Course number and name:	**CS 10337: Applied Database Technologies**
Credits and contact hours:	3 credits / 3 contact hours
Instructor's or course coordinator's name:	Jack Myers
Text book, title, author, and year:	Murach's MySQL 2nd edition – Joel Murach

Specific course information

Catalog description: This course covers the practical aspects of relational database systems, including database modeling using ER and EER diagrams, physical database design, the relational database query language SQL, normal forms, database integrity and transaction management. Includes a project involving an RDBMS.

Prerequisites: Junior standing

Type of Course: ☒ Required   ☐ Elective   ☐ Selected Elective

Specific Goals for Course

1. Students can distinguish poorly designed database (that may appear to work) from well- designed databases
2. Students have implemented a project in a relational database for a specified operating system.
3. Students will be able to assess the accuracy of relational queries expressed in SQL.
4. Students will have developed database triggers or other applications.
5. Students have considered the data requirements of a particular domain and have produced and justified a particular database model to support the information needs.
6. Students will have produced correct ER / EER diagrams that are routinely manifested in database design specifications.
7. Understand security issues associated with database development
8. Define the terminology, features, classifications, and characteristics embodied in database systems.

Required list of topics to be covered:

1. Overview of database types with advantages and disadvantages
2. Characteristics of the Database approach
3. Advantages of using the DBMS approach
4. Database concepts (indexing, inference, aggregation, polyinstantiation)
5. Data Models, Schemas, and Instances
6. Conceptual data modeling and database design (ER / EER)
7. Relational model concepts
8. Relational model constraints and relational database schemas

9. Update operations, transactions, and dealing with constraint violations
10. SQL data definition and data types
11. Specifying constraints in SQL
12. Basic retrieval queries in SQL
13. INSERT, DELETE, and UPDATE Statements in SQL
14. More complex SQL retrieval queries (joins, aggregations, subqueries)
15. Views
16. Schema change statements in SQL
17. Database normalization
18. Database administration (user creation/deletion, permissions and database access controls such as DAC, MAC, RBAC, Clark-Wilson)
19. Database security
    a. How to protect data (confidentiality, integrity and availability in a DBMS context)
    b. Vulnerabilities (e.g., SQL injection)
    c. Inference
    d. Aggregation
    e. Hashing and encryption
    f. Data corruption
    g. Unauthorized access

Optional list of topics to be covered:

1. Database Programming (functions, triggers, procedures)
2. Query Optimization
3. Transaction Processing
4. Concurrency Control
5. NoSQL Databases