NORTHWEST
MISSOURI STATE UNIVERSITY
MARYVILLE | KANSAS CITY

**School of Computer Science and Information Systems**

**44-517-02/03: Big Data (3 hrs.)**
**Fall 2023**

**Instructor:** Dr. Ajay Bandi **Email:** ajay@nwmissouri.edu
**Office hrs:** **M, W, F -- 1:00 PM to 2:00 PM**
**M – 3:00 PM to 4:00 PM**
**W – 3:00 PM to 5:00 PM** **Office:** CH 2250

**Prerequisites:** Undergraduate: 44-242 with a grade of C or better. Graduate: 44-542 with a grade of C or better, or consent of instructor

**Textbook and supplementary materials:** *Resources will be provided by the instructor as necessary through the semester.*

**Course description:** *An introduction to the design of data-intensive, reliable, scalable, and maintainable systems. Includes an introduction to current and relevant tools, technologies, design principles, and frameworks. This may include concepts such as parallel programming, distributed computing, distributed file systems, MapReduce, regular expressions, and the ingesting and processing of data at rest and data in motion. Tools used may include Hadoop, HDFS, Pig, Hive, Spark, Storm, Kafka, Mahout, MLlib, etc.*

**Student learning outcomes:** *This course satisfies the following outcomes for the School of CSIS*

| **Outcome** | **Assessment Methods** |
|---|---|
| DSI students will access, generate, and reorganize information using contemporary technologies. | Selected assignment(s) |
| DSI Students will work as a team to design, implement, and deliver solutions to problems using best practices with contemporary technologies. | Selected assignment (2) |

In addition, after completing this course, a student should be able to:

- Describe the characteristics of big data systems.
- Describe the history of distributed data processing including Hadoop, HDFS, and MapReduce • Describe big data integration platforms (e.g., Apache Beam).
- Compare choices for data processing engines.
- Describe key processing concepts.
- Describe common options for programming languages.
- Describe common options for I/O connectors.
- Create and execute big data jobs using contemporary technologies.

- Function effectively on teams to accomplish a common goal.

**Instructional methods:** Class time will consist primarily of lecture and student discussion about course topics, with time allotted for individual or group work on projects, homework, and hands on activities.

**Graded course requirements:** *Tentatively, the grade will be weighted as follows:*

| Category | Weight |
|---|---|
| Exam 1 | 10% |
| Exam 2 | 10% |
| Discussions | 25% |
| Assignments and In Class Activities | 25% |
| Final Project/Exam | 30% |

The class will meet during the final exam time as specified by the registrar's office at https://www.nwmissouri.edu/registrar/finals.htm

**Grading scale:** The grading scale is the standard 10-point grading scale but may be revised in the students' favor at the instructor's discretion.

| | |
|---|---|
| >90% | A |
| 80%-89.9% | B |
| 70%-79.9% | C |
| 60%-69.9% | D |
| <60% | F |

Undergraduate students will receive a 2% boost to their grade at the end of the semester.

**Course outline/major topics studied:**

- Introduction to Big Data
- Structured, Semi-structured, and Unstructured Data
- Hadoop
- Distributed Database Architectures
- Data Engineering
- Python for Data Science
- Map Reduce
- Selected Java topics
- PySpark
- Apache Beam
- Apache Kafka

**Note:** Course schedule is subject to change with instructor notification and students will be responsible for abiding by these changes.

**Attendance:** Students are expected to attend all classes as specified in the course syllabi for each course and are responsible for all material and work assigned during class lectures and hands on learning time. It is the responsibility of the student to promptly notify their instructor when unable to attend class. Please refer to the university policy on attendance at https://www.nwmissouri.edu/policies/academics/Attendance.pdf

**Final exams:**
If an emergency occurs that prevents the administration of a course scheduled final examination, the final course grades will be calculated based on the work in the course completed to that point in time and the faculty member's considered judgment. Final exams will not be rescheduled, and a grade of "I" will not be given as a result of an institutional cancellation of a final examination. This final exam policy does not apply to online courses.

**Artificial Intelligence Engines:** Generative AI engines, such as ChatGPT, are fast becoming important tools to help improve various personal, professional, and educational tasks. Specifically for this course, the submission of academic work created by a generative AI engine is not allowed. All submitted course work must be your own work. The goal is for you to learn and understand the course content. AI engines are a tool which can help facilitate the learning process. The understanding of course content is assessed by completing the required course work. Your understanding cannot be gauged if AI generated material is used.

**Administrative drop**: An instructor may request the Office of the Registrar delete a student from a course roster if the student has not met the prerequisite for the course as stated in the catalog, or as a result of nonattendance in the course.

**Academic Administrative withdrawal:** When it is in the best interest of Northwest Missouri State University for a student to withdraw, a student will be given a W, put on administrative hold, and given notice that they are about to be withdrawn. This action will result in removal of all credits associated with courses that have yet to be completed in the semester in question and the student will be administratively withdrawn from the University. An Administrative Withdrawal does not affect the student's grade point average. Please refer to Northwest Missouri State University's Academic Administrative Withdrawal Policy at: https://www.nwmissouri.edu/policies/academics/Adding-Dropping-Withdrawals.pdf

**University communications:** Students are expected to use their Northwest student email account for any electronic correspondence within the university. Students are also strongly advised to check their email and CatPAWS accounts on a regular basis.

**Academic integrity policy:** The students, faculty, and staff at Northwest endeavor to sustain an environment that values honesty in academic work, that acknowledges the authorized aid provided by and intellectual contributions of others, and that enables equitable student evaluation. Please refer to Northwest Missouri State University's Academic Integrity Policy at http://www.nwmissouri.edu/policies/academics/Academic-Integrity.pdf

**Learning or Living Accommodations Request Process:** Northwest Missouri State University complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 [ADA] and the ADA Amendments Act of 2008 [ADAAA]. If a student has a documented disability that qualifies under the

ADA/ADAAA and requests accommodations, they should review the Accessibility and Accommodations webpage at https://www.nwmissouri.edu/titleixequity/accessibility/index.htm for guidance, including the accommodations application and supporting documentation requirements. Contact ada@nwmissouri.edu or 660.562.1873 for further assistance. For the university policy on disability accommodation refer to http://www.nwmissouri.edu/policies/student/Disability-Accommodation.pdf

**Non-discrimination and anti-harassment policy:** Northwest Missouri State University is committed to maintaining an environment for all faculty, staff, students, and third parties that is free of illegal discrimination and harassment. Please refer to the Non-Discrimination and Anti-Harassment Policy at https://www.nwmissouri.edu/TitleIXEquity/titlevi/

**Family Education Rights and Privacy Act (FERPA) policy:** Family Educational Rights and Privacy Act of 1974, as amended (commonly known as the Buckley Amendment), is a federal law which provides that colleges and universities will maintain the confidentiality of student education records. Please refer to the Family Educational Rights and Privacy Act (FERPA) Policy at http://www.nwmissouri.edu/policies/academics/Family-EducationalRights-and-Privacy-Act.pdf

**Behavior and Wellness:** Northwest focuses on student success—every student, every day.
The Wellness Center, 660.562.1348, offers free counseling for students coping with depression, anxiety, alcohol or drug misuse, relationships, and other emotional, social, and academic stressors. In addition, faculty, staff, and students who are concerned with student wellbeing can report their concerns, including anonymously, to the Behavioral Intervention Team, so that the student can be offered relevant support, at this link: Concerning Behavior Reporting Form. If you are concerned about the immediate safety of a student, please call the University Police, who have specialized training in intervention, at 660.562.1254.

**Disclaimer:** Course schedule is subject to change and you will be responsible for abiding by any such changes. Your instructor will notify you of any changes.