UNIVERSITY OF WISCONSIN
Bachelor of Science in Applied Computing
APC 360 Section 01: Database Management 1
(Semester/Year)

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COURSE DESCRIPTION: This course covers design and implementation of relational database management systems to support computer-based information systems. Topics include: data modeling techniques such as entity-relationship modeling, extended entity-relationship modeling, database normalization techniques, and basic and advanced features of database query language SQL.

MODE OF DELIVERY: Online

COURSE OBJECTIVES: At the end of this course, students will be able to:

- Develop knowledge of basic and important concepts in modern database design such as entity-relationship model, extended entity-relationship model, and database normalization techniques
- Leverage fundamental features of Structured Query Language (SQL) for creating and querying databases, such as CREATE, INSERT, DELETE, DROP, and simple SELECT queries
- Leverage advanced features of Structured Query Language (SQL) for querying databases, such as ORDER BY, GROUP BY, Relational Set Operators, nested SQL queries, and OUTER JOIN SQL queries

TEXTBOOK:
Carlos Coronel and Steven Morris. *Database Systems: Design, Implementation, and Management*. 12th Edition. ISBN-10: 1-305-62748-2 | ISBN-13: 978-1-305-62748-2

COURSE OUTLINE:

I) Database Systems
   a. Motivation of using Databases
   b. Types of Databases
   c. Evolution of File Systems
   d. Problems of File Systems

II) Data Models
   a. Data Modelling and Data Models

b. Data Model Basic Building Blocks
c. Business Rules
d. Evolution of Data Models
e. Degrees of Data Abstraction

III) Relational Database Model
a. A Logical View of Data
b. Keys
c. Integrity Rules
d. Relationships Within Relational Databases
e. Relational Algebra Operators

IV) Entity Relationship (ER) Modeling
a. Entities (Weak and Strong Entities)
b. Attributes (Required and Optional Attributes, Single-Valued and Multivalued Attributes, and Derived Attributes)
c. Relationships (Weak and Strong Relationships, Connectivity and Cardinality, Existence Dependence, Relationship Degree, and Recursive Relationships)
d. Developing an ER Diagram

V) Introduction to Structured Query Language (SQL)
a. Introduction to SQL
b. Data Definition Commands
c. Data Manipulation Commands
d. SELECT queries using FROM, WHERE, ORDER BY, GROUP BY clauses and Aggregate Functions such as COUNT, MAX, MIN, and SUM.

VI) Advanced SQL
a. Relational Set Operators (UNION, UNIONALL INTERSECT, EXCEPT)
b. Nested SQL Queries (Non-Correlated Subqueries and Correlated Subqueries)
c. NULL Values Processing in Database Tables
d. Outer Join SQL Queries

VII) Extended Entity Relationship (EER) Data Modeling
a. Motivation of EER Modeling
b. Entity Supertypes and Subtypes
c. Subtype Discriminator
d. Disjoint and Overlapping Constraints
e. Completeness Constraint
f. Design Cases: Learning Flexible Database Design

VIII) Normalization of Database Tables
a. Motivation of Database Normalization
b. Normalization Process (1NF, 2NF, 3NF, and BCNF)

GENERAL TEACHING PROCEDURE/METHODOLOGY:
Audio Lectures, Practice Activities, Assignments, and Labs

EVALUATION PROCEDURES TO BE USED:
Practice Activities, Assignments, Labs, Quizzes, Midterm Exam, and Final Exam

COURSE GRADING: Grades will be assessed using a variety of methods:

Assignment	Points
Practice Activity Comments: 8 @ 0.5 point	4
Labs: 9 @ 4 points	36
Assignments: 2 @ 4 points	8
Midterm Exam	20
Final Exam	32
Total Points	**100**

FINAL EXAM: YES

GRADE SCALE:
Final grades will be assigned according to the following scale:
A: score >= 90,
B: 80 <= score < 90,
C: 70 <= score < 80
D: 60 <= score < 70,
F: score < 60

Depending on the overall performance of the class, the instructor may use lower cutoff points for some of the letter grades.

WORKLOAD:
Students should expect to spend 40 hours reading the required readings, 60 hours going through the online course material (audio lectures and self-check quizzes) and 50 hours completing the lab assignments and practice activities for a total of 150 hours.