1. **TITLE OF COURSE AND COURSE NUMBER**: Database Management, CS440 Credits: 3

2. **DESCRIPTION OF THE COURSE**: Topics include data collection, representation, modeling, and storage; file versus database approach to data management; database environment; principles of logical and physical database design. Emphases are placed on Entity-Relationship and relational data models. Other topics include client-server environment; database security and integrity; database administration; and trends of database technologies. A substantial project on the design and implementation of a database will be assigned.

3. **COURSE PREREQUISITES**: CS 342 with a grade of C- or better

4. **COURSE OBJECTIVES**:

   To appreciate data as an important corporate resources and the need to manage the data effectively and efficiently.

   To learn the evolution of database systems and to appreciate the advantages of database over file systems in terms of efficiency and effectiveness.

   To understand the basic concepts of database systems including data abstraction and the three-level architecture; data independence; and data modeling.

   To become familiar with the major data models including entity-relationship, relational, and object-oriented models.

   To learn both physical and logical database design methodologies and procedures.

   To become familiar with at least one major database management system such as Microsoft Access or Oracle.

   To understand the functions of database administration including recovery, security, integrity, access control, and concurrency management.

   To be aware of the new trends in database technologies including data warehouse, data mining, and the Internet databases.

   To understand the social impact of the database technologies on privacy, security, and other areas.
5. **STUDENT LEARNING OUTCOMES:**

Upon completion of the course, students will be able to:

a) Explain the motivation behind the data abstraction, the three-level database architecture, and the concept of data independence.
b) Describe the theories including functional dependencies and normalization and their consequences in database design.
c) Analyze major data models including the entity-relationship, the relational, and object-oriented models.
d) Explain top-down database planning and bottom-up database design methodologies and processes.
e) Design and implement a practical database that meets a specific set of criteria.
f) Describe the importance of ODBC or open database connectivity.
g) Explain the trends in database designs and applications, particularly the Web based database systems.
h) Describe database administrative functions including recovery, concurrency, security, and integrity.
i) Articulate how the proliferation of databases have raised concerns on security and privacy.

Assessment of the above will be through: exams, homework, surveys, and projects.

In addition, through classroom participation and discussions, various homework, term papers, lab projects, and other assignments, the course also reinforce the following students learning outcomes of the university:

a) Effectively express themselves in written and oral form. Measure: exams, homework and projects.
b) Demonstrate ability to think critically. Measure: exams, homework, and projects.
c) Locate and use information. Measure: homework and projects.
d) Demonstrate ability to integrate knowledge and idea in a coherent and meaningful manner. Measure: exams, homework, surveys, and projects.
e) Work effectively with others. Measure: larger projects.

6. **TOPICAL OUTLINE OF THE COURSE CONTENT:**

**Topic 1:** An Overview of Database Systems  
  a) Data as a major corporate resource  
  b) File versus database approach  
  c) Motivation, objectives and evolution of database systems  
  d) Database system environment  
  e) Types of database systems

**Topic 2:** ANSI-SPARC Architecture of a Database System  
  a) The three-level architecture
b) External level
c) Conceptual level
d) Internal levels
e) Data independence
f) The roles of database management system (DBMS)

Topic 3: Conceptual Database Design with Entity-Relationship Model
a) Data modeling concepts
b) Methodologies for conceptual design
c) View design
d) View Integration
e) Schema documentation and maintenance

Topic 4: Relational Database Design
a) Relational data structure
b) Relational databases
c) Integrity rules

Topic 5: Functional Dependence and Normalization
a) Functional dependency
b) First, second, and third normal forms
c) Good and bad decompositions
d) Higher normal forms

Topic 6: Relational Systems
a) Data definition: base tables and indexes
b) Data manipulations and the Structured Query Language (SQL)
c) The system catalog
d) Typical implementations

Topic 7: Object-Oriented Systems
a) Motivations
b) Objects, methods, and messages
c) Classes, Instances, and collections
d) Class hierarchies
e) Typical object-oriented systems

Topic 8: Other topics
a) Database Administration related issues
b) Implementation and Physical Design
c) Distributed and Client/Server Database Systems
d) The ODBC or Open Database Connectivity
e) Trends

7. GUIDELINES/SUGGESTIONS FOR TEACHING METHODS AND STUDENT LEARNING ACTIVITIES:
a) Lectures and classroom discussions emphasizing active learning.
b) Term papers and reports emphasizing to achieve breadth and depth. These assignments also aim to develop critical thinking and the ability to effectively utilize library and the Internet resources.
c) Lab sessions: design and implement a database applications with a major DBMS
d) Problem-solving sessions and pre-exam reviews.

8. GUIDELINES/SUGGESTIONS FOR METHODS OF STUDENT ASSESSMENT (STUDENT LEARNING OUTCOMES):

a) Attendance and classroom participation.
b) Examinations, quizzes, and final examination.
c) Various homework assignments including term papers and reports.
d) A substantial lab project on database application design and implementation.

9. SUGGESTED READINGS TEXTS, OBJECTS OF STUDY:


10. BIBLIOGRAPHY OF SUPPORTIVE TEXTS AND OTHER MATERIALS:


Barguin, R. and Edelstein H., 1997; Building, using, and Managing the Data Warehouse, Prentice Hall.


Microsoft Access material:

Paradice, D. and Baldwin, D, 2000; Applications Development in Microsoft Access 2000, Course Technologies, Cambridge, MA.

Morrison, M. and Morrision, J., 2000; Database-Driven Web Sites, Course Technologies, Cambridge, MA
Communications, a monthly journal published by ACM

Computer, a monthly journal published by IEEE Computer Society

11. **PREPARERE'S NAME AND DATE:** Drs. E. Hu and B. Su; Fall, 1996

12. **ORIGINAL DEPARTMENTAL APPROVAL DATE:** Spring, 1997

13. **REVISORS'S NAME AND DATE:** Drs. E. Hu and B. Su, Spring, 2005 and previously Spring, 2000

14. **DEPARTMENTAL REVISION APPROVAL DATE:** Spring, 2005