4CCS1DBS Database Systems
Coursework 1
February 2021

This coursework requires you to create a database ER schema and relational schema for a specification that is provided below. The coursework is formally assessed, and this part is worth **20%** of your final grade.

Coursework 1 Submission Deadline: Sunday 21 February 2021, 23:55 GMT

Late Submission Deadline: Tuesday 23 February 2021, 23:55 GMT

Any extensions to the deadline are only allowed after approval of a Mitigating Circumstances application which should be submitted to the office (ug-informatics@kcl.ac.uk). For details of Mitigating Circumstances Form (MCF) submission, please consult the handbook.

Please note that submissions marked as late will be capped to 40% and submission after the late deadline above will not be accepted.

Tasks that you should complete as part of this coursework:

(1.1) Identification and representation of entities, relationships and attributes based on the Entity-Relationship data model.

(1.2) Identification and representation of relationship cardinalities based on the database requirements, or by making proper use assumptions if the coursework requirements are vague. Any assumptions need to be reasonable and realistic.

(1.3) Conversion of the ER schema to a relational schema.

(1.4) Identify domain constraint specific to the database requirements.

Overall presentation including legibility and proper use of language (where applicable).

Database Specification

You have been hired by a nationwide fitness company named Fitness4All. Fitness4All has gyms in different locations and offers different types of memberships to customers. Customers can also purchase different fitness lessons and personal training sessions. The company wants to utilise a DBMS to track the sales of classes and memberships. In addition, Firtness4All would like to start a customer loyalty program called the SuperFitRewards. Members who sign-up to SuperFitRewards can get offers on free classes. This will also allow Fitness4All to store data on customer purchases for his Data Science team to analyse.

Here are the specifications for the database requirements:

Fitness4All has gyms in different locations across the country. All of these gyms have a gym suite and they may have a swimming pool. Each gym has a unique identifier and the date in which the gym opened.

Customers can become members of any of these gyms. In particular, there are three types of memberships 'GymOnly', 'SwimOnly' and 'Gym&Swim'. Note 'SwimOnly' and 'Gym&Swim' memberships are only available at locations where there is a swimming pool. For each membership, the company wants to store the unique membership number, start date, monthly fee, gym and customer information. For each customer, Fitness4All stores its full name, address, phone, and date of birth.

Members make online purchases consisting of group and individual fitness classes. For each type of class, the company stores its name, price and type (group or individual). Each type of class can take place at different dates, times and gyms. More than one occurrence of a same class type can take place simultaneously at a same gym. Each class occurrence has a unique identifier and a particular capability. Purchases are of particular places in class occurrences.

For each purchase, the company would like to keep the purchase identifier, date and time, the total price, the classes purchased and the member information. Note classes can also be purchased by non-members at the gym receptions. These purchases are registered in the system as purchases without member information.

Members may sign up to the SuperFitRewards with their email address. They will provide their membership number and email as part of the sign-up. Every member may have only one SuperFitRewards account.

Fitness4All would like to keep the offer scheme of the SuperFitRewards simple at first. Every SuperFitRewards member gets 1 free group class for every 10 group classes that they buy and 1 free individual class for every 5 individual classes that they buy. The database should keep track of the necessary information for the SuperFitRewards.

Your Database Design should include the following:

1.1 ER Diagram. Draw the ER schema that would correspond to the requirements above. Include all entities, attributes, and relationships.

If necessary, please explain/justify your design choices.

1.2 Cardinalities and Assumptions. On the ER Diagram include all cardinalities of the relationships using the (min, max) notation from lecture. State assumptions made and ensure that those assumptions do not contradict with the coursework requirements.

Please list your assumptions as bullet points.

1.3 Relational Schema. Convert the ER schema into a relational schema separately grouping the Entity and the Relationship relations.

1.4 Constraints.

(i) For each relation, identify their **primary** and **foreign keys**. You may write (PK) and (FK) to indicate the attribute(s) that serve as primary and foreign keys, respectively. For example, 'ProjectNumber (PK), EmployeeNumber (FK)'.

(ii) In addition, define all of the **domain constraints** for **three** relations in your relational schema. If necessary, include an explanation for these domain constraints.

(iii) Define **three semantic integrity constraints** for your schema specific to the Fitness4All domain. Include an explanation for each semantic integrity constraint.

What to submit

Organise your design into a single **PDF** document and submit it on KEATS before the deadline. **Other documents and extra materials will be ignored**.

Be sure to include your **Name** and **Student number** on your submission.

Your design will be accessed not only on the **quality of the design**, but also on the overall **presentation** including **legibility** and proper use of language in your explanations.

Utilise a diagramming / sketching program (as practiced in the Small Group Worksheet) to create an ER Diagram and relational schema.