Fall 2025

DS 637-001: Python and Mathematics

Nikita Nemane

Course Syllabus

DS 637: Python and Mathematics for Machine Learning

Fall 2025

Instructor: Nikita Nemane Email: nn43@njit.edu

Time: Monday and Thursday 4pm – 5:20pm

Location: TIER 114

Office Hours: Monday- Thursday 12pm-1:30pm. If these hours do not work with your schedule, appointments are also available by email.

Office: GITC 2118

Teaching Assistant/Grader: TBD

Note: Your messages will be answered by the end of the next day. Grades for all items will be posted during the week after their due date. For issues with your grades, contact the grader and cc the instructor.

Course Description: Data Analysis and Mathematics for Machine Learning

This course provides an integrated foundation in both **Python programming for data analysis** and the **mathematical methods essential for machine learning**. It is designed for students who want to build practical coding skills while simultaneously strengthening the mathematical background required for advanced study in machine learning and data science.

Part I: Data Analysis with Python
Students begin with Python fundamentals, learning how to manipulate arrays with NumPy and work with tabular data using Pandas Series and DataFrames. Essential topics in data preprocessing and graphical analysis are introduced to prepare data for deeper exploration and to effectively communicate insights. By the end of this section, students will have hands-on experience in building clean, interpretable analyses using Python's core data tools.

Part II: Mathematics for Machine Learning

The second half of the course focuses on mathematical concepts critical to machine learning, taught alongside their Python implementations. Topics include linear algebra and systems of equations, analytic geometry, symbolic algebra, eigenvalues/eigenvectors, and matrix decompositions. Students also explore numerical methods such as interpolation, Taylor series, root finding, numerical differentiation, and numerical integration. These topics are taught with an applied focus, enabling students to see how abstract mathematical ideas translate into computational tools for modeling and problem solving.

Course Communication

Canvas (canvas.njit.edu) will be the platform for posting lecture notes, submitting assignments and engaging in course discussions. For any questions and additional support, you are welcome to reach out to instructors and classroom assistants via email.

Generative AI

This course expects students to work without artificial intelligence (AI) assistance to better develop their skills in this content area. As such, AI usage is not permitted throughout this course under any circumstance

Learning Outcomes

By the conclusion of the course, students will:

- Develop fluency in Python for data manipulation and visualization.
- Understand and apply mathematical principles underlying modern machine learning.
- Gain experience bridging theory with implementation using numerical methods.
- Be well-prepared to progress into specialized machine learning and data science coursework.

Textbook (helpful but not required):

• Mathematics for Machine Learning 1st Edition by Marc Peter Deisenroth

Collaboration and Honor Code

Students are encouraged to discuss assignments with their peers to deepen understanding of the material. However, all submitted work must be written individually and reflect each student's own understanding. When submitting an assignment, students must clearly acknowledge the names of any peers with whom they collaborated.

Copying solutions—whether in part or in full—from another student, online sources, or any unauthorized resource is strictly prohibited. Any instance of cheating or plagiarism will be reported to the Dean of Students and the NJIT Committee on Professional Conduct.

Consequences may include Disciplinary Probation, a permanent notation on the academic record, failure in the course, and possible dismissal from the university.

All assignments will be systematically checked for similarity and plagiarism, and violators will be held accountable.

Grading:

The requirements of this course will consist of participating in lectures, quizzes, homework, two exams and a project.

Extra Credit

There will be **NO** way to get extra credit. Please don't ask.

The grading breakdown is the following:

- Homework (15%)
- Class Participation/Quiz (20%)
- Term Project (15%)
- Midterm (20%)
- Final Exam (30%)

The letter grade is based on the overall course score.

Grade Formula						
Grade	**A**	**B+**	**B**	**C+**	**C**	**D**
Overall Course Score Cutoff	90	85	80	75	70	60

Tentative course topics (Subject to changes according to progress)

1. Python Basics
2. Programming with Arrays in NumPy
3. Tabular Data with Pandas Series and Dataframes
4. Data Preprocessing
5. Graphical Analysis
6. Foundations of Linear Algebra
7. Coordinate Geometry
8. Symbolic Computation and Eigenvalue Analysis
9. Decomposition and Factorization of Matrices

10. Curve Fitting and Interpolation
11. Approximation with Taylor Series and Equation Solving
12. Computational Differentiation
13. Computational Integration

Academic Support System

NJIT Academic Calendar https://www5.njit.edu/registrar/calendars/ . This contains drop/add and other important dates.

Respondus LockDown Browser and Monitor:

Respondus LockDown Browser is a locked browser for taking assessments or quizzes in Canvas. It prevents students from printing, copying, going to another URL, or accessing other applications during a quiz. If a Canvas quiz requires that LockDown Browser be used, students will not be able to take the assessment or quiz with a standard web browser. Students may be required to use LockDown Browser with a webcam (Respondus Monitor), which will record students during an online exam.

The webcam can be built into your computer or can be the type that plugs in with a USB cable. Watch this short video to get a basic understanding of LockDown Browser and the webcam feature. A student Quick Start Guide (PDF) is also available.

Respondus Lockdown Browser and Monitor does not work with Linux and Chromebooks at this time. Please visit the Respondus Knowledge Base article on computer requirements for additional information.

IST Service Desk

The IST Service Desk is the central hub for computing information and first point of contact for getting help and reporting issues related to computing technology at NJIT. Students can put in a ticket with the service desk: https://servicedesk.njit.edu/CherwellPortal/IST or call (973) 596-2900 Monday - Friday from 8:00am – 9:00pm

Policy for Late Work

An assignment is late if it is not submitted to Canvas before the deadline. If you turn in your assignment 1 day late, you will lose 50%. Assignments turned in 2 days or later will receive 0 credit. If you have extenuating circumstances, please contact your instructor.

Accessibility and Support Services

Students who experience health, mental health, or family-related challenges that may

negatively affect their academic performance are strongly encouraged to contact the **Office of Accessibility Resources and Services (OARS)** as soon as possible: https://www.njit.edu/accessibility/. It is the student's responsibility to work with OARS to request appropriate accommodation.

Instructors are required to follow university policy regarding accommodations, and advance communication helps ensure that support is provided in a timely and appropriate manner. Students are reminded to submit any requests for accommodation early in the semester, and again before the midterm exam

Additional Tutoring Centers

The Writing Center

Bookstore

Canvas Help Page

Netiquette

Throughout this course, you are expected to be courteous and respectful to classmates by being polite, active participants. Please respect opinions, even those that differ from your own, and avoid using profanity or offensive language.

You must bring ID to all exams. Students with special needs are advised to make arrangements with the Office of Accessibility Resources and Services, Kupfrian Hall 201.

Academic Integrity:

"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: NJIT Academic Integrity Code.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu"