

RENCANA PEMBELAJARAN SEMESTER

PROGRAM STUDI S2 SAINS DATA

FAKULTAS SAINS DAN MATEMATIKA Universitas Kristen Satya Wacana

Form						
Semester	Genap 2026/2027					
Mata Kuliah	BD010 BIG DATA ANALYSIS					
Beban	3	SKS	T/A/P:	1/2/0	W/P:	Pilihan
Dosen Pengampu	1. Prof. Dr. Hanna Arini Parhusip, M.Sc.nat 2. Dr. Suryasatriya Trihandaru, S.Si., M.Sc.nat 3. Dr. Bambang Susanto, M.S. 4. Dr. Ir. Iwan Setyawan					

A. Program Learning Outcome / Capaian Pembelajaran Lulusan (CPL)

CPL01	Mampu menunjukkan sikap bertanggung jawab atas pekerjaan di bidang keahliannya secara mandiri.
CPL02	Menguasai konsep teoretis bidang pengetahuan dan keterampilan tertentu secara umum dan khusus untuk menyelesaikan masalah secara prosedural sesuai dengan lingkup pekerjaannya
CPL03	Mampu menganalisis kebutuhan perangkat lunak untuk menghasilkan spesifikasi yang tepat.
CPL04	Mampu merancang perangkat lunak yang sesuai dengan spesifikasi dan kebutuhan pengguna.
CPL05	Mampu mengimplementasikan perangkat lunak berdasarkan spesifikasi yang telah dirancang.
CPL06	Mampu berkomunikasi secara efektif, baik lisan maupun tulisan, dalam konteks profesional.
CPL07	Mampu bekerjasama dalam tim serta menunjukkan kemampuan kepemimpinan dalam konteks kerja kelompok.
CPL08	Mampu mengintegrasikan prinsip etika dan tanggung jawab sosial dalam pengambilan keputusan profesional.

B. Course Learning Outcome / Capaian Pembelajaran Mata Kuliah (CPMK)

CPMKBD01011	(CPL01) Mampu bertanggung jawab dalam melakukan analisis data berskala besar secara mandiri dengan memperhatikan validitas data dan ketepatan metode.
CPMKBD01022	(CPL02) Menguasai konsep teoretis analisis big data, arsitektur, dan teknik pengolahan data berskala besar secara prosedural.
CPMKBD01033	(CPL03) Mampu menganalisis kebutuhan data dan sistem analitik untuk merumuskan spesifikasi perangkat lunak big data yang tepat.
CPMKBD01034	(CPL03) Mampu menganalisis kebutuhan fungsional dan nonfungsional sistem big data untuk menghasilkan spesifikasi analisis yang akurat.

C. Prerequisite/Corequisite Courses /Prasyarat Mata Kuliah

Code	Course Name

D. Description/Deskripsi

This course introduces Big Data Analysis at the graduate level, covering: big data concepts and characteristics, distributed storage and file systems (HDFS), distributed processing with MapReduce and the Hadoop ecosystem, Apache Spark (RDD, DataFrame, Spark SQL), batch and stream processing (Spark Streaming, Apache Kafka), NoSQL databases for big data (HBase, Cassandra, MongoDB), big data architecture patterns (Lambda and Kappa architecture), data warehousing and data lakes, scalable machine learning on big data, and functional and nonfunctional requirement analysis for big data systems.

Mata kuliah ini membahas Big Data Analysis pada level magister, meliputi: konsep dan karakteristik big data, distributed storage dan file system (HDFS), distributed processing dengan MapReduce dan ekosistem Hadoop, Apache Spark (RDD, DataFrame, Spark SQL), batch dan stream processing (Spark Streaming, Apache Kafka), basis data NoSQL untuk big data (HBase, Cassandra, MongoDB), pola arsitektur big data (Lambda dan Kappa architecture), data warehousing dan data lake, machine learning skala besar pada big data, serta analisis kebutuhan fungsional dan nonfungsional untuk sistem big data.

E. Learning Stage/Tahap Pembelajaran

We ek	Final Ability	Material	Methods	Dura tion	Indicators	Assesment
1	<i>Have broad knowledge of Big Data: concepts and characteristics (Volume, Velocity, Variety, Veracity, Value).</i> Memiliki pengetahuan luas tentang Big Data: konsep dan karakteristik (Volume, Velocity, Variety, Veracity, Value).	Introduction to Big Data: Concepts & Characteristics	Presentation Discussion Demonstration Practicum	150'	Provides information about big data concepts and characteristics; Discussion	Discussion
2	<i>Master big data architecture: distributed systems and the Hadoop Distributed File System (HDFS).</i> Menguasai arsitektur big data: sistem terdistribusi dan Hadoop Distributed File System (HDFS).	Big Data Architecture: Distributed Systems & HDFS	Presentation Discussion Demonstration Practicum	150'	Obtain information about distributed systems and HDFS; Discussion and Practicum	Discussion
3	<i>Master distributed processing with MapReduce and the Hadoop ecosystem.</i> Menguasai distributed processing dengan	Distributed Processing: MapReduce & Hadoop Ecosystem	Presentation Discussion Demonstration Practicum	150'	Obtain information about MapReduce and the Hadoop ecosystem;	Discussion

	MapReduce dan ekosistem Hadoop.				Discussion and Practicum	
4	<i>Master Apache Spark: RDD, DataFrame, and Spark SQL.</i> Menguasai Apache Spark: RDD, DataFrame, dan Spark SQL.	Apache Spark: RDD, DataFrame & Spark SQL	Presentation Discussion Demonstration Practicum	150'	Obtain information about Apache Spark; Discussion and Practicum	Task: Submit a practicum report.
5	<i>Master practical work related to HDFS, MapReduce/Hadoop, and Apache Spark.</i> Menguasai praktikum terkait HDFS, MapReduce/Hadoop, dan Apache Spark.	Practicum/Case Study related to Meeting 1-4	Presentation Discussion Demonstration Practicum	150'	Carrying out practicum and tutorials related to Meeting 1 to Meeting 4	Practical Assignment /Report - CPMK2 (10%)
6	<i>Master batch and stream processing: Spark Streaming and Apache Kafka.</i> Menguasai batch dan stream processing: Spark Streaming dan Apache Kafka.	Batch vs Stream Processing: Spark Streaming & Apache Kafka	Presentation Discussion Demonstration Practicum	150'	Obtain information about batch and stream processing; Discussion and Practicum	Discussion
7	<i>Master NoSQL databases for big data: HBase, Cassandra, and MongoDB.</i> Menguasai basis data NoSQL untuk big data: HBase, Cassandra, dan MongoDB.	NoSQL Databases for Big Data: HBase, Cassandra & MongoDB	Presentation Discussion Demonstration Practicum	150'	Obtain information about NoSQL databases for big data; Discussion and Practicum	Discussion
8	<i>Master big data architecture patterns: Lambda and Kappa architecture.</i> Menguasai pola arsitektur big data: Lambda dan Kappa architecture.	Big Data Architecture Patterns: Lambda & Kappa Architecture	Presentation Discussion Demonstration Practicum	150'	Obtain information about Lambda and Kappa architecture; Discussion and Practicum	Task: Submit a practicum report.
9	<i>Master practical work related to stream processing, NoSQL databases, and big data architecture patterns.</i> Menguasai praktikum terkait stream processing, basis data NoSQL, dan pola arsitektur big data.	Practicum/Case Study related to Meeting 6-8	Presentation Discussion Demonstration Practicum	150'	Carrying out practicum and tutorials related to Meeting 6 to Meeting 8	Practical Assignment /Report - CPMK2 (15%)
10	<i>Master data warehousing and data lakes for big data.</i> Menguasai data warehousing dan data lake untuk big data.	Data Warehousing & Data Lakes for Big Data	Presentation Discussion Demonstration Practicum	150'	Obtain information about data warehousing and data lakes; Discussion and Practicum	Discussion
11	<i>Master scalable machine learning on big data using Spark MLlib.</i>	Scalable Machine Learning on Big Data (Spark MLlib)	Presentation Discussion Demonstration Practicum	150'	Obtain information about scalable machine learning on big	Discussion

	Menguasai machine learning skala besar pada big data menggunakan Spark MLlib.				data; Discussion and Practicum	
12	<i>Master functional requirement analysis for big data systems.</i> Menguasai analisis kebutuhan fungsional untuk sistem big data.	Functional Requirement Analysis for Big Data Systems	Presentation Discussion Demonstration Practicum	150'	Obtain information about functional requirement analysis; Discussion and Practicum	Discussion
13	<i>Master nonfunctional requirement analysis for big data systems (scalability, performance, fault tolerance).</i> Menguasai analisis kebutuhan nonfungsional untuk sistem big data (skalabilitas, performa, fault tolerance).	Nonfunctional Requirement Analysis for Big Data Systems	Presentation Discussion Demonstration Practicum	150'	Obtain information about nonfunctional requirement analysis; Discussion and Practicum	Task: Submit a practicum report.
14	<i>Master practical work related to data warehousing, scalable machine learning, and requirement analysis for big data systems.</i> Menguasai praktikum terkait data warehousing, machine learning skala besar, dan analisis kebutuhan sistem big data.	Practicum/Case Study related to Meeting 10-13	Presentation Discussion Demonstration Practicum	150'	Carrying out practicum and tutorials related to Meeting 10 to Meeting 13	Practical Assignment /Report - CPMK3 (25%)
15	<i>Able to formulate functional and nonfunctional specifications for an applied big data project.</i> Mampu merumuskan spesifikasi fungsional dan nonfungsional untuk proyek big data secara terapan.	PROJECT WORK	Project Work	150'	Design and formulate specifications for a big data project	Final Project Work - CPMK4 (25%)
16	<i>Able to present and defend the big data analysis project.</i> Mampu mempresentasikan dan mempertanggungjawabkan proyek big data analysis.	PROJECT PRESENTATION	Presentation Discussion	150'	Presenting the big data analysis project	Project Presentation - CPMK1 (25%)

Note/Catatan untuk Tabel E.

Abbreviation	Description
CPL	Capaian Pembelajaran Lulusan / Program Learning Outcome
CPMK	Capaian Pembelajaran Mata Kuliah / Course Learning Outcome
HDFS	Hadoop Distributed File System
RDD	Resilient Distributed Dataset
NoSQL	Not Only SQL

F. Learning Media and Tools

Hadoop, Apache Spark (PySpark), Apache Kafka, HBase/Cassandra/MongoDB, Computer, Flearn (Online Learning Media), WAG and Google Meet/Zoom.

G. Student Learning Experience/Portfolio

Students gain experience in working with distributed storage and processing systems (HDFS, MapReduce, Spark), applying NoSQL databases, designing big data architectures, and formulating functional and nonfunctional requirements for a big data analysis project.

Mahasiswa memperoleh pengalaman dalam bekerja dengan sistem distributed storage dan processing (HDFS, MapReduce, Spark), menerapkan basis data NoSQL, merancang arsitektur big data, serta merumuskan kebutuhan fungsional dan nonfungsional untuk proyek big data analysis.

H. References

1. [White, T. \(2015\). Hadoop: The Definitive Guide \(4th ed.\). O'Reilly Media.](#)
2. [Zaharia, M., et al. \(2016\). Apache Spark: A Unified Engine for Big Data Processing. Communications of the ACM, 59\(11\), 56-65.](#)
3. [Dean, J., & Ghemawat, S. \(2004\). MapReduce: Simplified Data Processing on Large Clusters. Proceedings of OSDI.](#)
4. [Ghemawat, S., Gobioff, H., & Leung, S.-T. \(2003\). The Google File System. Proceedings of ACM SOSP.](#)

I. Authorization

Pengembang	Tanggal	Koordinator	Kaprodi
Dr. Suryasatriya Trihandaru, M.Sc.nat	8 Agustus 2026	Prof. Hanna Arini Parhusip, M.Sc.nat	Prof. Hanna Arini Parhusip, M.Sc.nat