

CSE 5242: Advanced Database Management Systems

Course Description

Transaction management; query processing and optimization; organization of database systems, advanced indexing, multi-dimensional data, similarity-based analysis, performance evaluation, new database applications.

Prior Course Number: 770

Transcript Abbreviation: Advanced DBMS

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Undergrad, Graduate

Student Ranks: Senior, Masters, Doctoral

Course Offerings: Autumn

Flex Scheduled Course: Never

Course Frequency: Every Year

Course Length: 14 Week

Credits: 3.0

Repeatable: No

Time Distribution: 3.0 hr Lec

Expected out-of-class hours per week: 6.0

Graded Component: Lecture

Credit by Examination: No

Admission Condition: No

Off Campus: Never

Campus Locations: Columbus

Prerequisites and Co-requisites: CSE 3241

Exclusions: Not open to students with credit for CSE 770

Cross-Listings:

Course Rationale: Existing course.

The course is required for this unit's degrees, majors, and/or minors: No

The course is a GEC: No

The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.0901

Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
BS CSE	BS Computer Science and Engineering
MS CSE	MS Computer Science and Engineering
PhD CSE	PhD Computer Science and Engineering

Course Goals

Master transaction processing, concurrency control and crash recovery
Master query processing and optimization
Master advanced indexing and data organization for DBMS
Be competent with similarity-based querying

Be familiar with new data management applications

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Transaction Management: Concurrency Control and Serializability; Recoverability and Strictness; Two-phase locking; Two-phase commit	7.0							
Query Processing and Optimization: (a) Relational algebra transformations (b) Query size and I/O cost estimation (c) I/O cost for basic data management algorithms	7.0							
Advanced Indexing and Query Processing, Multi-dimensional Index Structures	10.0							
Data Warehouse Design and Implementation	4.0							
New Topics and Applications, e.g., (a) Information Retrieval (b) Bioinformatics (c) Incomplete and Uncertain Databases (d) Non-relational Databases, (e) Data Stream Management	10.0							
Scalable Data Storage, Parallel and Distributed Databases Database Performance Buffer and Storage Management	4.0							

Representative Assignments

Build a simple data warehouse with its essential components including reporting of OLAP queries.

Implement a data organization algorithm that orders data to minimize the query costs and/or maximizes the compression ratio when using a run-length encoder.

Build an advanced indexing method (e.g., VA-file) and analyze its performance both in terms of time and quality of the queries.

Grades

Aspect	Percent
Homeworks & Programming Assignments	35%
Presentations	15%
Project	20%
Final Exam	30%

Representative Textbooks and Other Course Materials

Title	Author
<i>Database System Implementation, Prentice-Hall, 2000.</i>	Hector Garcia-Molina, Jeffrey Ullman, and Jennifer Widom
<i>Concurrency Control and Recovery in Database Systems, Addison-Wesley Pub. Co., 1987.</i>	Philip A. Bernstein, Vassos Hadzilacos, and Nathan Goodman
<i>Foundations of Multidimensional and Metric Data Structures, First Edition, Morgan Kaufmann, 2006.</i>	Hanan Samet

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	a	An ability to apply knowledge of mathematics, science, and engineering.
**	b	An ability to design and conduct experiments, as well as to analyze and interpret data.

Course Contribution		College Outcome
**	c	An ability to design a system, component, or process to meet desired needs.
**	d	An ability to function on multi-disciplinary teams.
***	e	An ability to identify, formulate, and solve engineering problems.
	f	An understanding of professional and ethical responsibility.
*	g	An ability to communicate effectively.
	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
*	i	A recognition of the need for, and an ability to engage in life-long learning.
	j	A knowledge of contemporary issues.
***	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

BS CSE Program Outcomes

Course Contribution		Program Outcome
***	a	an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering;
**	b	an ability to design and conduct experiments, as well as to analyze and interpret data;
*	c	an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations;
**	d	an ability to function on multi-disciplinary teams;
***	e	an ability to identify, formulate, and solve engineering problems;
	f	an understanding of professional, ethical, legal, security and social issues and responsibilities;
*	g	an ability to communicate effectively with a range of audiences;
	h	an ability to analyze the local and global impact of computing on individuals, organizations, and society;
*	i	a recognition of the need for, and an ability to engage in life-long learning and continuing professional development;
	j	a knowledge of contemporary issues;
***	k	an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional;
*	l	an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution;
***	m	an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices;
**	n	an ability to apply design and development principles in the construction of software systems of varying complexity.

Prepared by: Hakan Ferhatosmanoglu