

BAN 5500: Statistics

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Virtual Hours: Tuesday: 6pm - 8:30pm

In-Class Hours: Tuesdays , 6:00pm - 8:30pm

Class Room: Preakness 232

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1 Required and Recommended Materials

Required Textbooks:

- Hogg, Robert V., Elliot A. Tanis, and Dale L. Zimmerman. Probability and statistical inference. Vol. 993. New York: Macmillan, 1977. (Any version will suffice)
- Kerns, G. Jay. Introduction to probability and statistics using r. Lulu. com, 2010. (This is a free e-book found at <https://cran.r-project.org/web/packages/IPSUR/vignettes/IPSUR.pdf>)
- Ross, S. M. (2014). Introduction to probability models. Academic press.

Desk References (These are CHEAP, and ABSOLUTELY RECOMMENDED)

- Halmos, Paul R. Naive set theory. Courier Dover Publications, 2017.
- Stewart, James. Single variable calculus: Early transcendentals. Cengage Learning, 2011.

2 Course Description

This course covers foundational to intermediate statistical and mathematical tools which form the basis for data driven managerial decision making. The course is application oriented, and considers contemporary topics from a business context. The topics chosen reflect most commonly encountered methods in business and industry, such as descriptive statistics, combinatorial and probability, discrete and continuous random variables, inferential statistics, analysis of variance, regression analysis, and multivariate techniques.

3 Prerequisites

You should have a solid understanding of Algebra. Calculus is required. I have posted notes in the event you have never taken Calculus, or you have forgotten it.

4 Course Format

This class will consist of one weekly lectures, held every other week in person, the other held virtually every other week. Each class/workshop will be 2 hours and 40 Minutes. The meetings will consist of lecture, discussion, demonstration of concepts using statistical software, and possibly in-class videos where appropriate. I usually expect you to read the text-book chapters before class, and take VERY GOOD NOTES IN-CLASS. Online sessions will necessitate you read papers and book chapters.

5 Course Objectives

1. Understand the conceptual difference between Data Analysis, Statistics, Machine Learning, Econometrics, Time-Series, and Panel-Data Approaches.
2. Understand the fundamentals of Probability Theory, including discrete and continuous random variables and distributions, PMFs and PDFs, CDFs, and Moments.
3. Understand the fundamentals of sampling methodologies, the differences between parameters and statistics, and the purpose of statistical inference.
4. Understand the basics of probability modeling.
5. Understand how to construct a simulation.

6 General Course Policies

1. Please adhere to professional behavior in class. Refrain from chatting, reading the newspaper, answering phones, wearing headsets etc. Such behavior is disruptive and discourteous and WILL result in you being asked to leave for the remaining time of the class. I cannot be more clear on this. If this is a continued pattern, this will result in you receiving an F for the course. Please note that if you are carrying private conversations with other students, this also classifies as a disruption. Do not be surprised if I call you out on it. It is nothing personal, however, private conversations will result in a warning and a second violation will result in you being asked to kindly leave the classroom.
2. Important announcements will be made in class and on Blackboard. So please make sure you are attending class and checking Blackboard! I ask everyone to check their email/Blackboard a MINIMUM of 30 minutes before class in the event of a last minute cancellation.

3. Final course grades are final. Let me repeat this. **Final course grades are final!** Changes will only be made if there is a mistake in the calculation of the final grade, but legitimate evidence suggesting the contrary must be presented to the professor. "Legitimate" constitutes the use of the professor's calculation in grade mismatching with the grade received. See below for more detail. It does NOT include a mistake made on a particular assignment or exam or project. Please keep in mind that grades are NOT rounded. So if you receive a 89.99, this constitutes a B+, not an A. Do NOT request me to change a grade due to the closeness of a letter grade. I'm informing you right now, this will not happen! Same for other grading boundaries.
4. Accommodating students with special learning needs: In accordance with the university policy, students with documented sensory and/or other learning disabilities should inform the professor, so that their special needs may be accommodated. Please let me know IMMEDIATELY following the first lecture.
5. As you may know, it is against university policy to cheat. It is a very serious violation of academic integrity. Please note that if cheating of any kind is observed in/out of the class, you will be reported to a higher authority in accordance with university policy on academic dishonesty.
6. I do not give extra credit just because you are falling behind. Please do not request me to do so.
7. All course material is posted on Blackboard. Our videos are posted on YouTube.
8. It is YOUR responsibility, not mine, to keep track of your grades. With that said, ensure that you use the formula indicated below to get an idea of your standing in my course. The "Total Score" grades on Blackboard **do not** properly reflect your grades. In order to determine your grade in the course, you must use the equation indicated below in this syllabus. Failure to keep track of your own grade is not an excuse for additional points, extra credit or additional revision on assignments outside the grace period for review for said assignments. It also is not a valid reason to contest a final course grade. If you receive a grade of F at the end of the semester, please keep in mind that this is not reason for me to change a final grade due to your lack of supervision of your own grade. If you need me to clarify or project what your final grade will be, or give you a comment on your progress in the course, I will be happy to do so, but YOU MUST first initiate that type of discussion with me, and do so **well before the semester ends**.
9. If you are having difficulty due to a death in the family, financial problems, or other personal issues, I MUST receive an email from you **in advance**. I do not accept such requests after due dates.
10. ALL submissions of anything in this course are digital. Furthermore, ALL documents MUST be of PDF file format upon submission. **DOC, TXT, DOCX, etc will NOT be accepted as valid submissions**. I have a hard absolute policy with this. So please, remember, don't let your hard work result in a 0 all due to you not submitting a PDF. We live in the 21st century, and ALL modern operating systems have the easy ability to convert any of the aforementioned types into a PDF format. HENCE, please make sure that submissions are

indeed in PDF format. Last, and most importantly, hard-submission (paper-format) WILL NOT be accepted as a valid form of submission.

7 Evaluation

Problem Sets (4 Total)	15% each
R-Problem Sets (4 Total)	10% each

Your grade is calculated according to the following formula:

$$\begin{aligned} \text{Final Grade} = & (0.15) \cdot (\text{ProblemSet}_1 + \text{ProblemSet}_2 + \text{ProblemSet}_3 + \text{ProblemSet}_4) \\ & + (0.10) \cdot (\text{RProblemSet}_1 + \text{RProblemSet}_2 + \text{RProblemSet}_3 + \text{RProblemSet}_4) \end{aligned}$$

Once your number grade is calculated, you can use the table below to determine your final letter grade in the course. I use a mathematical interval notation. So if your grade x is in the interval $[a, b)$ this is the same as saying $a \leq x < b$

Numerical Grade	Letter Grade
[94, 100]	A
[90, 94)	A-
[87, 90)	B+
[83, 87)	B
[80, 83)	B-
[77, 80)	C+
[70, 77)	C
[68, 70)	C-
[65, 68)	D
[0, 65)	F

8 Blackboard

All submissions for everything are conducted through blackboard. Make SURE you have access to this! Everything will equally be posted on blackboard. Another side-note, please DO NOT EMAIL ME via blackboard. If you need to email me, please do so DIRECTLY from your WPUNJ email account.

9 Problem Sets

There will be a total of 4 problem sets. Each problem set will be assigned directly after class and posted on Blackboard. Each problem set is due three weeks after being assigned. Please make sure to complete all of them in a timely manner. Each problem set comprises of problems across multiple lectures, so please ensure **to pay attention in class**.

When you are finished writing up your solutions, please scan them and post them on Blackboard **as a PDF document!**. You can type them in Word or Latex. HOWEVER, (1) it must still be in .pdf and (2) if you type it, IT MUST BE LEGIBLE!!!

I grade assignments in the following manner. First, I mark your answers as either correct or incorrect. I then give you a second chance to correct the incorrect ones. I then go through a second round or grading, where I will provide feed back and a grade on the incorrect set.

PLEASE DO NOT ASK ME FOR YOUR GRADE BEFORE THE END OF THE SECOND ROUND OF GRADING. I will not grade assignments until after the due dates, and so I cannot tell you what you would score if you did not give the assignment a second chance. Failure to submit during first round is an instant 0.

10 R Problem Sets

In addition to regular problem sets, I will posting R-Problem Sets. These are essentially mini-projects. **You are required to work on them individually.** You also have three-weeks to complete these, but they will be posted on virtual weeks. Each problem set comprises of a few R-based questions that are statistically driven. You will submit to be a .R file on Blackboard. **Please comment your code!**. Failure to comment will result in a loss of points.

11 Difference in Assignments for each Cohort

For your assignments, I will be posting two different types. This is due to the diversity of our class. We have students in our class that is near the end of the ABA program, and those that are near the beginning. As such, I will be posting "easier" problem sets for the Fall 2019 cohort (meaning, your first semester here in the ABA Program is in Fall 2019), and "more difficult" problem sets for the Fall 2018 cohort (meaning, your first semester here in the ABA Program was in the Fall 2018). Fall 2019: Please do NOT complete the more difficulty Assignment. Fall 2018: Please do NOT complete the "easier" assignment. Spring 2019 Cohort is given the option to choose which assignment they prefer to do.

12 Late Policy

I have a hard-lined late policy. Each assignment is due at 12:00pm on the specified due dates. For every 30minutes the assignment is submitted late, a 10 point deduction is taken. Here is the deduction schedule:

Time Submitted	Penalty
(12:00pm,12:30pm]	−10
(12:30pm,1:00pm]	−20
(1:00pm,1:30pm]	−30
(1:30pm,2:00pm]	−40
(2:00pm,2:30pm]	−50
(2:30pm,3:00pm]	−60
(3:00pm,3:30pm]	−70
(3:30pm,4:00pm]	−80
(4:00pm,4:30pm]	−90
(4:30pm,5:00pm]	−100

13 Course Textbook

We will be using three text books. The Hogg and Tanis book is a classic book in statistics, and, in my humble opinion, the best one that has ever been written on the subject. You can find it cheap online, and I would highly recommend holding onto it for your future courses. The chapter I ask you to read will be based on the 1977 edition. However, I will ensure to put the title of the chapter so you can try to correspond it with your version.

The second book we will use is a bit newer, and focuses on the implementation of statistical theory in R. We WILL be leveraging the basics of R. I will cover them in class. This book will help guide you towards working with some of the basic features in R with a focus specifically on statistics and probability.

The third book we will use is Sheldon Ross Probability Models. This book is the bible for basic probability modeling, and as such, we will leverage it quite extensively.

14 Virtual Sessions

Every other week, **we will not meet in person**. Our "online" portion will entail you reading a chapter of the book, reading notes I may post, or academic articles. PLEASE ENSURE TO READ THESE, as you will be questioned on the material in assignments. In addition, a lot of basic functionality in R will be covered, and so I ask that you please thoroughly examine the reading materials. I will be online during our virtual sessions to answer any emails. You should be able to hear a response from me during this time frame.

15 Laptops in Class and Required Software

We will be using two types of software in this class. The first is R. You are free to use R Classic if you want, but I will demonstrating topics in R Studio. This is free software, you can find it by Googling "R". Second, we will be using Latex. I expect you to learn at least the basics of proper publication with mathematics. This also is free software. I will demonstrate it's usage on day 1.

16 YouTube

Every class, make up class, extra course material and in some instances assignment solutions are recorded live using YouTube Live. While I offer this convenience to you, please do not be opportunistic of it. **You still are expected to attend class!**

After recording a live session, the video gets sent over to our YouTube Playlist (link is given above for this). You are free to review it at anytime thereafter. While I diligently work very hard to ensure all of your privacy is protected, your voice may pop up every now and then in the video as a result of your participation in class (you are not, however, physically shown in the video). The playlist, however, is only available to those with the link provided above. So unless some hacker out there is really interested in learning about our course, the likelihood of the videos being released to the general public is pretty slim.

Please note that there are times when there will be a delay in posting. This may occur due to technical difficulties or interruptions of service. I try my best to get them up on time for your convenience. **But do not hold my feet to the fire on this.** They are up there as a supplement. You still must come to class fully prepared to take notes.

If I begin to notice that attendance has drastically dropped, despite it being marked against you, I will hold off intentionally on posting the videos until it has reached a proper quorum. This could prove to be devastating. So please ensure you are attending class.

17 Class Cancellations and Make-Up Sessions

There are on some occasions where we will need to cancel class. Please note, I do not like to cancel class, as this gets in the way of our scheduled topics. However, just like with all of you, I have a life as well, and things do come up (mostly with my own children's life events).

In the event of a class cancellation, it is not always technically "canceled". First, I will try to find a replacement lecturer to cover the lecture that day, if needed. I ask that you give that lecturer the same level of respect and tolerance that you bestow upon me. If the type of cancellation is one where I cannot *physically* be there, but I can *virtually* be present, then I will present the lecture remotely. Please note, in this instance, **you will be required to attend the physical classroom.** I will ask for a student helper, who will receive a full 1 point of extra credit on their final course grade, to aid in the technology within the classroom. The virtual session will be conducted via Google Hangout or Skype. The student assistant will be tasked with

1. Setting up Skype/Google Hangout
2. Ensuring that everyone in the class can hear me
3. Act as a liason between students of whom have questions and myself (basically, just repeat to questions to me).
4. Solve any technical difficulties.
5. Be trusted that when attendance is taken, they physically see the student that is present in the classroom.

In the event of a weather situation (we're in summer, unlikely, but still possible!), please ensure that you are enrolled in the University Emergency Alert System. At the very least, please

check the homepage of William Paterson University, of whom updates operating status of the university. There are some questionable occasions when the weather appears bad for some (especially those of whom commute), and when the university is still attempting to render a decision. In such instances, I will always let you know the night before if class is canceled or not, regardless of the university's decision. My number one priority is **your safety**. If I feel that road conditions are too difficult to reach campus, I will instead move our lecture to a 100% pure virtual lecture. Weather will never be a reason for why class is canceled. We will always have it virtually in these instances (even if the university cancels class themselves). In these scenarios, attendance will not be taken, and everyone will receive full credit for that particular session.

When we conduct a 100% virtual lecture, I will follow the general structure:

1. I open up with an introduction. I wait until a certain number to arrive.
2. I begin lecture. During the lecture, you can ask questions in the chat box next to the video (a Google account is necessary in order to do so). Every 15 minutes I check the chat and answer questions.
3. I end by giving any important announcements.
4. Video is posted to the YouTube Playlist.

Please ensure you are active in asking questions. There is typically a 20 second delay between what you see on your screen and what was broad-casted live. Keep this in mind since you will not hear the response to your questions "instantaneously".

18 Office Hours

I only hold hours by appointment and during my allotted hours. If you cannot make it to my office hours, I may be able to meet virtually via Skype/Google Hangout/Zoom. Please just let me know a head of time if you plan to meet with me.

19 Course Schedule and General Syllabus Changes

19.1 Policy Regarding Changes to the Syllabus

I try my best to stick to this schedule and grade distribution. With that said, if I see that you need more time to absorb the material, some homework assignments or topics may be extended. If I begin to see that our grading distribution in regards to assignments becomes too much, I will need to redistribute points. Again, **this is a very rare situation that happens**. However, I understand that some of you may have more difficulty in absorbing the material than others. With that said, I want to ensure we spend the proper amount of time on each topic. If we need to change anything about this course, I will update the syllabus and post it.

If I need to make changes to the syllabus, you will be notified in class, on Blackboard, and via email. Changes to the syllabus may come as a consequence of in class discussions. I always consult with my students first before making any necessary changes. **Please note that if you miss class, especially on a regular basis, then your voice on such matters may not be heard.** I only take into consideration comments made within a class session. Moral of the story: attend class and you will have your voice heard if such a need for change arises.

19.2 Tentative Course Schedule

- Introduction to R
- Fundamentals of Probability
- Single and Multi-variate Random Variables
- Fundamentals of Probability Modeling
- Discrete Probability Distributions
- Continuous Probability Distributions
- Conditional Probability Theory
- Fundamentals of Stochastic Processes
- Discrete and Continuous Markov Chains
- Poisson Processes and Queuing Theory

If Time Permits, We Will Cover:

- A (VERY BRIEF) Review of Frequentist Statistics
- Bayesian Philosophy of Statistics
- Bayesian vs. Frequentist Statistics
- Statistical Estimation and Maximum Likelihood Estimation
- The Fundamentals of Writing Simulations

20 Syllabus Agreement Form

Having enrolled in this course, I, _____, agree to the following:

(Full Printed Name)

1. I have fully read every character, word, paragraph, and section of this syllabus, and was either present on the first day of class, or have viewed the video of the first day of class, of which fully reviewed this syllabus, and I fully understand, and agree to abide by, the entire structure of this course and it's guiding policies.
2. I understand that I will abide by all policies put forth in this syllabus, either explicitly mentioned herein or mentioned in class heretofore.
3. To remain in contact with the professor using the communication methods described above for any issue.
4. To ensure that I contact the professor via garveym2@wpunj.edu, and understand that any concern I may have will not be addressed if I email the wrong email address, fail to reach out to the professor using the aforementioned mediums, or use a non-WPU email account to contact the professor. In such an event, I understand that I am 100% responsible for any negative consequences of which I will bear.
5. Grades are distributed based on my work, and **not on my need**. I will not expect this professor to award me a grade that does not properly reflect, as determined by him and his criteria for grading, the result of my work, rather than the degree of effort involved, or any purpose including, but not limited to, being removed from academic probation, wanting a grade that would be awarded due to rounding up, or being friendly and in consistent contact with the professor. I further understand that the professor grades based on an equation he has described to me in this syllabus, and that he will not deviate from the equation, no matter the circumstance I find myself in.
6. To not cheat on any assignment, exam or any other aspect of this course, and that if I do, I understand that appropriate procedures will be taken with the involvement of the university, and I will receive an F for the course, along with the possibility of more severe consequences.
7. That email messages, recorded videos, books, notes, slides, comments on YouTube Videos and any other form of time-stamped communication between myself and the professor is the property of William Paterson, and that altering the content, information, or meta-information, on any of these original forms of content, without the explicit written permission from the professor, for the purpose of deceiving the professor in any way, shape, or form, is considered a violation of Section 2.4 of the **Academic Integrity Policy**, and **will result in an immediate F for the course**. In addition, I understand that **this professor will offer recommendation of expulsion from the university** in such a scenario. Examples of such manipulations may include: the altering of a grade on an assignment, an attempt to change a time-stamp on any form of document, and an attempt to change a previous email sent to the professor or from the professor.

8. To read the book chapters before every class, and attend the class. I also understand that I cannot expect the professor to lecture material that I may have missed due to persistent absence from the class.
9. To keep track of my own grade using the grade calculation presented above, and that if I am failing, it is my own responsibility to become aware of this, and change course to prevent a final grade of failure.
10. This professor makes zero exceptions to anyone and treats every student equally. I will not expect this professor to offer any extra work, make-up assignments, make-up exams (in the event of a failure), or extra videos additional to what is already posted for the purpose of improving my grade.
11. That the in-class exercises requires a computer, tablet or smart phone.
12. That I will attend class on time.
13. That if I am in financial stress, academic stress, or some other unexpected event that occurs in my own personal life that thwarts my ability to perform in this class, I will reach out to the professor immediately. I understand that such an event will not be a reason to excuse my performance prior to the informing of the professor of such events.
14. That this professor assumes that everyone of whom is registered for this course has the complete and competent ability to physically attend class, and that I will not attempt to persuade the professor to alter the structure of this course so as to appease my own schedule. In other words, I understand that if I currently hold a job, and register for this course, it is assumed by this professor that your employment schedule **will not** intersect your class schedule. I further understand that this professor will make **zero exceptions** if I am required to be somewhere else during the scheduled time of our course.

Name (Printed) _____

Signature _____

Date _____

21 Electronic Recording Disclosure Form

Having enrolled in this course, I, _____, understand

(Full Printed Name)

that lectures held within the classroom are recorded for the benefit for all the students. Throughout the course of recording, I am aware that my voice may be recorded throughout the course of the normal recording. I agree to relinquish the university and this professor from all violation of privacy considerations in any such instance. In addition, I have been made aware that if I choose not to participate in class due to privacy concerns, that I will submit a one-page summary of the lecture to the professor. I understand that failure to do so will have a negative impact on my grade.

Furthermore, I have been informed by this professor that all recorded materials within the university are to be considered the property of William Paterson University. I agree not to sell, distribute, share, post, or gift any of the videos that have been recorded during this course, either inside or outside the classroom. I have been made aware that this professor has allowed myself to record my own versions of the course, and that such recordings are also to be considered as the property of William Paterson University, and shall only be used for own educational purposes.

I fully agree to comply with the terms stated above, and understand that if I fail to abide by the terms above, that the professor, William Paterson University, or a third-party associated with William Paterson University or any classes within the university, may render academic disciplinary action as well as potential legal proceedings.

Name (Printed) _____

Signature _____

Date _____