

# STA 490 – Statistics Capstone

## CONTACT INFORMATION

**Instructor:**  
**Phone:**  
**Email:**  
**Office:**  
**Classroom:**  
**Meeting Time:**  
**Office Hours:**  
**ZOOM Link:**  
**Course Web Page:**

## COURSE DESCRIPTION [\[Suggested New Catalog Description\]](#)

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 reports

### **Speaking**

7. Use the posted guidelines (rubrics) to prepare oral presentations.

## 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 (20%)
- (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 (40%): SAP (10%), report(15%), oral presentation (15%)

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	<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 the 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> </ul>

	<ul style="list-style-type: none"> <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.

### Part One: Strategies and Tools for Effective Communication

#### 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
- R Markdown document template
- Create GitHub repositories

#### Week 02: Showcase Your Analytic Skills Using GitHub and RPubs

- Code and data sharing via GitHub
- Host a professional web page on GitHub
- Templates of professional web pages
- Publish analytic reports on RPubs

**Week 03: Tools for Computing and Reporting**

- Setting up a computing environment: open-source and proprietary software programs
- Best practices for coding
- Analytic report writing: principles and strategies
- Use of computational notebook: integrating computing with reporting

**Week 04: Effective Presentation and Communication**

- Strategies in design an analytic presentation
- Components in effective storytelling
- Visual tools in
- Use of web technologies for visual aids

**Part Two: Sampling Techniques and Analysis****Week 05: Review of Statistics Methods**

- Descriptive Statistics
- Summary of inferential statistics: confidence intervals and testing hypothesis
- Linear regression models
- Logistic regression model.

**Week 06: Sampling Techniques**

- Getting to know the first working data set
- Study designs and sampling plans
- Sampling with R
- Project #1 proposal

**Week 07: Sampling A Finite Population – Methods and Techniques**

- Defining study population
- Descriptive statistics and basic visual analytics
- Comparing the performance of three sampling plans
- Project #1 draft report

**Week 08: Reporting Sampling Project**

- Setting up three sampling plans
- Defining performance metrics
- Finalizing project #1 report
- Oral presentation: 10 minutes per presenter (including QA).

**Part Three: Survey Design and Analysis****Week 09: Survey Instrument Design**

- Best practices of statistical consulting
- Questionnaire design
- Likert scales: analysis and interpretation

- Dissecting well-established survey instruments
- Concepts of survey reliability and internal consistency

**Week 10: Challenges in Survey Data**

- Handling missing values
- Sparse demographic variables
- Survey scales and subscales
- Methods of information aggregation: mean score vs PCA score
- Project #2 proposal

**Week 11: Statistical Methods of Information Aggregation**

- Extracting information from multi-item survey instruments
- Creating analytic data
- Perform EDA, EVA, and regression analysis
- Project #2 draft Report

**Week 12: Structure of SAP and Project #2 Oral Presentation**

- Structure of Statistical Analysis Plan (SAP)
- Proposal vs SAP vs report
- Preparing web-based dynamic presentation of project #2
- Oral presentation of project #2: 10 minutes per presenter (including QA)

**Part Three: Final Team Project -**

**Week 13: Team Creation and Project Topic Selection**

- Each team should have 2-3 members
- Clear responsibilities for individual members
- Identification of data set and formulation
- Draft an SAP.

**Week 14: Preparing Project Report**

- Critical reading of each team's SAP
- Revising SAP and drafting the report
- Initial report due.
- Preparing oral presentation

**Week 15: Project Report Revision and Oral Presentation**

- Revising the final project report
- Final project presentation. Each team has 30 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).

### STUDENTS WITH DISABILITIES

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 University's 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](mailto:ossd@wcupa.edu), and their website is at <https://www.wcupa.edu/universityCollege/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.

### 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:

<https://www.wcupa.edu/admin/diversityEquityInclusion/sexualMisconduct/default.aspx>

## 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 [www.wcupa.edu/wcualert](http://www.wcupa.edu/wcualert). 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.