Summary
This course is intended for students who want to understand modern large-scale data analysis systems and database systems. It covers a wide range of topics and technologies, and will prepare students to be able to build such systems as well as read and understand recent research publications.

Content
• Database systems
• Online analytics; data stream processing
• Column stores
• Decision support systems and data warehouses
• Large-scale data analytics infrastructure and systems
• Transaction processing. OLTP systems and concurrency control algorithms
• Distributed data management systems
• Query optimization; database tuning
• Logging and recovery
• Modern storage hierarchies

Learning Prerequisites
Required courses
• CS-322: Introduction to database systems
• CS-105: Introduction to object-oriented programming

Recommended courses
• CS-323: Introduction to operating systems
• CS-452: Foundations of software

Learning Outcomes
By the end of the course, the student must be able to:
• Design big data analytics systems using state-of-the-art infrastructures for horizontal scaling, e.g., Spark
• Implement algorithms and data structures for streaming data analytics
• Decide between different storage models based on the offered optimizations enabled by each model and on the expected query workload
• Compare concurrency control algorithms, and algorithms for distributed data management
• Identify performance culprits, e.g., due to concurrency control

Teaching methods
Lectures, project, homework, exercises

Expected student activities
During the semester, the students are expected to:
• attend the lectures in order to ask questions and interact with the professor,
• attend the exercise sessions to solve and discuss exercises about the recently taught material,
• work on projects, which cover the practical side of the taught material,
• take a midterm,
• take a final exam,
• read scientific papers related to the course material

Assessment methods
• 60% exams
• 40% project

Supervision
Office hours Yes
Others Office hours on request. Q&A sessions in lectures and exercises.

Resources
Bibliography

Ressources en bibliothèque
• Database Management Systems / Ramakrishnan
• Mining of Massive Datasets / Rajaraman
• Readings in Database Systems / Hellerstein