

Lehman College, Department of Computer Science:
Project
CMP 420 & CMP 758 - Database Systems
Spring 2022
Total points: 120

Due Date: May 06, 2022, by 11:59 pm

Submission information and Instructions

- No late submission will be accepted, and **no emailed work will be accepted.**
- All work must be submitted on Blackboard in a PDF or Microsoft Word Document.
- You must do this work on your own.
- This work contains 10 points of extra credit.

Final Project

In this class, you are expected to complete an individual final project. This project will cover conceptual modeling by ER or EER, logical modeling, normalization, and functional dependencies.

As you are working on this project, it is important to regularly discuss your progress with the professor(me). You can always come to the office hours with your work so that we can discuss it.

Project Requirements and Description(The Mini world or UOD):

The Computer Science Lab (CS Lab) wants to build a database for maintaining its records. You are invited as a database architect to develop a database schema for keeping track of their data. The database requirements are summarized as follows:

- The CS Lab has employees, each employee has an emplid, first name, last name, sex, date of birth, date of hire, email, phone number, address, hourly rate, total amount of weekly working hours, and title. Each employee is uniquely identified by an emplid.
- There are two categories of employees: coordinator, or tutor. This category is based on the title. Each employee can belong to one and one category only.
- Tutors have different courses they tutor. Each tutor can tutor one or more courses.
- A course is identified by course name such as CMP 420. A course also has a title, description, credit, hours.
- The CS Lab also maintains students visit to the lab for tutoring services. Each (student) tutee has emplid, first name, last name, phone, email and address. Each student is uniquely identified by an emplid.
- The database keeps track of each tutee's visit including the date of visit, time in and time out, and the course the tutee is visiting for, reason of the visits such as homework help. Each tutee is assigned a tutor. A tutor can tutor up to 5 students at a time.

Lehman College, Department of Computer Science:
Project
CMP 420 & CMP 758 - Database Systems
Spring 2022
Total points: 120

- The CS Lab also loans books to students for their use in the lab. A book contains book id, title and authors. A book can have multiple authors.
- The CS Lab also loans out laptops to students for their use in the lab to complete their assignments and course work. Laptops have serial number, name, manufacturer. A laptop is uniquely identified by a serial number.

You are allowed to make assumptions to complete the requirements provided above and those assumptions should be stated and discussed in your project write up.

Now as part of your project in response to the requirements presented above, you are required to:

- I. (30 points) Conceptual Modeling: Create a conceptual model for the above requirements using the ER Model. Make sure to indicate primary keys, cardinality constraints, weak entities (if any), and participation constraints. There might be extra constraints which cannot be captured by the E/R diagram, make sure you mention them below the diagram if there is any. List any assumptions you make in the process.
You can use drawing tools to create your ER models.
- II. (20 points) Logical Modeling: Convert your ER model to a relation model
- III. (15 points) Normalize your relations. Specify all the functional dependencies.
- IV. (30 points) Database Implementation: Based on the normalized database relations above, create the following SQL queries.
 - Write SQL queries to create your CS Lab database. (Include all your relations for the database). Add primary keys for your relations and foreign keys where necessary.
 - Write queries that insert 5 or more records in all your relations you have created above. This means 5 records per relation.
 - Write simple select statements that retrieves records from the tables without any condition. (1 Select statement per table)
 - Write 1 simple select statements that retrieves records from all the tables using some simple condition. (1 Select statement per table)
 - Write 2 advanced select statements that select data from two or more of your tables. You can use exists, and , join etc.
 - Write a query that retrieves students who have visited the CS Lab more than others.
 - Write a query that retrieves tutors who get paid more than any other tutor per hour
 - Write a query that retrieves tutors who get lowest hourly rate pay.
 - Write a query that calculates and retrieves the average hourly rate of all tutors.
 - Write 3 update statements that update certain records based on some conditions
 - Write 1 statement that deletes a record from a table based on some condition
- V. (10 points) Application implementation: You can do this part as an extra credit. Using a programming language of your choice (Such as PHP, JavaScript) write a web application that interfaces with the database you created above. Refer to chapter 10 or 11 for help.

Lehman College, Department of Computer Science:
Project
CMP 420 & CMP 758 - Database Systems
Spring 2022
Total points: 120

Note that the extra credit can only be done if you have completed all the requirements for the project including writing your report. The Application implementation can be added to the report later. Your applications should make sure that it achieves the following conditions:

- Able to insert data into any of the database tables
- Update some data in a relation
- Delete some data
- Updates data

(This forms a CRUD Application). CRUD stand for Create, READ Update and Delete)

VI. (20 points) Final Report Write up: Your report should include the following:

- A cover page with the project name(title), your name, course number and date
- Introduction. You can use the project description and make sure you state any assumptions here.
- Entity Relationship Model Diagram(ER diagram). Explain what you did. And add your diagram also
- Map(Convert) the ER model into a relational model. Explain the steps that you followed to convert your ER model to relational model.
- Normalization: Normalize your relations. As you are normalizing each relation, explain the process. Make sure you list all the functional dependencies.
- Write SQL queries to create all your relations. (You take the queries from the database implementation and place the here.
- Application implementation: add the pictures and images of your application interface. Discuss your application.
- Conclusion:
 - What was your experience? What was easy about this project for you? What was difficult about this project for you? Did you ask anyone for help? Did anyone do your work? Did you take someone work, modify it and submit it?
 - What are your future plans about this project? What are your future plans about databases? What would you have done different if you had more time?
 - Any final comments and conclusions

(5 extra credit points) For a very nicely written and edited report. This includes nicely done diagrams.

Submission Details:

- **Your work must be submitted on Blackboard. No any other forms of submission will be accepted.**
- You are required to submit a zipped folder that contains your project write up, queries, pictures and images, pdf or word documents or any other files of your work. If you also do the extra credit, please include your code in the folder.

**Lehman College, Department of Computer Science:
Project
CMP 420 & CMP 758 - Database Systems
Spring 2022
Total points: 120**

- **You must submit your own work.** Please refer to Lehman College's Handbook for more information about plagiarism and academic dishonesty. **You cannot copy someone else's work. While you are allowed to discuss ideas, you are not allowed to complete this work as a group project.**
- **Due Date: May 06, 2022, by 11:59 pm**