Here's a detailed outline for a comprehensive Apache Spark course:

Week 1: Introduction to Apache Spark

- **Overview of Spark:** History, architecture, and ecosystem.
- **Spark Components:** Spark Core, Spark SQL, Spark Streaming, MLlib, GraphX.
- **Setting Up Spark:** Installation and configuration, running Spark in local and cluster modes.

Week 2: Spark Core Concepts

- **Resilient Distributed Datasets (RDDs):** Understanding RDDs, operations (transformation and actions), and persistence.
- **DataFrames and Datasets:** Introduction to DataFrames and Datasets, differences, and use cases.
- **Spark Context and Session:** Creating and managing Spark contexts and sessions.

Week 3: Spark SQL

- **SQL Basics:** Querying data using Spark SQL, using SQLContext and SparkSession.
- **DataFrame Operations:** Filtering, aggregation, and transformation using DataFrames.
- **Integrating with Databases:** Connecting Spark SQL with relational databases and other data sources.

Week 4: Data Processing with Spark

- **Transformations and Actions:** Detailed exploration of common RDD and DataFrame transformations and actions.
- **Joining Data:** Techniques for joining data in Spark (inner, outer, left, right joins).
- **Handling Missing Data:** Strategies for dealing with null and missing data.

Week 5: Spark Streaming

- **Introduction to Spark Streaming:** Overview, architecture, and use cases.
- **Streaming Data Sources:** Handling data from various sources like Kafka, Flume, and files.

- **Windowed Operations and State Management:** Implementing windowed operations and managing state in streaming applications.

Week 6: Machine Learning with MLlib

- **Introduction to MLlib:** Overview of MLlib and its capabilities.
- **Basic Algorithms:** Implementing common machine learning algorithms (classification, regression, clustering).
- **Pipeline API:** Creating and using ML pipelines for building machine learning models.

Week 7: Graph Processing with GraphX

- **Introduction to GraphX:** Overview and use cases for graph processing.
- **GraphX Basics:** Creating and manipulating graphs, performing graph computations.
- **Graph Algorithms:** Implementing common graph algorithms (PageRank, Connected Components, etc.).

Week 8: Advanced Spark Topics

- **Performance Tuning:** Optimizing Spark jobs for performance, understanding Spark's execution plan.
- **Resource Management:** Configuring and managing resources in a Spark cluster.
- **Debugging and Monitoring:** Tools and techniques for debugging and monitoring Spark applications.

Week 9: Data Integration and ETL

- **ETL Concepts:** Extract, Transform, Load processes with Spark.
- **Integrating with Other Tools:** Connecting Spark with data lakes, data warehouses, and other big data tools.
- **Data Formats:** Working with various data formats (Parquet, Avro, JSON, etc.).

Week 10: Real-World Applications and Case Studies

- **Case Studies:** Real-world examples and applications of Spark in different industries.
- **Project Work:** Implementing a project that leverages Spark for data processing, analytics, or machine learning.

Week 11: Future Trends and Emerging Technologies

- **Future Trends:** New developments and future directions in the Spark ecosystem.
- **Integration with Cloud Platforms:** Using Spark with cloud services (AWS, Azure, Google Cloud).

Week 12: Review and Exam Preparation

- **Review:** Recap of key concepts, tools, and techniques covered in the course.
- **Exam Preparation:** Practice questions, review of important topics, and preparation for any certification exams.