Revised 8/21

NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY
ITD 256 – ADVANCED DATABASE MANAGEMENT (3 CR.)

Course Description

Focuses in-depth instruction in the handling of critical tasks of planning and implementing large databases. Includes an introduction to concepts of advanced data warehousing and database configuration. Lecture 3 hours per week.

General Course Purpose

The purpose of this course is to provide a comprehensive introduction to essential database terms and concepts, efficient relational database design, data normalization and database management. The emphasis of the course is on the design, development, and use of a relational database. The student will learn the basics of drawing an entity-relationship diagram (ERD) to represent user requirements, transform the ERD to a normalized relational design, and then use Structured Query Language (SQL) to implement and work with the database.

Course Prerequisites/Corequisites

Prerequisite: ITE 115

Course Objectives

Upon completing the course, the student will be able to:

a) Define essential database vocabulary
b) Effectively apply data relationships and normalization techniques
c) Describe the transformation of database design from a conceptual user model (e.g., an ERD) to a normalized relational model
d) Explain and apply Structured Query Language (SQL) in a database environment
e) Describe the methods available for minimizing DBMS risks and security failures
f) Characterize the roles and responsibilities of the Database Administrator (DBA)
g) Apply fundamental database concepts to an information systems problem

Major Topics to be Included

a) Basic Database Concepts
b) Relational Database Terms and Concepts
c) Normalization
d) Structured Query Language
e) Data Modeling
f) Database Design
g) Database Management and Administration
h) Business Intelligence / Basic Data Warehousing Concepts

Student Learning Outcomes

Basic Database Concepts

a) Define basic database terms and principles
b) Discuss why databases are used
c) Contrast (traditional) file processing with database processing

d) Describe the components of a database as well as a database management system
e) Describe the purpose and functions of a database management system (DBMS)

Relational Database Terms and Concepts

a) Describe the conceptual foundation of the relational model
b) Distinguish between relational and non-relational tables
c) Explain basic relational terminology to include, but not limited to, relation/table, tuple/row, attribute/column, cardinality/multiplicity
d) Explain the meaning and importance of keys, primary and foreign keys, and related terminology
e) Explain how foreign keys and intersection relations represent relationships
f) Explain the purpose and use of surrogate/synthetic keys
g) Explain the meaning of both entity and referential integrity

Data Modeling

a) Describe the basic stages of database development
b) Explain the purpose and role of a data model
c) Describe the principal components of the entity-relationship (ER) data model
d) Interpret traditional ER diagrams (ERDs)
e) Interpret and construct ER diagrams using Crow's Foot notation
f) Represent binary relationships to include 1:1, 1:M, M:N with the ER model
g) Explain weak entities and how to use them
h) Explain non-identifying and identifying relationships and how to use them
i) Create an ER diagram from source documents or specifications
j) Explain the concept of object-relational databases

Normalization

a) Define normalization
b) Explain the motivation behind the use of normalization in database design
c) Explain the nature and background of normalization theory
d) Apply the normalization process to produce a relation in third normal form (3NF)
e) Explain and analyze functional dependencies within tables

Database Design (logical and physical)

a) Transform ER data models into relational designs
b) Recognize and describe motivations and processes for de-normalization
c) Represent weak entities with the relational model
d) Represent 1:1, 1:M, and M:N binary relationships

Structured Query Language

a) Write basic SQL statements for creating database structures (DDL: CREATE)
b) Write basic SQL statements to add data to a database (INSERT)
c) Write basic SQL SELECT statements and options for processing a single table
d) Write basic SQL SELECT statements for processing multiple tables (JOINs)
e) Write basic SQL statements to modify and delete data from a database (UPDATE, DELETE)
f) Write basic SQL statements to modify and delete database tables and constraints (DDL: ALTER, DROP)
g) Write basic SQL statements for creating and using views
h) Explain the reasons for using views

Database Management and Administration

a) Describe the need for, and importance of, database administration
b) Describe basic administrative and managerial DBA functions
c) Describe different ways of processing a database

d) Describe the need for concurrency control, security, and backup and recovery
e) Describe typical problems that can occur when multiple users interact with a database concurrently
f) Explain the use of locking and the problem of deadlock
g) Distinguish between optimistic and pessimistic concurrency and list examples of each
h) Describe specific design and implementation strategies for improving database security
i) Distinguish between recovery by reprocessing and recovery by rollback/rollforward
j) Explain the nature of tasks required for recovery using rollback/rollforward
k) Explain distributed database processing

Business Intelligence / Basic Data Warehousing Concepts

a) Explain the basic concepts of data warehouses, data marts, and dimensional tables
b) Explain the basic concepts of business intelligence (BI) systems
c) Explain the basic concepts of OnLine Analytical Procession (OLAP) and data mining
d)

Database Project

Given a business case (project scenario), the student will:

a) Explain how database principles may be applied as a part of an IT solution
b) Draw an ERD to reflect a given set of user requirements and example data
c) Transform the initial design/ERD into a 3NF-compliant relational model
d) Write the necessary SQL to create database structures (DDL: CREATE) and insert data (DML: INSERT)
e) Write the necessary SQL to output data as meaningful query results

Required Time Allocation per Topic

In order to standardize the core topics of ITD 256 so that a course taught at one campus is equivalent to the same course taught at another campus, the following student contact hours per topic are required. The topics do not need to be followed sequentially. Many topics are best taught as an integrated whole, often revisiting a topic several times, each time at a higher level. There are normally 45 student-contact-hours per semester for a three-credit course—which includes 14 weeks of instruction and excludes the final exam week (14*3.2 = 45 hours). Sections of the course that are given in alternative formats from the standard 15-week section still meet for the same number of contact hours. The final exam time is not included in the timetable. The last category, Other Optional Content, leaves time for an instructor to tailor the course to special needs, topics, or resources.

Topic	Hours	Percent
Basic Database Concepts	3	7
Relational Database Terms and Concepts	4	9
Data Modeling	6	13
Database Design	5	11
Normalization	6	13
Structured Query Language	11	24
Database Management and Administration	4	9
Business Intelligence / Basic Data Warehousing Concepts	3	7
Other Optional Content	3	7
Total	**45**	**100**