Database Technology - Project

30% of semester grade

The goal of the class project is to implement a database system application. Choose an application of your choice. The project includes the following activities:

- Pick a database application domain.
- Determine the functionalities of the database application.
- Model the data stored in the database (Identify the entities, roles, relationships, etc.).
- Design, normalize, and perfect the relational database schema.
- Write the SQL commands to create the database, find appropriate data, and populate the database.
- Finally and most importantly, write the software needed to embed the database system in a web application.

Instructions:

You will work in groups of 3-4 students. Your project submissions should be made via Blackboard before the specified deadline. You will work through this project in 2 iterations. The deliverables for each iteration are listed below.

Iteration 1: System Analysis and Modeling

- Identify an application domain and title of your project.
- Identify the initial list of entities (tables) and relationships. The next step is to create an Entity Relationship diagram. You may use a specific E-R modeling tool (such as Microsoft Visio, or any free online tools), drawing tools available in MS Word or MS Powerpoint, or hand-draw it.

Deliverables:

- E-R Diagram (via Blackboard)

Iteration 2: Database Implementation

- Given the E-R diagram and sets of attributes for each entity, the next step is to convert the E-R model into a relational model and go through the process of normalization. This step will require the group to list all of the functional dependencies and come up with normalized relations.
- Update your E-R diagram with normalized relations.
- Groups should then implement the database tables from the normalized set of relations.

- Data should be supplied for each table. The amount of data should be such that the application can be tested and demonstrated.
- Application Implementation: The application (forms, reports, queries, menus) can then be created on top of the tables. For Queries, provide the associated SQL statements. Identify and write a variety of queries to demonstrate the usefulness of your database application.

Deliverables:
- Updated E-R diagram(s)
- Scripts (create, insert/update statements) for creating and populating tables, SQL Query scripts (select statements)
- Complete source code for web application
- Readme file with instructions on creating the database and setting up the web application

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Grading Rubric:

Iteration 1: 30 points
Iteration 2: 60 points
Demo/Presentation: 10 points
Total: 100 points

Project Ideas: You are encouraged to come up with project ideas of your own. The ones listed below can serve as a guide or as inspiration for a slightly different project.

1. ***Scheduling Application*** - A consulting company has a lunch room, 12 conference rooms, 6 overhead projectors, 3 portable PCs, etc. They need to be able to schedule each of these resources for a given day and time period and avoid conflicting use of resources. Also, management would like reporting on resource utilization per week, month, year. They are also considering renting out resources to other companies if resource utilization is low. Queries might include:
   - When is the next day resource X is free between 1:00 and 5:00.
   - How many hours per week on average is conference room X occupied.

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2. ***Supply Cabinet*** - A company centrally maintains supplies for each of its branch offices. They need a database to keep track of what they have in stock, requests from branch offices for supplies and purchasing

of supplies from vendors. Should keep track of the vendor with the best price for a particular supply. They would also like to minimize shipping costs by shipping several supplies at one time to a given branch office. Queries might include:

- When should supply X be replenished
- How many shipments, on average, go out to the branch offices per week ?

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3. ***Books Database*** - This is another popular domain. Just look at barnesandnoble.com or amazon.com for excellent examples. You could model entities such as books, their authors, topics (which may be a complex hierarchy). You may also model various attributes of the authors and the institutions they belong to. You can support a service for buying and selling used books or books used in specific university courses. Your system can build a personal profile of people (and the books they like) and your database application could form the basis for a "recommender system", such as those supported by the commercial sites. The goal here is to "cluster" similar preferences together and the system can then make recommendations: "Since you liked Harry Potter and the Sorcerer's Stone, I recommend that you try Harry Potter and the Chamber of Secrets".

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4. ***Baseball Statistics*** - A professional baseball team would like to maintain a database that records player statistics on all team members and complete records of every game (on an inning-by-inning basis). Each player would have a set of offense and defense statistics. Queries might include:
   - What is the batting average for player X
   - Who is the best relief pitcher to use against a left-handed batter

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5. ***Apartment Homes*** - Similar to a friendly neighborhood web guide such as www.findgreatapartment.com, this domain would require mod-

eling apartments and their attributes, areas of town and their various characteristics (e.g., bus lines, crime rates, distance from various landmarks). You would provide an interface for offering apartments for rent, finding apartments based on various requirements ("gas heating + pets allowed + rent less than $500 + close to campus + internet connectivity").

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6. ***Census Database*** - Can you make a census data dissemination system for the Census Bureau? A census gathers data about people, business, geographic regions, etc. Different types of users need to gain different types of answers from the data. Homeowners want to know statistics about their region, such as crime rates. Business owners want to find holes in the competition. Government decision makers want to learn about demographic trends, and where to focus resources.

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7. ***Movies Database*** - There are several excellent movie resources on the web, such as the hollywood.com movies site or the Internet Movie Database. You could model entities such as movies, their actors, directors, genres, playing times, and reviews. There are several sources on the web from which you could get data to populate such a database. You can support various queries such as finding specific playing times, finding movies playing in Phoenix directed by a given director. You can also support updates to the reviews section of the database (e.g., viewers giving their own opinions). Another functionality is to provide personal profiles of people (i.e., the movies they like) and then try to recommend movies to them based on profiles of viewers with similar tastes. You could also create a database of OSCAR or Golden Globe nominations and awards and answer queries such as "Find all the sitcoms that have been nominated three years in a row".
