# MATH 2120 – Introduction to Data Science

Department of Mathematics & Statistics, University of New Mexico

Semester: Fall 2026

Course Title: Introduction to Data Science

Course Number: 2120

Course Credits: 3 (see the credit-hour statement section)

## Prerequisites/Corequisites

**Prerequisites:**

- One of MATH 1300 - Statistical Literacy or MATH 1350 - Introduction to Statistics
- MATH 1512 - Calculus I

**students may be considered for a prerequisite override if they have completed 1430. Email mathstatugprogram@unm.edu for the override.*

**Corequisite:**

- CSCI 1108 - Computer Programming Fundamentals (may be taken concurrently).

## Instructor & Class Information

Instructor: Kate Pearce

Email: TBD

Office Location: SMLC

Office Hours: TBD

Class Time/Location: 1400 - 1450
Class Meeting Days: MWF
Room: TBD

## Course Description

This course provides an introduction to the core ideas and practices of modern data science for beginning university students. Through a combination of conceptual lectures and hands-on activities, students learn how data are collected, represented, visualized, and interpreted to answer real-world questions. The course builds foundational skills in Python programming, data types and structures, visualization, and matrix-based reasoning, leading to applications in regression, classification, and clustering. Additional topics include working with real datasets, exploratory data analysis, and ethical considerations in data communication. Programming in Python will be introduced and used throughout the course. Students may take CSCI 1108 (Computer Programming Fundamentals) concurrently or should have equivalent prior exposure to basic programming concepts.

## Course Goals

**Knowledge**

- Understand core concepts of data science, including data types, visualization, and matrix-based data representation.
- Recognize how linear algebra ideas such as vectors, span, and rank support data analysis.
- Identify the basic principles behind regression, classification, and clustering.
- Understand the role of data cleaning, exploratory analysis, and ethics in sound data practice.

**Skill**

- Use Python, Jupyter notebooks, and libraries such as *NumPy*, *pandas*, and *matplotlib* to analyze and visualize data.
- Perform basic data manipulation, visualization, and interpretation tasks.
- Communicate findings clearly through visuals and written explanations.
- Collaborate effectively on data exploration and problem-solving activities.

**Attitude / Values**

- Demonstrate integrity and responsibility in collecting, analyzing, and presenting data.
- Appreciate fairness, transparency, and reproducibility in data-driven work.
- Develop curiosity and confidence in exploring data through computation and reasoning.
- Value diverse perspectives and understand the social impact of data science.

## Student Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Describe and classify different types of data (quantitative, categorical, structured, and unstructured) and their appropriate uses.
2. Use Python and Jupyter notebooks to load, clean, manipulate, and visualize datasets using libraries such as *NumPy*, *pandas*, and *matplotlib*.
3. Apply basic matrix operations and explain their roles in representing and analyzing data.
4. Interpret relationships in data through simple linear regression, classification, and clustering examples.
5. Summarize and communicate findings using descriptive statistics, visualizations, and clear written explanations.
6. Recognize ethical issues in data collection, analysis, and communication, and explain the importance of fairness, accuracy, and transparency in data science.

## Course Materials

**Textbook** (recommended):

- Wes McKinney, Python for Data Analysis (3rd ed.), O'Reilly.
- Joel Grus, Data Science from Scratch (2nd ed.), O'Reilly.

**Computer:** Students are required to bring a personal laptop with adequate hardware and battery capacity to run Python and JupyterLab. Laptops should be brought to every class session to participate in programming demonstrations and complete in-class exercises.

**Software:** Python, JupyterLab (for example via Anaconda), NumPy, pandas, matplotlib, scikit-learn. All software is open-source and free to install.

**Course Website**: All materials, assignments, and announcements will be posted on UNM Canvas.

## Course Requirements

**Assignments:**

In addition to scheduled exams, periodic assignments (readings, case study, short answer/essays and quizzes) will be assigned. The point values will be factored into the total points available for the course. These assignments will be conducted throughout the semester and are at the discretion of the instructor. Students must be present during class to participate in any in-class assignments.

**Assessments:**
Homework / Labs - 20%
In-class activities/quizzes - 20%
Midterm Exam - 30%
Final Exam - 30%

## Grading

Final grades will be based on the sum of all possible course points as noted above.

| Percentage of available points | Grade |
|---|---|
| 90.00 – 100.00 | A |
| 80.00 – 89.99 | B |
| 70.00 – 79.99 | C |
| < 70.00 | F |

Grades may use +/- at instructor's discretion.

## Course Schedule (tentative)

| Week | Topics and Activities |
|---|---|
| 1 | **What Is Data Science?** Overview of the field; examples from science, business, and society; the data cycle; course expectations; introduction to Jupyter notebooks and class workflow. |
| 2 | **Types of Data and Examples.** Qualitative vs. quantitative, discrete vs. continuous, structured vs. unstructured data; examples from public datasets; discussion of measurement, sampling, and context. |
| 3 | **Python Basics for Data Work.** Introduction to variables, lists, loops, and simple computations; working interactively in Jupyter notebooks; reading small CSV files. |
| 4 | **Visualizing Data.** Basic charts and plots using matplotlib and pandas; interpreting trends, variability, and patterns; how visualization aids reasoning. |
| 5 | **Introduction to Matrices and Vectors.** Data as arrays; matrix notation and arithmetic; geometric interpretation (lines, planes, scaling). |
| 6 | **Linear Combinations, Span, and Rank.** Understanding independence, rank, and how these relate to representing datasets and solving small systems. |
| 7 | **Applications of Matrices.** Simple matrix models: transformations, image filters, or network examples; connecting linear algebra to data representation. |
| 8 | **Linear Regression as Geometry.** Fitting a line through data, residuals, interpreting slope and intercept; hands-on practice with Python's linregress. |
| 9 | **Midterm Review and Exam.** Review sessions and midterm covering Python, visualization, and linear-algebra foundations. |
| 10 | **Introduction to Classification.** Predicting categories; visualizing decision boundaries with simple two-feature datasets. |
| 11 | **Introduction to Clustering.** Grouping without labels; exploring k-means conceptually; visual examples with 2-D data. |
| 12 | **Classification and Clustering: Comparison and Integration.** Connecting supervised and unsupervised learning; applying both methods to the same simple dataset; discussion of similarities, differences, and real-world uses. |
| 13 | **Working with Real Data.** Importing and exploring larger datasets; cleaning data, handling missing values, computing basic descriptive statistics; practical examples from open datasets. |
| 14 | **Exploratory Data Analysis, Ethics, and Communication.** Using visualization and summary statistics to tell a coherent story about data; identifying misleading graphs or biased samples; communicating results responsibly and clearly. |
| 15 | **Comprehensive Review and Reflection.** Revisiting key concepts from Python, linear algebra, visualization, and data modeling; integrated review exercises; preparation for the final exam. |

**Disclaimer**: The schedule and topics are subject to adjustment as needed. Minor changes will be announced in class, major ones provided in writing.

## Course Policies

**Attendance**: Regular attendance and participation are expected. More than three unexcused absences may affect your participation grade.

**Communication**: All announcements will be made through UNM Canvas and UNM email. Students are responsible for checking both regularly.

**Late Work**: Late assignments may be accepted for partial credit up to 48 hours past the deadline unless otherwise stated.

## Credit-hour Statement

This is a three-credit-hour course. Class meets for two 75-minute sessions or three 50-minute sessions of direct instruction for fifteen weeks during the semester. Students should plan for a minimum of six hours of out-of-class work (including study, assignments, and preparation) each week.

## Accommodation Statement

In accordance with University Policy 2310 and the Americans with Disabilities Act (ADA), academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention, as he/she are not legally permitted to inquire. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow. Contact Accessibility Resource Center at 277-3506 for additional information.

## Title IX Statement

In an effort to meet obligations under Title IX, UNM faculty, Teaching Assistants, and Graduate Assistants are considered "responsible employees" by the Department of Education;
see pg 15 - http://www2.ed.gov/about/offices/list/ocr/docs/qa-201404-title-ix.pdf.
This designation requires that any report of gender discrimination which includes sexual harassment, sexual misconduct and sexual violence made to a faculty member, TA, or GA must be reported to the Title IX Coordinator at the Office of Equal Opportunity (oeo.unm.edu). For more information on the campus policy regarding sexual misconduct;
see: https://policy.unm.edu/university-policies/2000/2740.html

## Academic Integrity Statement

Each student is expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, up to and including dismissal, against any student who is found guilty of academic dishonesty or otherwise fails to meet the standards. Any student judged to have engaged in academic dishonesty in course work may receive a reduced or failing grade for the work in question and for the course.

Academic dishonesty includes, but is not limited to, dishonesty in quizzes, tests, or assignments; claiming credit for work not done or done by others; hindering the academic work of other

students; misrepresenting academic or professional qualifications within or without the University; and nondisclosure or misrepresentation in filling out applications or other University records.

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This syllabus is subject to reasonable change with advance notice.