

Syllabus for CS 624, Data Analytics and Big Data, FALL 2025

Course Instructor:

Dr. Santosh Kumar Nukavarapu.

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Classroom: Online through Zoom using course collaboration tool and in-person dragas 2114.

Time: Wednesday 4:30 PM – 7:10PM.

Course Delivery Method:

This course will be delivered online through zoom. Please use the zoom under course collaboration tool.

Office Hours (This time can be used to discuss any questions or concerns)

Tuesday, 1 PM- 2 PM or by Zoom link: <https://odu.zoom.us/j/8830769453>[Links to an external site.](#)

Office: DRAGAS HALL, 1103C (available online only in summer).

TA

No TA for this course in the summer.

Content:

<https://canvas.odu.edu/>

Course content will be delivered fully online, asynchronously via Canvas weekly modules.

Attendance: Not Mandatory.

Course Description

Data analytics and data modeling is in great need in the era of big data. The first half of the course focuses on learning data analytics tools and learning how to leverage those tools to analyze data and facilitate decision-making based on insights from the data. We will study specialized systems and algorithms that have been developed to work with data at scale including parallel database systems, Apache Spark, and its contemporaries. The second half of the course is close to data mining, which explores models/algorithms to extract value in the data. It introduces algorithms designed for processing big data. In addition, it covers algorithms working with different types of data (static and streaming data) and can be applied to real-world

problems in different domains such as recommendations and graphs. Moreover, we'll talk about Generative AI technology and emerging shift to data centric models in context of Big data.

Prerequisites

Python Programming.

Basic knowledge of Python libraries such as numpy and pandas will be very useful.

Textbook and Reference Materials

There is no required textbook. Assigned readings are available in Canvas.

Technology Requirements

- Computer with reliable internet access

Course Learning Objectives

By the end of this course, students will be able to:

- Apply the Structured Query Language (SQL) for database definition and manipulation
- Utilize software systems designed for working with data at scale
- Analyze real-world data by leveraging big data tools
- Describe the many techniques/algorithms for big data modeling
- Identify techniques/algorithms used when handling various types of data (stream data, graph data)
- Formulate a real-world problem as a machine learning/data mining problem.

Course Structure

1.Intro to Big Data.

2.Spark-Intro and Setup.

3.Spark SQL

4.Spark SQL Transformations

5.Spark Complex Data Types

6.Spark Streaming

7.Spark Machine Learning

8.Spark Adaptive Query Engine

- 9. Spark Performance Tuning
- 10. Spark Catalyst Tungsten
- 11. Recommendation Engine
- 12. Generative AI.

Grading Criteria

In this course, I will calculate your final grade based on the following categories:

Criteria	Percentage/Points
Assignment #1: Spark fundamentals and UI. (2-member team)	10%
Assignment #2: Exploratory data analysis using Spark. (2 member team) (2-member team)	10%
Assignment#3: Building a predictive machine learning pipeline using Spark. (2-member team)	10%
Project #1: Building a Scalable Multimodal GEN AI and RAG - In class.	15%
Project #2: Building a Scalable data lake and recommendation system. (2-member team)	25%
In-class-Labs - hands on	10%
One Extended Lab Session (in class)	20%

Textbook and Reference Materials

There is no required textbook. Assigned readings are available in Canvas.

Grading Scale

Final course grades are based on the overall average. Overall class grade (not the individual grade) windows may be increased in size if the instructor finds it appropriate. Final score in %

will be rounded to the nearest whole number. Assigning + or – grades may be made at instructor’s discretion.)

Letter grades are based on the following percentage scale:

Percentage Letter Grade

100-94	A
93-90	A-
89-87	B+
86-84	B
83-80	B-
79-77	C+
76-74	C
73-70	C-
69-60	D
<59	F

Grading correction: The grading correction requests should be sent to the instructor within 1 week of receiving the grade, or before the end of the semester, whichever comes first. After that, your grade will not be adjusted. If you find a mistake in grading, please let the instructor know. Your grade will not be lowered. Graduate students: see the graduate policies and procedures page for specific requirements of grades

(<https://catalog.odu.edu/graduate/graduatepoliciesandprocedures/>) There is no separate grading scale for PhD students, but PhD students will typically be held to a higher standard.

Policy on Incomplete Grades

A grade of "I" indicates assigned work yet to be completed in a given course, or absence from the final examination, and is assigned only upon instructor approval of a student request. The "I" grade may be awarded only in exceptional circumstances beyond the student's control. The "I" grade becomes an "F" if not removed by the day grades are due for following term based on specific criteria: [Incomplete, Withdraws and Z grades](#).

Expectations

What you can expect from me, as your instructor:

- I will ensure the accuracy of the course content.
- I will provide clear guidelines on the course assignments.
- I will be available to answer your questions.
- I will provide meaningful feedback in a timely manner.
- I will do my best to create a worthwhile learning experience for all of my students.
- I will follow fair and clear evaluation guidelines for all the course assignments.
- I will do my best to prepare you for exams and assignments.

What I expect from you, as my student:

- You will complete all course readings, presentations, and project in a timely manner.
- You will follow the ODU honor pledge.
- You will follow proper [netiquette](#).
- You will interact with your faculty and classmates professionally and respectfully.
- You will avoid sarcasm and inappropriate language, including the use of ALL CAPS.
- You will acknowledge your classmates' ideas and build on them to contribute to the discussion.

Course Policies

Late Submissions

Due dates are set to give ample time for the preparation of the presentations and will not be extended except for the unexpected and unlikely major, long-lived catastrophe. For projects, please start early – last-minute computer malfunctions will not be accepted as a reason for delaying a due date. Individual accommodations will be discussed if you have a valid medical excuse. Late submissions of project reports will incur the following penalties.

0-24 hours late: - 5%

25-48 hours late: -10%

49-72 hours late: -20%

after 72 hours not accepted.

Course Disclaimer

The course schedule and activities are subject to change. Changes will be posted as Announcements in Canvas. I will make every attempt not to change the syllabus, however, certain changes may be made based on the needs and experiences of students.

University Policies

Code of Student Conduct and Academic Integrity

The [Office of Student Conduct & Academic Integrity](#) (OSCAI) oversees the administration of the student conduct system, as outlined in the Code of Student Conduct. Old Dominion University is committed to fostering an environment that is: safe and secure, inclusive, and conducive to academic integrity, student engagement, and student success. The University expects students and student organizations/groups to uphold and abide by standards included in the Code of Student Conduct. These standards are embodied within a set of core values that include personal and academic integrity, fairness, respect, community, and responsibility.

Honor Pledge

By attending Old Dominion University, you have accepted the responsibility to abide by the Honor Pledge:

I pledge to support the Honor System of Old Dominion University. I will refrain from any form of academic dishonesty or deception, such as cheating or plagiarism. I am aware that as a member of the academic community it is my responsibility to turn in all suspected violations of the Honor Code. I will report to a hearing if summoned.

Discrimination Policy

The purpose of this policy is to establish uniform guidelines in order to promote a work and education environment that is free from harassment and discrimination, as defined below, and to affirm the University's commitment to foster an environment that emphasizes the dignity and worth of every member of the Old Dominion University community. The [Discrimination Policy](#) details the process to address complaints or reports of retaliation, as defined by this policy.

Diversity and Inclusion

The [Division of Student Engagement & Enrollment Services](#) values the uniqueness of our Monarch community. The word "engagement" reflects our commitment to embrace the

differences in our cultural backgrounds, perceptions, beliefs, traditions, world views, socio-economic status, cognitive and physical abilities.

We will strive to serve as the pre-eminent model for engaging every student to achieve their own success. Our core values are fueled by our responsibility and actions toward community development and engagement, cultural competence and understanding, physical and mental wellness and inclusion for every member of ODU. We will embrace our greatest strength - the diverse composition of our student body and workforce. For more information regarding diversity and inclusion, please visit the [Office of Intercultural Relations](#).

Educational Accessibility and Accommodations

Old Dominion University is committed to ensuring equal access to all qualified students with disabilities in accordance with the Americans with Disabilities Act. The [Office of Educational Accessibility](#) (OEA) is the campus office that works with students who have disabilities to provide and/or arrange reasonable accommodations.

The [Accommodations for Students with Disabilities](#) define the procedures used to accommodate student with disabilities. Students are encouraged to self-disclose disabilities that the Office of Educational Accessibility has verified by providing Accommodation Letters to their instructors early in the semester in order to start receiving accommodations. Accommodations will not be made until the Accommodation Letters are provided to instructors each semester.

University Email Policy

With the increasing reliance and acceptance of electronic communication, email is considered an official means for University communication. Old Dominion University provides each student an email account for the purposes of teaching and learning, research, administration, and service. It is the responsibility of every eligible student to activate MIDAS, the Monarch Identification and Authorization System, in order to obtain email access. It is important that all students are aware of the expectations associated with email use as outlined in the [Student Email Standard](#). The email account provided by the University is considered to be an official point of contact for correspondence. Students are expected to check their official e-mail account on a frequent and consistent basis in order to stay current with University communications. Mail sent to the ODU email address may include notification of University-related actions, including academic, financial, and disciplinary actions. For more information about student email, please visit [Student Computing](#).

Withdrawal

A syllabus constitutes an agreement between the student and the course instructor about course requirements. Participation in this course indicates your acceptance of its teaching focus,

requirements, and policies. Please review the syllabus and the course requirements as soon as possible. If you believe that the nature of this course does not meet your interests, needs or expectations, if you are not prepared for the amount of work involved – or if you anticipate assignment deadlines or abiding by the course policies will constitute an unacceptable hardship for you – you should drop the course by the drop/add deadline, which is listed in the [ODU Schedule of Classes](#). For more information, please visit the [Office of the University Registrar](#).

Privacy of Student Information

Old Dominion University recognizes its duty to uphold the public's trust and confidence, not only in following laws and regulations, but in following high standards of ethical behavior. Members of the Old Dominion University community are responsible for maintaining the highest ethical standards and principles of integrity. The [Code of Ethics](#) is a set of values-based statements that demonstrate the University's commitment to this goal. The [Privacy of Student Information](#) details Family Educational Rights & Privacy Act (FERPA), along with other information regarding privacy.