STA 490 – Statistics Capstone

Spring 2025

CONTACT INFORMATION

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Meeting Time: Tuesday/Thursday, 12:30 PM – 1:45 PM
Classroom: UNA 119
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                    Thursday: 9:30 AM – 11:30 AM
Course Web Page: https://pengdsci.github.io/STA490

COURSE DESCRIPTION

The course will synthesize lessons learned throughout the student's career to prepare students for work as professional statisticians and emphasizes the development of effective oral and written communication skills through working with real-world projects. Topics will include the use of up-to-date technologies for effective communication, report writing, presentations, statistical consulting, sampling design, and resume writing.

COURSE LEARNING OUTCOMES

After finishing this course, students are expected to achieve the following learning outcomes.
   General
   1. Use appropriate statistical methods to solve real-world applications.
   2. Use a statistical programming language to perform rigorous data analysis.
   3. Effectively utilize data to address practical questions.
   4. Identify sources of bias and avoid misinterpretations.
   5. Use up-to-date technology to improve effective written and oral communications.
   Writing
   6. Use the posted guidelines (rubrics) to write professional statistical analysis reports
Speaking
   7. Use the posted guidelines (rubrics) to prepare oral presentations using modern technologies.

ASSESSING STUDENT LEARNING OUTCOMES

Three major projects will be used to assess students' learning outcomes. The detailed evaluation components are outlined in the following components:

   (1). Class participation: class discussion and consulting practice (30%)

(2). Project #1 on sampling design and analysis (20%): Report (10%) and oral presentation (10%)
(3). Project #2 on survey design and analysis (20%): Report (10%) and oral presentation (10%)
(4). Final team project presentation (30%): SAP (10%), report(10%), oral presentation (10%)

A letter grade will be assigned based on performance in the course according to the following scale:

Grade	Quality Points	Percentage Equivalents	Interpretation
A	4.00	93-100	Excellent
A-	3.67	90-92	
B+	3.33	87-89	Superior
B	3.00	83-86	
B-	2.67	80-82	
C+	2.33	77-79	Average
C	2.00	73-76	
C-	1.67	70-72	
D+	1.33	67-69	Below Average
D	1.00	63-66	
D-	0.67	60-62	
F	0	< 60%	Failure

Refer to the Undergraduate Catalog for a description of NG (No Grade), W, Z, and other grades.

EVALUATION RUNBRICS

- **Class Participation and Discussion**:

  Adapted from Bean, J. C. & Peterson, D. (1998). Grading classroom participation. New Directions for Teaching and Learning, 74, 33-40. Participation is evaluated using the following scale:

Grade Scale	Criteria
10 Points	- come to class prepared. - contribute readily to the conversation but don't dominate it. - make thoughtful contributions based on the literature that advances conversation. - show an interest in and respect for others' contributions. - participate actively in all groups.
7 points	- come to class prepared and makes thoughtful comments when called upon. - contribute occasionally without prompting. - shows interest in and respect for others' views. - participate actively in small groups.
5 Points	- participate in the discussion, but in a problematic way. - talk too much, ramble, interrupt the instructor and others, or do not acknowledge cues of annoyance from others.
3 Points	come to class prepared but only minimally contribute.

- **Oral Presentation Rubrics.**

  The following grading rubrics apply to all three oral presentations during the semester. The emphasis is to use up-to-date technologies to enhance effective presentations. These rubrics should be used as guidelines to prepare oral presentations.

Category and Scoring Criteria	Points Possible
Organization:	**3.0**
Presentation is appropriate for the topic and audience	0.5
A clear opening statement and purpose	0.5
Information presented in a logical sequence	0.5
Pertinent	0.5
Design/layout: neat, clear, and visually appealing	0.5
Summarizes main points	0.5
Content:	**6.0**
Full understanding of the topics	0.5
Practical and analytic logic	0.5
The technical term well defined	0.5
Analytic justifications	0.5
Text content: straightforward, concise, and accurate	0.5
Reference (acknowledge other's contributions)	0.5
Quality of Conclusion:	**2.0**
Well-justified and persuasive conclusions	0.5
Limitations and potential improvements	0.5
Delivery:	**5.0**
Clear and audible voice	0.5
Projects enthusiasm, interest, and confidence.	1
Interaction with audience	0.5
Presentation time management	0.5
Visual Aids:	**2.0**
Uses various visual tools to enhance the presentation	0.5
Effectively use colors and charts and avoid distraction	0.5
Response to Questions:	**2.0**
Demonstrates full knowledge of the topic	0.5
Explains and elaborate on all questions	0.5

- **Project Report Grading Rubrics**:

  The following grading rubrics apply to all three project reports during the semester. These rubrics should be used as guidelines to prepare your project reports.

Category and Scoring Criteria	Points Possible
Statistical Analysis	**3.0**
Statistical questions are appropriately formulated	0.5
Data sources are well explained	0.5
Models are appropriately selected and justified	1.0
Model diagnoses are appropriately performed	0.5
Remedy any issues from diagnostics	0.5
Interpretation, Conclusion, and Recommendations	**2.0**

The correct interpretation of results	0.5
Draw appropriate convincing conclusions	0.5
Limitations and potential improvements	0.5
Make practical recommendations	0.5
Organization and Structure	**1.0**
Sections and subsections are clearly and logically structured	0.5
The code is well-documented and placed in the appendix	0.5
Readability: Clarity, Correctness, Accuracy, Effectiveness	**3.0**
Results are presented correctly and completely (unbiasedly)	0.5
Written explanation is clear, straightforward, accurate, and concise	1.0
Supporting tables and charts are accurate, neat, and visually appealing	0.5
Error-free in spelling, grammar, punctuation, and syntax	0.5
Meet the page limit	0.5
Summary	**1.0**
The summary is concise and complete	0.5
The summary is non-technical and understandable to the general audience	0.5

TENTATIVE TOPICS

This is a project lead course. The topics that are described in the course description are delivered through the following projects outlined in the following tentative thematic projects.

Week 01: Logistics and Technical Tools
- A laptop with relevant software programs installed.
- Outline of the topics for the semester
- Computational tools: R, RStudio, R Markdown, and GitHub

Week 02: Creating Online Resume and Personal Webpage
- Getting started with basic HTML.
- HTML Tags for RMarkdown and concepts of CSS
- Templates of personal web pages
- Set up your professional web page on GitHub.
- Create and publish your online CV on GitHub

Week 03: Effective Communication with Web Technologies: HTML presentation
- Presentation formats in RMarkdown
- RMarkdown presentation template: Ninja presentation
- Prepare an HTML presentation based on a project completed in STA321.

Week 04: Effective Presentation and Communication
- Effective writing of reports
- The role of visual aids
- Effective delivery of oral presentation

Week 05: Oral Presentation #1
- 20-minute team presentation (small two-member team).
- Pre-defined rubrics for evaluation contents and aesthetic designs of the presentation

Week 06: Basics of EDA
- EDA methods and techniques
- Commonly used EDA techniques
- Applications of EDA
- EDA process

Week 07: Sampling A Finite Population – Methods and Techniques
- Defining study population
- Four probability-based sampling plans
- Implementation of sampling plans with a real-life data set

Week 08: Finalize Sampling Project and HTML Presentation Slides
- Drafting a formal sampling report individually (not a team report).
- Preparing team presentation slides in HTML format with your teammate

Week 09: Oral Presentation #2
- 20-minute oral presentation
- Using the same rubrics to evaluate the presentation based on content and design.

Week 10: Basics of Survey Design
- Basics of survey designs: focus on multi-item instrument design
- Relationship between sampling and survey design
- Implementation of sample survey
- Handling missing values in survey data

Week 11: Validity and Reliability of Survey
- Evaluating survey instruments with multi-items: validity and reliability
- EDA for processing survey data
- Case study with real survey instruments

Week 12: Principal component analysis approach to analyzing survey data.
- First consulting meeting on a new survey study on students' experience and satisfaction.
- Introduction to Principal Component Analysis
- A case study using PCA on self-compassion and gratitude survey.

Week 13: Structure Statistical Analysis Plan (SAP) and Project Proposal
- The importance and benefit of SAP.
- Develop SAP for the final project based on the experience/satisfaction survey.

Week 14: Preparing Project Report and preparing the final oral presentation.
- Critical reading of each team's SAP
- Finalize report.
- Preparing oral presentation slides in HTML format

Week 15: Oral Presentation #3
- Final project presentation. Each team has 20 minutes (including 5 minutes for QA).
- Presentation report and slide due.

UNIVERSITY POLICIES AND RESOURCES

ACADEMIC & PERSONAL INTEGRITY

It is the responsibility of each student to adhere to the university's standards for academic integrity. Violations of academic integrity include any act that violates the rights of another student in academic work, that involves misrepresentation of your own work, or that disrupts the instruction of the course. Other violations include (but are not limited to): cheating on assignments or examinations; plagiarizing, which means copying any part of another's work and/or using ideas of another and presenting them as one's own without giving proper credit to the source; selling, purchasing, or exchanging of term papers; falsifying of information; and using your own work from one class to fulfill the assignment for another class without significant modification. Proof of academic misconduct can result in the automatic failure and removal from this course. For questions regarding Academic Integrity, the No-Grade Policy, Sexual Harassment, or the Student Code of Conduct, students are encouraged to refer to the Department Undergraduate Handbook, the Undergraduate Catalog, the Ram's Eye View, and the University website at www.wcupa.edu.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

West Chester University is committed to providing equitable access to the full WCU experience for Golden Rams of all abilities. Students should contact the Office of Educational Accessibility (OEA) to establish accommodations if they have had accommodations in the past or if they believe they may be eligible for accommodations due to a disability, whether or not it may be readily apparent. There is no deadline for disclosing to OEA or for requesting to use approved accommodations in a given course. However, accommodations can only be applied to future assignments or exams; that is, they can't be applied retroactively. Please share your letter from OEA as soon as possible so that we can discuss accommodations. If you have concerns related to disability discrimination, please contact the university's ADA Coordinator in the Office of Diversity, Equity, and Inclusion or 610-436-2433.

EXCUSED ABSENCES POLICY

Students are advised to carefully read and comply with the excused absences policy, including absences for university-sanctioned events, contained in the WCU Undergraduate 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.

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 comply with the requirements of Title IX of the Education Amendments of 1972 and the University's commitment to offering supportive measures in accordance with the new regulations issued under Title IX, 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: Office of Diversity, Equity, and Inclusion

INCLUSIVE LEARNING ENVIRONMENT AND ANTI-RACIST STATEMENT

Diversity, equity, and inclusion are central to West Chester University's mission as reflected in our Mission Statement, Values Statement, Vision Statement and Strategic Plan: Pathways to Student Success. We disavow racism and all actions that silence, threaten, or degrade historically marginalized groups in the U.S. We acknowledge that all members of this learning community may experience harm stemming from forms of oppression including but not limited to classism, ableism, heterosexism, sexism, Islamophobia, anti-Semitism, and xenophobia, and recognize that these forms of oppression are compounded by racism.

Our core commitment as an institution of higher education shapes our expectation for behavior within this learning community, which represents diverse individual beliefs, backgrounds, and experiences. Courteous and respectful behavior, interactions, and responses are expected from all members of the University. We must work together to make this a safe and productive learning environment for everyone. Part of this work is recognizing how race and other aspects of who we are shape our beliefs and our experiences as individuals. It is not enough to condemn acts of racism. For real, sustainable change, we must stand together as a diverse coalition against racism and oppression of any form, anywhere, at any time.

Resources for education and action are available through WCU's Office for Diversity, Equity, and Inclusion (ODEI), DEI committees within departments or colleges, the student ombudsperson, and centers on campus committed to doing this work (e.g., Dowdy Multicultural Center, Center for Women and Gender Equity, and the Center for Trans and Queer Advocacy).
Guidance on how to report incidents of discrimination and harassment is available at the University's Office of Diversity, Equity and Inclusion.

EMERGENCY PREPAREDNESS

All students are encouraged to sign up for the University's free WCU ALERT service, which delivers official WCU emergency text messages directly to your cell phone. For more information, visit WCU Alert. To report an emergency, call the Department of Public Safety at 610-436-3311.

ELECTRONIC MAIL 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.

UNIVERSITY RESOURCES

COMMUNICATION VIA NAVIGATE

- West Chester University uses Navigate as a communication tool between faculty, students, and student support offices. Throughout the term, you may receive text messages and/or WCU emails from Navigate regarding your academic progress. These messages will have information to promote your success and direct you to support services that will best fit your needs—please open and read them. Additionally, Navigate has

useful features such as your course schedule, campus resources with contact and location information, and a feature called Study Buddies that lets you connect with other students in your class sections who are interested in studying together outside of class.

- To access Navigate, you will need to download the Student App to your phone by visiting the [Navigate website](#) (use the QR code).
- For technical assistance visit the [Help Desk](#). For additional Navigate documentation, visit the [Navigate Training Site](#).

TECHNICAL SUPPORT

- The [IS&T Help Desk](#) is the central point of contact for all technology-related hardware, software, and system support such as Office 365 and D2L at West Chester University. Located in Anderson Hall 119, the Help Desk provides first-level customer support for students and employees in locations such as administrative offices, classrooms, residence halls, remote sites & satellite campuses using ServiceNow.
- *Submit a support ticket*: [Login to ServiceNow](#) *Phone*: 610-436-3350
- Hours for support may vary. Check the website for times of operation.

ACADEMIC SUPPORT

- The [Academic Support Resources](#) website is a good place to start looking for academic support services.
- The [Learning Assistance and Resource Center](#) provides tutoring services for free, but availability is limited.
- [WCU Library](#) resources are available remotely.
- You are strongly encouraged to review the [Navigating Digital Learning](#) Orientation D2L module (in the Orientation tab of your My Courses page).

STUDENT SUPPORT

- The [WCU Student Support Center](#) is a good place to start looking for support services.
- [WCU Counseling & Psychological Services](#) offers counseling, referrals, and emergency resources.
- In the event of a health-related absence, the Health and Wellness [Student Assistance](#) webpage can help you notify instructors.
- Need a Laptop? Loaner equipment may be available; see the [Laptop and Equipment Loaner Program](#).

APSCUF

- APSCUF (The Association of Pennsylvania State College and University Faculties) is the union that represents the faculty and coaches who have devoted themselves to providing quality higher education for Pennsylvania students at the ten universities in the Pennsylvania State System of Higher Education, including West Chester University. To learn more about APSCUF, see www.apscuf.org.

WRITING CENTER

- The West Chester University Writing Center provides tutoring **free of charge** for any student on any writing project. To learn more about the WCU Writing Center and to make an appointment, go to www.wcupa.edu/writingcenter.