CSC 263  Database Systems  [formerly CSC 405]  4 cr.

Catalog description:
This course is an in-depth study of the underlying principles of database systems. Topics include data modeling and reduction, physical representations of data and access paths, and the semantics and theory of several major approaches to database organization, including relational and object-relational. Extensive discussion of query generation and optimization is included for at least one database system. Three lecture hours and three hours of scheduled laboratory per week, plus programming work outside of class. Not open to students who have received credit for CSC 405.

Prerequisite: CSC 260.

Goals:
The purpose of the course is to develop students’ understanding of the theory and application of modern database management systems. The goals of this course are:

CG01: to develop an understanding of data and database modeling methodologies and techniques
CG02: to develop the skills necessary to interact with a modern DBMS in a software development environment

Objectives:
Upon successful completion of the course, student will be able to:

CO01: explain and justify the benefits and costs associated with modern, robust DBMSes;
CO02: properly utilize database modeling methodologies and techniques;
CO03: utilize standard SQL;
CO04: use a modern database system to implement and test a database design.

In addition, students will:

CO05: practice database design and implementation;
CO06: gain significant experience with query generation and analysis;
CO07: participate in at least one group project involving problem analysis, design specification and selection, and the implementation, testing and evaluation of a database.

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Topics:
- basic concepts of information systems
- overview of database management
- database system architecture
- data modeling
  - ER diagrams
  - UML
- overview of the relational model
- integrity rules
- relational database design

IM1(2), SP2(5), SP4(1), SP6(5)
IM2(2), SP5(5), SP7(2)
SP9(5) (not core)
IM2(1)
IM3(3)
IM3(1)
IM4(3) (not core)
IM6(3) (not core)
ormalization rules
- description of a sample relational system
- schema (data) definition IM5(1) (not core)
- queries and data manipulation IM5(2) (not core)
- subschema (view) definition and manipulation IM5(1) (not core)
- query (data manipulation) optimization IM5(2) (not core)
- embedded queries IM5(1) (not core)
- distributed database concepts IM8(1) (not core)
- recovery and concurrency concepts IM7(2) (not core)
- security and integrity IM7(1) (not core)
- transaction processing IM7(3) (not core)
- overview of the object and object-relational models IM3(1)
- physical database design and implementation OS8(1), IM9(3) (not core)
- overview of the network model
- current research developments

The emphasis of this course is on the thorough understanding of the precepts and underlying mechanisms of database systems. These systems are investigated from two points of view: the internal (design) view, where such topics as physical storage and underlying retrieval algorithms are considered, and the external (user) view, where such topics as query simplicity and ease of use are discussed. Extensive homework and classroom discussion of query design and implementation serve to acquaint the student with typical applications considerations.

The course grade will be determined using the following approximate weights: final exam - 30%; other tests and written homework - 35%; lab and programming exercises: 35%

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Bibliography:

General texts:
Connolly, Thomas; Begg, Carolyn. Database System Implementation. Addison-Wesley, 1999

Technical support resources: