Library Management System (LMS)

1. Brief Description of the Project

University libraries have undergone transformational changes in the current digital age. The objective of this course project is for student teams to develop the database for a University Library Management System (LMS) that can support the key features specified in this document.

2. Key Features of the Project

To keep the course project simple, the following are the **only** functions that your LMS database system needs to support. If any of the functions offered by a library you know is different from the one specified in this document, please adhere to the functions specified in this document. Please **ignore other functions** that real-world libraries may offer. The attributes that your system must keep track of are specified in this document: your system should **not** keep track of any attribute that is not mentioned in this document, unless it is necessary to support the listed required functions in this document.

2.1 Function 1: Collection Information

The library maintains a collection of items. For each item, the library keeps track of the ISBN (unique), the Title of the item, Classification Code that helps in cataloguing the item, Publisher name, and Author name(s). Each Item has one or more copies and all copies of the item share the same ISBN number. Each copy has a copy ID which is only unique among copies of the same item. In addition, we also store the date when the copy was acquired and its loan status, which has a value 'not available' if the item copy is currently borrowed by some user, or 'available' if it is currently available to borrow. We assume that every item copy can be borrowed, as long as it is currently available.

An Item must be in one of the two formats: physical or electronic. Titles that exist in both formats have different ISBN numbers and are considered as different items. A physical item could be in the form of book or DVD, and the system needs to know which of these forms it is. Physical items are placed in a designated location (room and shelf, which are detailed in Function 2). All copies of a physical item are placed in the same location, and the library needs to record that location. For each electronic item, we must track the Uniform Resource Locator (URL). All copies of an electronic item share the same URL, but each copy can be loaned to only one user at a time, thus controlling the total number of users that can borrow it concurrently.

2.2 Function 2: Location Information

The library has rooms with shelves for storing physical items. Each room has a unique identifier RID. Each shelf has a SID which is only unique within a room. Shelves are designated to either store books or DVDs. Each shelf has a maximum capacity of items it can store. We need to track if the shelf is designated to store books or DVDs and also its capacity. The system needs to track for each room the RID, the floor it is in, how many shelves it currently has, and whether there is space for any additional shelf.

2.3 Function 3: User Information

Each user has a name and an ID (a unique identifier assigned by the library), which are stored in the database. Faculty members and current students of the university are users of the library. A user cannot be both faculty member and student. For each faculty member, the system captures his/her office address and main research interest. For each student, the system needs to capture his/her year of enrolment and expected year of graduation.

Users can borrow (copies of) items from the library. For each borrowed item, they need to return it within a *loan period*, i.e., within a number of days (to be elaborated shortly). Every user chooses his/her membership type (i.e., basic membership or premium membership). Each of the two membership types determines the loan period, the number of borrowed items that the user can concurrently hold, and the annual membership fee. For example, premium membership allows the user to concurrently hold 10 borrowed items, every borrowed item has a loan period of 30 days, and the annual membership fee is $88. On the other hand, basic membership costs $28 annually, it allows the user to concurrently hold only 2 borrowed items, and the loan period of each borrowed item is 7 days. The terms of each membership type (i.e., item limit, maximum loan period, and annual fee) are subject to change over time, but only their current values need to be stored, together with the name of the membership (basic or premium). A user may switch his/her membership type, but the system needs to record only his/her current choice. Function 4 elaborates on loans and penalties.

2.4 Function 4: Library Items Loan and Penalty

A user can borrow an item from the library if at least one copy of the item is available (i.e., not currently loaned to another user). The system needs to track each user's loan history by recording the exact copy of every item that the user has ever borrowed, the datetime borrowed, and the datetime returned.

A user can borrow more than one items together at the same time and may return them all at once or may choose to return different items at different times. It is possible that the same copy of an item is borrowed by the same user at different times. For every user, the system needs to track the number of items currently borrowed by him/her.

The library does not allow extending the loan period of borrowed items. Each user will be fined if he/she returns an item late, i.e., later than the loan period he/she is entitled to. The fine is calculated as the number of days delayed times the *daily penalty rate*. The daily penalty rate is independent of the item. It depends only on the user's membership type, e.g., it is different for basic and premium members, and it needs to be recorded in the system. For fairness and consistency across user cohorts, a strict principle of the library is that the daily penalty rates will not be revised over time. For every user, the system needs to keep track of the total fine amount that he/she has accrued since he/she first started using the library.

2.5 Function 5: Administrator Information

The library has a group of administrators. Administrators are also users of the library, whose name and ID (a unique identifier similar to the ID of faculty members and students) are captured by the system. There could be some library administrators who are also students of the university. The database needs to know who among the administrators are students, and in that case it needs to also store their year of enrolment and expected year of graduation. All administrators must also choose between the basic and the premium membership type, but they enjoy a discount on the annual fee (irrespective of whether they are also enrolled as students or not). Currently, the discount is 30% for basic membership and 50% for premium membership. The system needs to track these two percentages.

One of the administrators is assigned as the chief librarian, and the system must keep track of who the current chief librarian is. To provide dedicated service to each school, a team of at least three administrators are assigned to be in charge of a school. The system must record which administrators are in charge of each school. An administrator can be in charge of at most one school. The University has many schools and, for each school, the system records a unique name, a unique address and a unique URL.

2.6 Function 6: Acquiring New Items

In addition to the items that the library decides by itself to acquire, faculty members can also raise requests for new items that they require from the library to acquire on behalf of a specific school. Each request is submitted by one faculty member and regards one new item. Each new item request needs to be managed by one library administrator (he/she could be any of the administrators of the library). For each new item request, the system needs to record a description of the item being requested, the school the item is requested for (a faculty might request for items on behalf of any school), the faculty member who raised the request, the library administrator who manages the request, and the library's decision (yes or no) on whether the item will be acquired. A faculty member cannot submit multiple requests with identical description. For any item that is acquired upon request, the system must be able to track the item request(s) that were submitted for its procurement.

2.7 Function 7: Student Comments and Ratings on Electronic Items

Students can provide comments on electronic items in the library. For each comment, the system needs to track the student who makes the comment, the item the comment is made for, the comment's text and the comment's datetime. Each electronic item can receive any number of comments and each student can make any number of comments on electronic items (it is possible also that he/she can make multiple comments on the same item). Each comment made by a student can be rated by other students. Ratings (1 star to 5 stars) can be received for each comment. A comment can receive any number of ratings and a student can give any number of ratings to different comments, but no more than one rating for the same comment. The system needs to capture the average rating (average number of stars received) for each comment, and also the student users who gave ratings for the comment, together with the individual rating each of them gave.

3.1 Project Phases and Deliverables

Your team is tasked to design the LMS database that can capture the stated business rules as closely as possible. Please focus on the functions that are listed in this document ONLY and ignore other functions that an actual LMS systems may have.

If there is any business rule or feature stated in this document that conflicts with those of any actual library system you know of, you should adhere to the business rules or features of this document.

All clarifications must be made using eLearn Discussion Forum (menu ribbon -> Discussions). Post your queries in appropriate Topics in the function clarifications.
It is **mandatory** for all teams to read the discussion forum on project clarifications posted on eLearn. Posts asking questions that have already been answered shall not be answered.

The project work is divided into two phases, according to the database development process.

- Phase 1: ER Modeling (Week 5, Friday, February 19, 2021, 23:00)
- Phase 2: Database Implementation & SQL Queries (Week 11, Sunday April 18, 2021, 23:00)

Please refer to individual phase handout documents for the detailed deliverables and requirements.

3.2 Project Submission

For every phase and as a team, you are required to submit a softcopy of your project deliverables via SMU eLearn Assignment Dropbox.

Penalty for late submission is as follows:

No. of Hours	**Marks Deductions**
<6 hours	10%
>6 – 24 hours	20%
>24 hours	50 %

The page limit of the submission (to be listed in each phase's handout document) is firm. For example, if the limit is 4 pages, only the first 4 pages of the report will be marked.

3.3 Plagiarism

Plagiarism is strictly not tolerated and plagiarism cases will be referred to the university's disciplinary committee.

3.4 Peer Evaluation and Instructor Adjustment

During week 9, you can (optionally) complete a confidential peer evaluation of your fellow team members. However, if you have any issues within your team, do highlight to your instructors early and do not wait until the peer evaluation.

We will use these peer evaluations to make a maximal plus or minus 5 marks (out of the total of 15 marks) adjustment of individual student marks over your group's grade. Nevertheless, we will not hesitate to make adjustments of more than 5 marks for any non-participating members of the team.