

BAN 5000: Calculus for Business Analytics

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Zoom-Class Hours: TBD
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1 Required and Recommended Materials

Required Textbooks:

- Stewart, James. Calculus: Early transcendentals. Cengage Learning, 2011. (Any version is OK, ensure to purchase the book that has both single variable and multi-variable calculus).
- Halterman, Richard. Fundamentals of Python Programming. 2019
(This is free: <http://cs.appstate.edu/rmp/cs5245/pythonbook.pdf>)

Desk References:

(These are CHEAP, and ABSOLUTELY RECOMMENDED to keep on your desk throughout your career)

- Balakrishnan, V. K. Introductory discrete mathematics. Dover Publications, 2012.
- Halmos, Paul R. Naive set theory. Courier Dover Publications, 2017.
- Schneider, Hans, and George Phillip Barker. Matrices and linear algebra. Dover Publications, 1989.

2 Course Description

A comprehensive analysis of single and multivariable functions. Topics include limits, derivatives and partial derivatives, extreme values, integrals, and differential equations. Applications of mathematical techniques to business analytics will be emphasized.

3 Prerequisites

You should have a solid understanding of Algebra, Precalculus, and Set Theory. We will be conducting a review of these on day 1.

4 Course Format

This course will leverage a combination of solving by pen and paper techniques, as well as leveraging software to solve calculus-based problems. The standard format for this course involves two types of class sessions. The in-person session will comprise of primarily lecture and some discussion. The virtual session will comprise of videos and hands-on workshop style lecture. You will be required to complete the workshop at home.

5 Course Objectives

1. Have a thorough understanding of limits, derivatives, and integrals in both single variable and multivariable contexts.
2. Understand the ability to model a real-world business problem as an analytical mathematical optimization problem.
3. Understand the fundamentals of the Python Programming Language
4. Understand the fundamentals of Linear Algebra.

6 General Course Policies

1. Please adhere to professional behavior in class. In our case, this will be conducted over Zoom. Professional behavior over Zoom entails muting your microphone until you have a question to ask, and not interrupting others.
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 our YouTube playlist.
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. 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 (6 Total)	5% each
Python Programming Assignments (2 Total)	10% each
Group Project	50%

Your grade is calculated according to the following formula:

$$\begin{aligned} \text{Final Grade} &= (0.05) \cdot (\text{ProblemSet}_1 + \text{ProblemSet}_2 + \text{ProblemSet}_3 + \text{ProblemSet}_4 + \text{ProblemSet}_5 + \text{ProblemSet}_6) \\ &\quad + (0.1) \cdot (\text{Python}_1 + \text{Python}_2) \\ &\quad + (.50)\text{GroupProject} \end{aligned}$$

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 6 problem sets. Each problem set will be assigned and posted on Blackboard every Friday night at 11:59pm. Each problem set is due one week after being assigned. Please make sure to complete all of them in a timely manner. Each problem set comprises of 5 - 10 questions. You are required to submit your solutions in PDF format, with the document properly oriented (do not submit something that is sideways or upside down). If you have experience, or would like to gain experience, with LaTeX, I have provided a template for you to use to type up your solutions. Please do not use Microsoft Word to submit solutions. If you feel uncomfortable using LaTeX (<http://www.overleaf.com>), please just hand write (NEATLY!) your solutions, scan or take a picture of your solutions, and submit the resulting PDF. Please submit **only one** pdf document. You should be able to know how to put together multiple picture files into the same pdf document.

When you are finished writing your solutions, please post them on Blackboard **as a PDF document!** I will grade them by simply marking a check or an "x". You will see the responses

on blackboard. After seeing the responses, you have a second-chance opportunity to fix your mistakes. I will not tell you where it is wrong, you are tasked with figuring that out. Resubmit it to the same link, and I will offer a grade. In the first round of grading, you will receive either a 0, 1 or 100. 0 means that your submission did not follow the correct rules, and you will need to resubmit. NOTE: you are not allowed to be given a second chance if you submit incorrectly. A 1 indicates that you submitted correctly, but you got some of the problems wrong, and you will be offered the chance to resubmit the corrections. A 100 means that you got all the problems correct, and there is no need to resubmit a corrected version. After the second round of submission, I will subsequently grade them and post your final grades on Blackboard. We will cover solutions in the class **after** the due date. Due dates are always on the nights of virtual classes (Fridays).

10 Python Assignments

You will assigned two Python assignments. Each assignment you will be asked to write a python script that solves a calculus-based problem. Submit these on blackboard as a .py file. I will grade them in the same manner as ordinary problem sets.

11 Group Projects

You will be assigned a group project. The project will comprise of you leveraging your skillset in Python to solve a calculus-based problem. More details on this are to follow with a formal write up of the project outline.

12 Late Policy

I have a hard-lined late policy. Each assignment is due at 11:59pm 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
(12:00am,12:30am]	−10
(12:30am,1:00am]	−20
(1:00am,1:30am]	−30
(1:30am,2:00am]	−40
(2:00am,2:30am]	−50
(2:30am,3:00am]	−60
(3:00am,3:30am]	−70
(3:30am,4:00am]	−80
(4:00am,4:30am]	−90
(4:30am,5:00am]	−100

13 Course Textbook

We will be using two text books. The first book covers Calculus 1 - 3, along with some linear algebra and differential equations. This book can be found a very low cost used. No need to buy

the most recent edition. The other book is 100% free for you to download. We will leverage the second book for Python.

14 Laptops in Class and Required Software

We will be using Python. I will be using Jupyter. Unlike R, there are many different types of interfaces to use with Python. You are free to use any one you like.

15 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.

According to [University Policy 02-20-01-02-09](#), there are a few things you need to be made aware of. First and foremost, if you wish, for whatever reason, to record our lectures, you are free to do so. University Policy mandates I give you approval. The signing of the syllabus agreement form below is in effect permission for you to record lectures. However, according to the policy, *“Unauthorized recording, downloading, file sharing or distribution of any part of a recorded lecture, class discussion or other oral classroom communication, or using the material for any purpose other than as an aid to an individual student’s learning may be considered a violation of the William Paterson University Copyright Policy (<http://www.wpunj.edu/library/copyright/copyright-policy.html>) and subject to disciplinary sanction. Unauthorized activities noted in this policy may also be a violation of William Paterson University Information Technology Policies”*. Put simply, while you are allowed to record our lectures, and have access to them via our YouTube Channel, **you are not in any circumstance permitted to share or sell the lectures**. Doing so will result in disciplinary and possibly legal consequences of yourself. So please be wise about this.

Second, this policy mandates that I receive your consent to record, since your voice will be heard on the video as part of your participation requirement (I do ensure that only MYSELF is shown in the video, and not any of you). Given that I want to give all students the ability to access our previous lectures, if you choose **not to consent**, then you will agree not to verbally participate in the course. However, a lack of your ability to speak in the class will result in a

lack of participation. Hence, I will ask you to write a one paragraph summary for every lecture so that you can receive proper participation credit in the event that you do not consent to be verbally part of any video. Failure to submit such summaries **will** result in a 0.5 point reduction of your final grade for every lecture.

16 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 liaison 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”.

17 Office Hours

I only hold hours by appointment. Please email me if you would like to meet out of class. I am fairly flexible. If we cannot agree on a time and day to physically meet, 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.

18 Course Schedule and General Syllabus Changes

18.1 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.

18.2 Tentative Course Schedule

Lecture	Video Post Date	Topic
1	5/28/2020	Set-Theory Review
2	5/28/2020	Pre-Calculus Review Motivating Calculus Applications
3	6/1/2020	Introduction to Programming in Python Single Variable Limits
4	6/1/2020	Single Variable Derivatives
5	6/8/2020	Sequences and Series
6	6/8/2020	Single Variable Integration Business Applications of Single Variable Calculus
7	6/15/2020	Fundamentals of Matrix and Vector Algebra
8	6/15/2020	Matrix Algebra in Python
9	6/22/2020	Multivariable Functions and Multivariable Limits
10	6/22/2020	Partial Derivatives Multiple Integrals
11	6/29/2020	Fundamentals of Optimization, Problem Complexity, and Algorithms
12	6/29/2020	Heuristics and Meta-Heuristics

19 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 _____

20 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 _____