

Manhattan College

Department of Mathematics

MATG 511 Section 01

Computational Methods for Analytics

Fall 2020

Class Time: M 6:50 pm -7:40 pm *Remote Instruction*

The Google Meet for remote instruction is:

<https://meet.google.com/vax-zzfb-zna>

Note: This course will be taught in hybrid remote format with a synchronous component on Monday night and the remaining content will be delivered using asynchronous instruction. At this moment Manhattan College does not have this type of course so it will appear as **remote** with a schedule of MR 6:50 pm – 8:05 pm in Self Service.

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Office Hours: Monday 3:40-4:30 pm, Wednesday 1-1:50 pm, Thursday 3:05-3:55 pm, or by appointment.

Note: All office hours this semester will be virtual using Google Meet:

<https://meet.google.com/yxb-btsg-jnj>

Course Texts

Title	Author	Edition	ISBN
MATLAB An Introduction with Applications	Amos Gilat	6 th	ISBN-13: 978-1119385134 ISBN-10: 111938513X
Introductory Statistics with R	Peter Dalgaard	2 nd	ISBN-13: 978-0387790534 ISBN-10: 9780387790534 (PDF Available through MC Library)
Python Data Science Handbook	Jake VanderPlas	1 st	https://jakevdp.github.io/PythonDataScienceHandbook/
Optional			
Numerical Computing with MATLAB	Cleve Moler	2 nd	ISBN-13: 978-0898716603 ISBN-10: 0898716608 Available online: https://www.mathworks.com/moler/chapters.html
R for Data Science	Hadley Wickham & Garrett Grolemund	1 st	ISBN-13: 978-1491910399 ISBN-10: 1491910399 Available online: https://r4ds.had.co.nz/
A Practical Introduction to Python Programming	Brian Heinold	1 st	Available online: https://www.brianheinold.net/python/A_Practical_Introduction_to_Python_Programming_Heinold.pdf

Course Software

Title	Publisher	Link
MATLAB	MathWorks	Manhattan College Portal (Site License): https://www.mathworks.com/academia/tah-portal/manhattan-college-40634592.html
LaTeX (overleaf online editor)	The LaTeX Project	https://www.overleaf.com/
R	R Foundation	https://www.r-project.org/
R Studio (IDE for R)	R Studio	https://rstudio.com/
Anaconda Distribution of Python (Including Spyder & Jupyter Notebooks)	Anaconda	https://www.anaconda.com/distribution/

Catalog Course Description:

This course is a survey of programming tools used in solving problems in applied mathematics and data analytics. The course material comprises the following broad areas: programming techniques in scientific languages such as MATLAB, Python, and R; and an overview of selected topics in data handling, data visualization, and introductory predictive analytics. Additional topics may include analytics-related topics in linear algebra and numerical analysis. A final project is required for this course.

Prerequisites: CMPT 101 and MATH 285 or MATH 287 and MATH 272 or MATH 351, acceptance into the master's program in applied mathematics – data analytics or consent by instructor.

Student Learning Outcomes:

A student who successfully completes this course will know the following:

- Write, document and debug basic programs in MATLAB, R and Python
- Wrangle and clean data in preparation for data analysis
- Use appropriate data visualization methods for data sets
- Use computation for solving problems in data science including descriptive and predictive analytics
- Understand the types of problems where MATLAB, R and Python are most appropriate
- Communicate their results in writing and presentations using LaTeX, Word and PowerPoint

Course Homepage (Moodle):

Here you will find four features that will be used in this course:

- *Email:* make sure that your email on Moodle is one that you check regularly.
- *Course Information and Documents:* material covered each week, video lectures, quizzes, assignments, and solution keys.
- *Student Discussion Board:* this online forum allows for students and faculty to communicate about the course. It is like an online study group.
- *Social Forum:* this online forum will be used to have students share something about themselves so that we all get to know each other.
- *Grades:* students will be able to keep track of their grades online.

Minimum Technology Requirements for Remote Students:

Windows or Macintosh computer - although many courses activities can be completed on a mobile device, students will need a computer in order to fully participate in the remote component of the course.

Windows minimum requirements:

2 GHz Intel core i5

8 GB of Memory

256 GB Hard Drive

Macintosh minimum requirements:

1.3 GHz Intel core i5 or higher

8 GB of Memory

256 GB Hard Drive

Computer should be equipped with a webcam, microphone, and speaker/headphones for participating in virtual class meetings, completing video-based assignments, and completing exams that require video proctoring. Reliable internet access and the Chrome web browser (latest version) are needed.

Assessment of Student Learning:

Assignments (15%)

Weekly Assignments are meant for students to put into practice the material covered each week.

Quizzes and Discussion (5%)

Weekly provide a quick way to use the material from the video lectures and readings. The online discussion forum will be a venue to ask questions about the material in the course and share ideas with other students.

Midterm Exams: (20 % each)

Exam I	Exam II	Exam III
Monday September 28	Monday October 26	Monday November 23

Exams in each of the three languages introduced in this class provide a deeper assessment and the opportunity to apply the material to realistic problems in data analytics. All of the exams in this class will be take-home exams and will have an interview.

Final Project (20 %)

In the course project, the student will write a paper and give a presentation on a topic of their choice with the instructor's approval. The project will use computation to solve a data science problem. Details for the course project will be given after Exam I. The Final Project will be presented on *Monday December 14 from 6:30-8:30 pm*.

Tentative Grading Scale

Percent	90-100	85-89	80-84	75-79	70-74	65-69	60-64	50-59	0-49
Grade	A	A-	B+	B	B-	C+	C	D	F

The exact grading scale will be determined after the final exam. The numerical scores in the tentative grading scale guarantee the associated letter grade but the instructor may change the scale to the student's benefit.

Dates to Remember:

August 31: First Day of Classes
September 7: Late Registration & Add/Drop Ends
September 7: Labor Day – No Classes
September 28: Exam 1
October 12: Fall Break – No Classes
October 13: Monday Schedule
October 20: Midterm Grades Due
October 26: Exam 2
November 20: Last Day to Withdraw from Courses
November 23: Exam 3
November 25-27: Thanksgiving Holiday – No Classes
November 30 – December 19: Classes are Fully Remote
December 11: Last Day of Classes
December 14-19: Final Exam Period

Class Policies

- **Attendance:** The official College Attendance Policy, as published in the College Catalog, is: “Students are required to fulfill all course requirements as detailed in the course syllabi for their registered courses. Implicit in these requirements is completion of all course assignments and attendance in all classes. A student who is absent from class cannot expect the course instructor to provide notes or allow makeup tests, quizzes, or laboratories. The student may incur an appropriate grading penalty for such absences if the penalty was described in the syllabus. Reasonable accommodations for absences are recommended, but are solely at the discretion of the course instructor. If the instructor believes that a student's failure to attend class is substantially affecting the student's course grade, then the instructor is strongly encouraged to report the situation to the dean of the school in which the student is matriculated. It is recommended that the dean be contacted by the course instructor after the student incurs four hours of absences in a course. The dean will address the situation with the student.”
- **Time-on-Task:** Whether this course is taught online, remotely, or face-to-face, the total amount of time that you spend on this course is equivalent to that which you would spend in the face-to-face version of the course and is consistent with the Federal Credit Hour Definition. For each 3-credit fifteen-week course, you are expected to complete a minimum of nine hours (each academic hour is 50 minutes) of work each week on average, where 9 academic hours is equivalent to 7.5 real hours. This includes studying, working on projects, homework, reading, and any other activities that you must do to be successful in this class. Every student will work at his or her own pace, so you might take more or less than this average amount of time.
- **Late work:** Late assignments, quizzes or exams will not be accepted after the solutions are distributed. In case assignments are handed in before the solutions are posted it will be marked 20% off for every day (or part thereof) it is late.
- **In-Class Camera Policy:** In order to promote community, it is important that faculty are able to interact and engage with students. Thus, during online class activities, students are required to leave their cameras turned on. Students with extenuating circumstances may request an exemption from this requirement to the professor in writing.

Suggestions for Success

- The course requires a time commitment of about 8 hours outside of class time per week (2 per class hour). The material builds on itself, so it is very important not to fall behind.

- Find a study partner or group.
- Treat your homework, quizzes, and labs as a study guide for future exams. Write solutions to problems in a neat and organized fashion.
- Review your notes from the previous lecture before each class.
- Read the textbook. It will complement the presentation in lecture and help give you the big picture of the material.
- I encourage you to come to office hours regularly. I will do my best to help you. Even virtually, this is the best one-on-one tutoring possible.

Student Academic Support Services | Center for Academic Success

The [Center for Academic Success](#) (CAS) is committed to providing student-centered programs and initiatives designed to enhance learning and promote success and persistence for all Manhattan College students. Students will work collaboratively with qualified peers and professionals to develop knowledge, skills and strategies needed for success in the classroom and beyond. The CAS has two locations; the Learning Commons in Thomas Hall 3.10 and the Leo Learning Center in Leo 117/118. Services include online and in-person individual tutoring, online small group peer tutoring (select courses), Supplemental Instruction (select courses), student academic success coaching, and online writing center services. All services are free of charge and available to all Manhattan College students. Appointments are preferred but walk-ins are welcome. To make an appointment, students can log into their Jasper Connect account or visit the CAS in Thomas Hall, 3.10. Students can also contact success@manhattan.edu with any questions. For more information about these services please visit the CAS webpage [here](#), and to learn about CAS Fall 2020 return to campus safety efforts please visit the One Manhattan webpage [here](#).

Academic Integrity:

Recall that as students of Manhattan College, you have each signed The Manhattan College Honor Pledge as a part of the Honor Code:

As a Manhattan College student, I will not lie, cheat, or steal in my academic endeavors, nor will I accept the actions of those who do. I will conduct myself responsibly and honorably in all my activities as a Manhattan College student. I am accountable to the Manhattan College community and dedicate myself to a life of honor.

Whenever you put your name on work to be handed in for grading in this class, you are reaffirming the above pledge. Violations of the Honor Code include, but are not limited to, cheating, plagiarism, fabrication, and other forms of academic misconduct. Please see the Manhattan College Code of Conduct and Academic Policies for a detailed description: <https://inside.manhattan.edu/student-life/dean-of-students/code-conduct.php>

Covid-19 Safety

[The One Manhattan Health and Safety Guidelines](#) provide information on how students, faculty, staff, and visitors must work together to ensure the overall health and safety of the Manhattan College community. [In accordance with section II.L of the Manhattan College Community Standards and Student Code of Conduct](#), students are must abide by these Guidelines and are subject to judicial action if they

do not do so, including the **mandatory wearing of masks or facial coverings on campus**. The following expectations are also outlined in our policy:

- Symptom monitoring including daily symptom checker
- Contact tracing cooperation and truthful reporting
- Personal protective equipment (PPE) is required on campus, in the library and in classrooms.
- Testing is required for all staff, students, and faculty.
- Social distancing is expected on campus and in class.

Violations of these safety guidelines will be reported to the Dean of Students Office via [this reporting form](#). It is the responsibility of all students to follow them. Should there be repeated violations, the following sanctions will be put into action:

- First Offense – Written Warning
- Second Offense – Interim Disciplinary Probation
- Third Offense – Suspension from participation in all on-campus activities including in-person classes.

Any questions regarding these guidelines, the sanctions, and/or about accommodations can be sent to deanofstudents@manhattan.edu.

Special Accommodations:

- Students with special needs should bring appropriate documentation to the Specialized Resource Center, Thomas Hall 3.15, <https://inside.manhattan.edu/academic-resources/specialized-resource-center/>, to obtain an Academic Adjustment/Auxiliary Aid form. Bring the completed form to me as soon as possible, and together we will decide on how best to fulfill the adjustments and/or aids listed on the form.
- Student athletes should bring their event schedules to me as soon as possible.

Copyright Materials: Copyright in educational materials prepared by the College faculty member is owned by the faculty member, and may not be shared without his or her permission.

The material in this syllabus may be changed at the instructor's discretion. Any changes will be communicated to the students. During these challenging times, we need to be particularly flexible.

Course Content:

MATLAB will be used to review the principles of programming and for applied mathematics. LaTeX will be used for mathematical typesetting.

- 1.1 Install and Run MATLAB
- 1.2 Use MATLAB as a calculator
- 1.3 Write scripts and functions in MATLAB
- 1.4 Document code and use a programming convention
- 1.5 Write Loops with MATLAB
- 1.6 Import Data into MATLAB
- 1.7 Typeset a simple document in LaTeX
- 1.8 Apply Numerical Analysis Methods in Data Analysis using MATLAB
- 1.9 Visualize Data using MATLAB
- 1.10 Profile and Speed up MATLAB code (time permitting)

R syntax and structure will be presented and used primarily for statistical applications and data cleaning.

- 2.1 Install and Run R & RStudio
- 2.2 Use R as a calculator
- 2.3 Write scripts and functions in R
- 2.4 Document code and use a programming convention
- 2.5 Write Loops with R
- 2.6 Import Data into R
- 2.7 Create and summarize data frames in R
- 2.8 Wrangle and Clean Data using R
- 2.9 Visualize Data using R
- 2.10 Apply statistical methods using R
- 2.11 Use SQL within R (time permitting)
- 2.12 Scrape data from online sources (time permitting)
- 2.13 Apply R Markdown for publishing results (time permitting)

Python syntax and structure will be presented and used primarily for machine learning applications.

- 3.1 Install and Run Python & Spyder and Jupyter Notebooks
- 3.2 Use Python as a calculator
- 3.3 Write scripts and functions in Python
- 3.4 Document code and use a programming convention
- 3.5 Write Loops with Python
- 3.6 Import Data into Python
- 3.7 Create objects with Python
- 3.8 Wrangle and Clean Data using Python
- 3.9 Manage data using Pandas
- 3.10 Visualize data using Matplotlib
- 3.11 Apply Machine Learning methods using Python and SciKitLearn