

# STA 490 – Statistics Capstone

## CONTACT INFORMATION

**Instructor:** Cheng Peng

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**Office:** UNA107

**Meeting Time:** Tuesday/Thursday, 12:30 PM – 1:45 PM

**Classroom:** BPC116

**Office Hours:** Tuesday: 2:00 PM – 3:00 PM

Wednesday: 2:00 PM – 4:00 PM

Thursday: 2:00 PM – 5:00 PM

**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 RUBRICS

- 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	<ul style="list-style-type: none"> <li>• come to class prepared.</li> <li>• contribute readily to the conversation but don't dominate it.</li> <li>• make thoughtful contributions based on the literature that advances conversation.</li> <li>• show an interest in and respect for others' contributions.</li> <li>• participate actively in all groups.</li> </ul>
7 points	<ul style="list-style-type: none"> <li>• come to class prepared and makes thoughtful comments when called upon.</li> <li>• contribute occasionally without prompting.</li> <li>• shows interest in and respect for others' views.</li> <li>• participate actively in small groups.</li> </ul>
5 Points	<ul style="list-style-type: none"> <li>• participate in the discussion, but in a problematic way.</li> <li>• talk too much, ramble, interrupt the instructor and others, or do not acknowledge cues of annoyance from others.</li> </ul>
3 Points	<ul style="list-style-type: none"> <li>• come to class prepared but only minimally contribute.</li> </ul>

- 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
<b>Organization:</b>	<b>3.0</b>
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
<b>Content:</b>	<b>6.0</b>
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
<b>Quality of Conclusion:</b>	<b>2.0</b>
Well-justified and persuasive conclusions	0.5
Limitations and potential improvements	0.5
<b>Delivery:</b>	<b>5.0</b>
Clear and audible voice	0.5
Projects enthusiasm, interest, and confidence.	1
Interaction with audience	0.5
Presentation time management	0.5
<b>Visual Aids:</b>	<b>2.0</b>
Uses various visual tools to enhance the presentation	0.5
Effectively use colors and charts and avoid distraction	0.5
<b>Response to Questions:</b>	<b>2.0</b>
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
<b>Statistical Analysis</b>	<b>3.0</b>
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
<b>Interpretation, Conclusion, and Recommendations</b>	<b>2.0</b>
The correct interpretation of results	0.5
Draw appropriate convincing conclusions	0.5
Limitations and potential improvements	0.5
Make practical recommendations	0.5

<b>Organization and Structure</b>	<b>1.0</b>
Sections and subsections are clearly and logically structured	0.5
The code is well-documented and placed in the appendix	0.5
<b>Readability: Clarity, Correctness, Accuracy, Effectiveness</b>	<b>3.0</b>
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
<b>Summary</b>	<b>1.0</b>
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 personal 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 a 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 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
- 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 as SAP for the final project based on the experience/satisfaction survey.

**Week 14:** Preparing Project Report and prepare 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](http://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.