer consists merely of the collection of data and their presentation in charts and tables (descriptive statistics) - it is now considered to encompass the science of basing inferences on observed data and the entire problem of *making decisions in the face of uncertainty* (inferential statistics). This covers considerable ground since uncertainties are met when we flip a coin, when a drug company evaluates the efficacy of a new drug, when an actuary determines life expectancy, when a quality control engineer accepts or rejects manufactured products, when a teacher compares the abilities of students, when an economist forecasts market trends, when a newspaper predicts an election, and so forth.

This course, using the probability theory developed in a mathematical probability class, such as STA-505, deals with the basic ideas and methods of analyzing data and making inferences about an unknown population based on information contained in a sample. We will study the formalisms behind frequently used statistical methods, and develop a link between statistical theory and practice.

Student Learning Outcomes for the Masters of Science in Applied Statistics:

1. Demonstrate an understanding of probability and statistical inference, including the fundamental laws of classical probability, discrete and continuous random variables, expectation theory, maximum likelihood methods, hypothesis testing, power, and bivariate and multivariate distribution theory.

2. Demonstrated the ability to apply the elementary methods of statistical analysis, namely those based on classical linear models, categorical methods, and non-parametric ideas to perform data analysis for the purposes of statistical inference.

3. Demonstrate proficiency in the effective use of computers for research data management and for analysis of data with standard statistical software packages, particularly SAS.

4. Learn to develop and critically assess design of experimental studies and the collection of data.

5. Apply one or more methods of statistical inference to a particular area of interest, particularly the program in the elective concentration.

6. Gain practical experience in statistical consulting and communicating with non- statisticians, culminating with interaction with research workers at a local company as part of the internship practicum.

COURSE OBJECTIVES

1. To introduce the basic ideas and methods that underlie the mathematical theory of statistics. [SLO 1].

2. To develop and use methods for summarizing and evaluating numerical data. [SLO 2].

3. To develop skills in the applications of statistical methods to problems in the sciences and the social sciences, including specification of models, assessment of model assumptions, and interpretation of results. [SLO 2].

4. To begin to learn to use standard statistical packages, e.g., R, to analyze data. [SLO 3].

LECTURES

Lectures will consist mainly of notes that I will post on the course website the night before class. However, there will be plenty of time for discussion. Statistics is very conducive to collaboration so it is important that you contribute to the process. I expect everyone to participate in discussion when the situation arises.

HOMEWORK

• There will be regular homework assignments for this class. Homework will be assigned at the end of each class and will (usually) be **due the following week**. Homework is due in class **BEFORE** class starts. **No late homework will be accepted unless it's previously cleared by me**. Homework and their solutions will be available on the course website. Please submit neat, *stapled* paper copies or nicely organized electronic versions of your homework.

• Homework assignments will consist of problems from the end of each chapter covered along with additional problems at my discretion.

• Statistics is very conducive to collaboration. Therefore, unless otherwise instructed, I encourage you to discuss assignments with other students. The best way to work with others on homework is to do as much as you can on your own, and then get together. If you've done the problems independently, it's more likely that one of you will have the right answer. If you do them together from the outset, you might both make the same mistakes.

EXAMS

• There will be TWO IN-CLASS EXAMINATIONS and an IN-CLASS FINAL. The first exam is *tentatively* scheduled for MONDAY, MARCH 7TH. The second exam is *tentatively* scheduled for MONDAY, APRIL 25TH. The final exam will be cumulative and will be taken on MONDAY, MAY 7TH. For the first two exams, you will be allowed the front of a regular size sheet of paper to write down any notes you deem necessary. You are allowed to write notes on both the front and back of a regular size sheet of paper for the final.

The online section will be given a 72 hour window from the above dates to complete each exam. They will still have the same amount of time to take the exam as the in-person section.

• **No makeup examinations** will be given. A student who misses an examination because of a medical reason must provide **documented** evidence of serious medical incapacitation. Other reasons for missing an examination must be discussed with me **before** the day of the examination. Each case will be considered on an individual basis. The overall course grade for a student who misses an examination with a valid reason will be based on that student's remaining course work. A student who misses an examination without a valid excuse will receive a grade of zero on that examination. Sleeping through an exam is not a valid excuse and will result in a grade of zero.

COURSE GRADE

Your course grade consists of:

Exam 1	25%
Exam 2	25%
Homework	20%
Final	30%

STUDENT CONDUCT

• For questions regarding Academic Dishonesty, the No-Grade Policy, Sexual Harassment, or the Student Code of Conduct, students are encouraged to refer to their major department's handbook, the Undergraduate Course Catalogue, the Ram's Eye View, or the University Web Site. Improper conduct in any of these areas may result in a grade of zero points, a failing grade in the course and/or expulsion from the class.

ATTENDANCE POLICY:

• **I will not be taking attendance**. However, I highly recommend that you attend class. Even though I will be posting some notes on the website, there will be a lot of supplemental material not in the notes. If you miss a class, your best bet to learn the material is to come to my office hours, meet with someone from class or, in extreme cases, contact me to meet at another time.

CLASS CANCELLATION POLICY

In the event that I am unable to meet a class, I will: (a) notify you in person at a prior meeting to that effect or (b) an official class cancellation notification on the *stationary of the Department of Mathematics and signed and date stamped by the Department's* will be posted on the classroom door. All other postings announcing the cancellation of this class are to be considered unofficial and are to be ignored.

OFFICE HOURS

I will hold office hours each week. I am also frequently available by appointment. Please make sure to provide ample advance notice for these appointments.

ADA

• If you have a disability that requires accommodations under the Americans with Disabilities Act (ADA), please present your letter of accommodations and meet with me as soon as possible so that I can support your success in an informed manner. Accommodations cannot be granted retroactively. If you would like to know more about West Chester Universitys Services for Students with Disabilities (OSSD), please visit them at 223 Lawrence Center. Their phone number is 610-436-2564, their fax number is 610-436-2600, their email address is ossd@wcupa.edu, and their website is at www.wcupa.edu/ussss/ossd. In an effort to assist students who either receive or may believe they are entitled to receive accommodations under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973, the University has appointed a student advocate to be a contact for students who have questions regarding the provision of their accommodations or their right to accommodations. The advocate will assist any student

who may have questions regarding these rights. The Director for Equity and Compliance/Title IX Coordinator has been designated in this role. Students who need assistance with their rights to accommodations should contact them at 610-436-2433.

COMPUTING

You will be asked to use *R* software throughout the semester. However, no programming background is required since all of the code will be provided. Any computing will be done in the computer lab so there is no need to bring your own laptop. If you choose to bring your personal laptop then it is your responsibility to download the packages (ask me).
I will hold office hours each week. I am also frequently available by appointment. Please make sure to provide ample advance notice for these appointments. You can attend office hours in-person or remotely. The link to my Personal Meeting Room on Zoom can be found in the Announcements on D2L.

EMAIL POLICY

• It is expected that faculty, staff, and students activate and maintain regular access to University provided e-mail accounts. Official university communications, including those from your instructor, will be sent through your university e-mail account. You are responsible for accessing that mail to be sure to obtain official University communications. Failure to access will not exempt individuals from the responsibilities associated with this course.

CAMPUS EMERGENCIES

• All students are encouraged to sign up for the Universitys free WCU ALERT service, which delivers official WCU emergency text messages directly to your cell phone. For more information, visit www.wcupa.edu/wcualert. To report an emergency, call the Department of Public Safety at 610-436-3311.

REPORTING INCIDENTS OF SEXUAL VIOLENCE

West Chester University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to meet this commitment and to comply with Title IX of the Education Amendments of 1972 and guidance from the Office for Civil Rights, the University requires faculty members to report incidents of sexual violence shared by students to the University's Title IX Coordinator. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred to the person designated in the University protection of minors policy. Information

regarding the reporting of sexual violence and the resources that are available to victims of sexual violence is set forth at the webpage for the Office of Diversity, Equity, and Inclusion at https://www.wcupa.edu/_admin/diversityEquityInclusion/aboutUs.aspx.

EXCUSED ABSENCE POLICY

Students are advised to carefully read and comply with the excused absences policy, including absences for university-sanctioned events, contained in the WCU Graduate Catalog. In particular, please note that the responsibility for meeting academic requirements rests with the student, that this policy does not excuse students from completing required academic work, and that professors can require a fair alternative to attendance on those days that students must be absent from class in order to participate in a University-Sanctioned Event.

TENTATIVE LIST OF COVERED TOPICS

- Sampling Distributions/Central Limit Theorem [CO 1] (Chapters 7.1-7.4)
- Point Estimation [CO 1,2] (Chapters 8.1-8.4)
- Interval Estimation [CO 1,2] (Chapters 8.5-8.9)
- Sufficiency [CO 3] (Chapters 9.1-9.5)
- Method of Moments [CO 1,2] (Chapter 9.6)
- Maximum Likelihood Estimation [CO 1,2] (Chapters 9.7-9.8)
- Elements of Hypothesis Testing [CO 1,2] (Chapters 10.1 - 10.8)
- Power of Tests and Neyman-Pearson Lemma [CO 3] (Chapters 10.10 - 10.11)
- Inference for Linear Models [CO 3] (Chapters 11.1-11.5)

I am looking forward to teaching this class as I hope you are looking forward to taking it. Please do not hesitate to contact me if you have any questions or concerns whatsoever.

Welcome, and Good Luck!