BAN 5000: Calculus for Business Analytics

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Virtual Hours: TBD

Zoom-Class Hours: TBD

Class Room: Virtual

Contents

1 Required and Recommended Materials

Required Textbooks:

- None. We will be using weekly posted class notes.

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.

- 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)

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 first is a set of two-weekly videos for which you will be responsible watching. Each video is labeled as "Lecture X", and "X" refers to the lecture number indicated on the tentative schedule below. For example, the first week will comprise of "Lecture 1" and "Lecture 2". The second type is a Zoom-Meeting. We will (very quickly) review through the material together on Zoom, and we will solve problems together. This is also an opportunity for everyone to meet each other, and ask questions.

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 (4 Total)	7.5% each
Python Programming Assignments (4 Total)	5% each
Group Project	50%

Your grade is calculated according to the following formula (each individual grade is out of 100 points):

$$
\begin{aligned}
Final\ Grade = {} & (0.075) \cdot (ProblemSet_1 + ProblemSet_2 + ProblemSet_3 + ProblemSet_4) \\
& + (0.05) \cdot (Python_1 + Python_2 + Python_3 + Python_4) \\
& + (.50) Project
\end{aligned}
$$

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 and posted on Blackboard every Monday night at 11:59pm. Each problem set is due one week after being assigned (the following Monday at 11:59pm). Please make sure to complete all of them in a timely manner. Each problem set comprises of 5 - 10 questions. Your 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 with Latex, you are allowed to submit solutions using this (but ONLY use it if you have proper experience!). Microsoft word and equations typed in word are **not permissible**. If you do not have experience with Latex, 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!**.

10   Python Assignments

You will assigned four Python assignments. Each assignment you will be asked to write a python script that solves a calculus-based problem. These will be posted on Blackboard every Friday at 11:59pm and they will be due the following Fridays at 11:59pm. Submit these on blackboard as a .py file. I will grade them in the same manner as ordinary problem sets. ENSURE TO COMMENT YOUR CODE!!!

11   Projects

You will be assigned a project. The project will comprise of you leveraging your skillset in Python as well as calculus 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 PyCharm. Unlike R, there are many different types of interfaces to use with Python. You are free to use any one you like, but please be warned that I will only be lecturing in PyCharm! Details on installation will be provided on the introduction videos.

15 YouTube

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

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. 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, 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.

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).

17 Office Hours

I only hold hours by appointment. Please email me if you would like to meet out of "class". 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

18.2.1   Lecture Topic 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

18.2.2   Assignment Schedule

Assignment	Posted Date	Due Date
Problem Set 1	6/1/2020	6/8/2020
Problem Set 2	6/8/2020	6/15/2020
Problem Set 3	6/15/2020	6/22/2020
Problem Set 4	6/22/2020	6/29/2020
Python Assignment 1	6/5/2020	6/12/2020
Python Assignment 2	6/12/2020	6/19/2020
Python Assignment 3	6/19/2020	6/26/2020
Python Assignment 4	6/26/2020	7/3/2020

19   Electronic Recording Disclosure

Having enrolled in this course, you fully understand that lectures held within the "classroom" (ie Zoom) are recorded for the benefit for all the students. Throughout the course of recording, please be aware that your voice may be recorded throughout the course of the normal recording. By being enrolled in this class, you agree to relinquish the university and this professor from all violation of privacy considerations in any such instance.

Furthermore, you have been informed by this professor that all recorded materials within the university are to be considered the property of William Paterson University. You 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. You fully agree to comply with the terms stated above, and understand that if you 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.