

COURSE OUTLINE (TENTATIVE)

Course Code: SE 446	Course Title: Big Data Analytics	Semester: Spring 2026
Course Credits: 3	Lectures Hours: 3 Hrs.	Tutorial Hours: 0
Lectures Schedule: Location:	Male Section: MON/WED, 13:00 to 14:15, BG.069	
Course Instructors: Name: Office Location: Email: Office Phone: Office Hours:	Prof. Anis Koubaa SG-10 akoubaa@alfaisal.edu 7497 MON/WED 12:00 PM – 01:00 PM or 02:30 PM to 03:30 PM (or appointment)	
Required Textbook: Learning Spark: Lightning-Fast Data Analytics, 2nd Edition Jules S. Damji, Brooke Wenig, Tathagata Das, Denny Lee O'Reilly Media, 2020 Supplementary: - Hadoop: The Definitive Guide, 4th Ed (O'Reilly, 2015) - Designing Data-Intensive Applications (O'Reilly, 2017)		
Prerequisites: SE 371 (Database Systems) SE 324 (Data Structures)		Co-requisites: None Course Type: <input checked="" type="checkbox"/> Required <input type="checkbox"/> Elective <input type="checkbox"/> Selected Elective
Course Description: This course introduces students to the core concepts, architectures, and technologies underlying modern Big Data Analytics. It examines how large and complex datasets are captured, stored, processed, and analyzed to extract meaningful insights at scale. Students will explore key paradigms in distributed computing, data-intensive programming, and large-scale data management, along with foundational techniques in batch and real-time processing. The course emphasizes applied learning and familiarizes students with widely used platforms and frameworks in the Big Data ecosystem, preparing them for real-world data engineering and analytics workflows. Through hands-on exercises and a semester-long project, students will design and implement scalable data pipelines, perform exploratory and analytical tasks on large datasets, and communicate their findings effectively. By the end of the course, students will gain both conceptual understanding and practical experience that enable them to work with massive datasets and contribute to data-driven decision making in diverse domains.		
Major Topics:		
	Topic	
1.	Course Introduction & GitHub Setup	
2.	Big Data Concepts (5 V's) & HDFS Architecture	
3.	Data Formats (CSV, JSON, Parquet)	
4.	MapReduce Paradigm & Implementation	
5.	Apache Hive & HiveQL Analytics	
6.	Apache Spark Introduction & DataFrames	
7.	Spark SQL & Performance Optimization	
8.	Apache Kafka & Stream Processing	
9.	Spark Streaming & Real-time Analytics	
10.	AI Applications & Ethics	

* Calendar and outline are tentative and subject to change depending on unforeseen influential factors.

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CLO	Course Learning Outcomes (CLO) <i>Students who successfully complete this course should be able to:</i>	ABET Outcomes (i.e. addressed by the course)
	Knowledge & understanding	
1	Explain essential concepts, challenges, and approaches in Big Data.	SO 1 (PLO1)
	Skills	
2	Implement scalable data processing pipelines for batch, streaming, analytical, and real-time workloads on distributed data platforms.	SO 2, SO 6 (PLO4, 5)
3	Perform data analysis on large datasets and interpret results to support evidence-based decision making in real-world contexts.	SO 2 (PLO2)
	Values, autonomy, and responsibility	
4	Demonstrate ethical, responsible, and collaborative practices when working with data, including respect for privacy, security, and teamwork principles.	SO 4, SO 5 (PLO7)

Schedule

Class Meetings: Mondays & Wednesdays, 1.5 hrs each

Start: Mon 25 Aug 2025

End: Wed 17 Dec 2025

Week	Date Range	Day	Topic	Assessment / Activity
1	Jan 12–14	Sun	Course Introduction	—
		Tue	GitHub Setup & Q&A	—
2	Jan 19–21	Sun	Big Data Intro (5 V's)	—
		Tue	HDFS Architecture	—
3	Jan 26–28	Sun	Data Formats (CSV, JSON, Parquet)	M1 Start
		Tue	MapReduce Basics	—
4	Feb 2–4	Sun	MapReduce Practice	—
		Tue	M1 Due	M1 Submission
5	Feb 9–11	Sun	Apache Hive Introduction	M2 Start
		Tue	HiveQL Practice	Quiz 1
6	Feb 16–18	Sun	M2 Due + Review	—
		Tue	MIDTERM 1	Exam
7	Feb 23–25	Sun	Apache Spark Introduction	M3 Start
		Tue	Spark DataFrames	—
8	Mar 2–4	Sun	Spark SQL	—
		Tue	M3 Due	M3 Submission
9	Mar 9–11	Sun	Apache Kafka Fundamentals	M4 Start
		Tue	Spark Streaming	Quiz 2
10	Mar 16–18	Sun	M4 Due + Review	—
		Tue	MIDTERM 2	Exam
11	Mar 23–25	Sun	Streaming Complete	M5 Start
		Tue	M5 Work	—
12	Mar 30–Apr 1	Sun	M5 Due + Showcase	—
		Tue	Buffer/Extra Practice	—
13	Apr 6–8	Sun	Final Review	—
		Tue	Final Review	—
14	Nov 24–30	Sun–Sat	Mid-Semester Break (No Classes)	—
15	Dec 1–3	Mon	AI applications (Robotics, NLP, Ethics, Vision 2030)	—
	Dec 8–10	Mon	Project development + mentoring	—
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	Dec 15–17	Wed	Final Project Presentations & Wrap-up	Project due
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Course Assessment Methods & Weights

Assessment Component	Weight	Details
Midterm Exam 1	20%	Covers Weeks 1–5 (Big Data, HDFS, MapReduce, Hive).
Midterm Exam 2	20%	Covers Weeks 7–10 (Spark, Kafka, Streaming).
Final Exam	30%	Comprehensive.
Quizzes (2)	10%	Quiz 1 (Week 5), Quiz 2 (Week 9).
Project Work	20%	GitHub Commits (10%) + In-Class Submissions (10%). 5 Milestones × 4% each.

Alfaisal University Grading Scale

Grade	Percent Range	Grade	Percent Range
A+	95%-100%	C+	75%-79%
A	90%-94%	C	70%-74%
B+	85%-89%	D+	65%-69%
B	80%-84%	D	60%-64%
		F	0%-59%

Program Learning Outcomes / Student Outcomes

K1 PLO1 SO8	an ability to recognize Big Data concepts, distributed systems architecture, and the Hadoop ecosystem for processing massive datasets.
S1 PLO2 SO1	an ability to identify, formulate, and solve Big Data problems using distributed processing frameworks.
S2 PLO3 SO7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
S3 PLO4 SO2	an ability to apply data engineering design to produce solutions for batch and streaming data pipelines.
S4 PLO5 SO6	an ability to develop and conduct appropriate data analysis experiments using Spark and SQL.
S5 PLO6 SO3	an ability to communicate effectively with a range of audiences
V1 PLO7 SO4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
V2 PLO8 SO5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

Policies and Notes

1) Student Affairs Notes

- The course follows the University policy as outlined in the [Undergraduate Student Handbook](#).

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- Sessional dates, registration deadlines, and withdrawal deadlines are available on the **Student Affairs and Admission** website.
- The **final exam date** will be announced by Student Affairs towards the end of the semester.
- Once deadlines and exam dates are published, no rescheduling will be permitted, except in cases of unforeseeable circumstances where the university suspends classes. In such cases, in-session submissions and exams will be automatically rescheduled to the following session.

2) Attendance Policy

- **Class Attendance:** Students are expected to attend all lectures, labs, and tutorials. Exceeding **20% of lecture-hour absences** may result in a **Dismissal Notification (DN) grade**. The 20% allowance covers medical emergencies or the death of an immediate family member, with valid supporting documentation required. Only in these cases can students make up missed coursework or exams. Excessive absenteeism may result in loss of scholarship eligibility or administrative withdrawal from the course and University.
- **Late Arrival:** Arriving **5 minutes late** counts as tardy, with **three tardies equaling one absence**. Arriving **10 minutes late or more** is recorded as a full absence.

3) Electronic Devices Policy

- Use of mobile phones, laptops, tablets, or other portable electronic devices during class is **prohibited** unless explicitly permitted by the instructor. Violation may result in being asked to leave class and receiving a full absence.
- Electronic Devices are **prohibited during exams**, except calculators approved by the instructor. Mobile phones, even if switched off, will result in a score of **zero (0)** and may incur further disciplinary action.

4) Late Submission of Student Work

- Homework, assignments, lab reports, and projects must be submitted **on time**. Late submissions will be penalized according to the instructor's policy and **will not be accepted more than two days past the deadline**, including weekends.

5) Academic Integrity

- Cheating, plagiarism, or any form of academic dishonesty constitutes a **scholastic offense**. Cheating in examination or attempting to cheat, or violating instructions, and examination regulations shall render the student to punishment in accordance with the Student Disciplinary By-Laws as issued by the University Council. Penalties may include expulsion from the program. Students are expected to maintain academic integrity and consult the instructor if uncertain.

6) E-Learning Management System

- **Moodle** is the official platform for course materials, announcements, and messages. Students are responsible for regularly checking Moodle for updates.

7) Instructional Materials

- Instructors are expected to post all instructional materials no later than two days after the lecture.

8) Lines of Communication

- Students should follow the established communication chain and raise issues in the following order:
 1. **Course Instructor/Professor**
 2. **Department Chair** (if unresolved in reasonable time)
 3. **Vice Dean for Academic & Student Affairs** (if the issue merits escalation)
 4. **Dean** (issues may then be addressed by the Dean or escalated to the President at the Dean's discretion)

9) Exams and Retake Policy

1. Students are not allowed to enter the examination venue if more than 5 minutes have passed since the start of the exam.

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2. Students are required to remain in the examination venue for a minimum of 30 minutes before they are permitted to leave.
3. Students must possess a valid student ID in order to be allowed entry into any exams.
4. In case a student misses a major exam, the student must **submit an Absence Leave eForm** with supporting documentation **no later than one week** after missing the exam.
5. If a student has an approved absence (via e-form), the faculty member must provide **a retake exam**—covering the same material as the original—**within two weeks**.
6. Alternatives such as transferring the exam weight to another assessment or substituting it with another grade component **are not permitted**.

10) Accessibility and Special Accommodations

- In accordance with the University's Undergraduate Student Handbook, students with documented disabilities or special needs are entitled to reasonable accommodations. Students requiring accommodations, such as adjustments in coursework or exams, must contact the Deanship of Student Affairs and follow the University's Examination Special Accommodation Policy (Section 3.32). Students are advised to notify the instructor as early as possible in the semester to ensure timely arrangements. Counseling and support services are also available through the University's Counseling & Skills Development unit (Section 5).