

School of Computing
ST1501 Data Engineering CA1
AY2022/2023 Semester 1

A. Instructions and Guidelines

1. This is an **INDIVIDUAL** assignment which requires the student to design and setup a database to support a business scenario and demonstrate the competency in writing SQL statement.
2. The deadline of this assignment is on 6/6/2022 9 am.
3. Submissions should be made via the ST1501 CA1 Assignment Submission link by the stated deadline.
4. **A compulsory demo/interview will be conducted.** During the session, you may need to give a short demonstration of the database that you have created and the SQL statements that you have submitted. Your module tutor will ask questions related to database design, SQL statements.
5. This assignment will account for **35%** of the module grade.
6. No marks will be awarded, if the work is copied or you have allowed others to copy your work.
7. 50% of the marks will be deducted for assignments that are received within ONE (1) calendar day after the submission deadline. No marks will be given thereafter. Exceptions to this policy will be given to students with valid LOA on medical or compassionate grounds. Students in such cases will need to inform the module tutor as soon as reasonably possible. Students are not to assume on their own that their deadline has been extended.
8. **Warning:** Plagiarism means passing off as one's own the ideas, works, writings, etc., which belong to another person. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turning it in as your own, even if you would have the permission of that person.
Plagiarism is a serious offence, and if you are found to have committed, aided, and/or abetted the offence of plagiarism, disciplinary action will be taken against you. If you are guilty of plagiarism, you may fail all modules in the semester, or even be liable for expulsion.

B. The Business Scenario

Background



Jackson Chan and a few friends have pooled in resources to set up a video rental company (VHS Tapes and Equipment Rental) with intention to have several outlets in the States. Aside from the capital they have invested, the friends need a software application specialist to develop a system for them to manage the video rental, transactions and the daily operations of the business. The system will facilitate an information system that a video company can use to manage the rentals of videos and video equipment.

The specialist suggests to have a client server application used by multiple users at several locations. Users will be able to interface with the system via Web Page while connected to the Internet. The system will provide communication to a centralized RDBMS database system. The system is created by using any current market web application framework like ReactJS or Flask with Django or NodeJS as the middle tier.

System General Requirements

The system will provide necessary information via a web page to manage video, video camera and camcorder rentals, reservations and returns. The system will have the ability to be scalable, which means it will be able to functions if it is changed in size or volume to meet a user needs. The architecture of system will be opened which will allow the customer to add to the system and adapt it as necessary.

- Provide user authentication/access levels
- Store information about stores
- Store information about employees
- Store information about customers

- Store information about transactions
- Store information about movies
- Store information about video cameras.
- Store information about VCRs
- Store information about rentals
- Provide catalog of all movies
- Provide reports:
 - Total number of outgoing movies per store and per month
 - The number of rentals per customer
 - Ten Most frequently reserved titles for the last year
 - Average number of outgoing movies per store
 - Monthly revenue of the company for the 12 months

The store will have a catalogue. The catalogue of movies contains the title of the movie, the producer, the director, two lead actors, the category of movie, the number of VHS cassettes and DVDs, and charge per day. Items can be categorised under the types:

- movie
- vcr
- videocamera

In future, more items can be added to the list for rentals. The video store carries multiple copies of the same title, and a store could have been assigned any number of copies of each title. A store that has more copies of a given title than assigned to it will return these at the end of each week to head office once, which redistributes them to appropriate stores. Similarly, the store carries multiple pieces of equipment under its charge and customers may rent a particular piece of the equipment. Store has inventory of all items and the web page they will be using has management capabilities to:

- Query, add, update, and remove movie, and equipment
- Show status of movie, and equipment
- Show rentals of items
- Handle reservation, rental and returning of movies and equipment by members. Transaction can be either 'Reserve' or 'Rent'. Assume that a new record is created for each individual transaction. i.e a reserve transaction will not later be updated to rent if the customer decides to rent the items out.
- Manage payments for rental by members (including late charges)
Late charges are computed based on the number of days overdue. For movies, \$0.50 per day and for equipment \$1.50 per day. There is a non-partial return policy enforced once the items are on loan for each particular transaction. It means that a customer must return all loaned items at the same time and not on each item basis for that transaction. The amount paid covers the rental charge as well as the penalty charge. It will be computed once all loaned items are returned including any late charges.

The application must provide a user interface for Video Store for renting videos, video cameras and camcorders. Some snapshots of the application are appended in the Appendix for a better appreciation of the whole system.

Various employees will use the system across various stores. The system needs to be protected from unauthorized users/access to prevent malicious activities. The application will need to provide the means to limit access and functions of the system by user. A manager may have the ability to create, modify, and delete information, but a sales associate can only rent or reserve movies and equipment or view information about customers. The system is flexible in allowing the customer define the level of authorization. Employees are paid under the following categories:

- manager
- assistantManager
- partTime

C. The Submission Deliverables

Deliverable should be a zip file with the following file-naming convention: "ST1501-YourClass-YourStudentID-YourName.zip.

Example ST1501-DITFT2B01-9999999-Benson Ang.zip

Zip file should include the following items:

- a) Use the submission template provided for the following:
 - The Entity Relationship Diagram to support all the requirements stated in section B.
- b) Two SQL Scripts in SQL extension
 - Create Table SQL Script for all tables
All tables must be implementable in MS Server taking into consideration the resolution of M:N relationships
 - Explain your database design (describe the purpose of each table, list the required fields (indicate PK), the relationship between tables (indicate FK) disregard referential actions for FK
 - Insert Records SQL Script for all tables
Create sufficient variety of data to be inserted into the tables so that you are able to fully support the SQL SELECT statements for the queries and their corresponding query results.
- c) Write SQL statement for each query and display their results.
 - Query 1 - View total number of outgoing movies per store and per month.
 - Query 2 - View the average number of rental days
 - i) per customer
 - ii) per title
 - Query 3 - View 10 most frequently reserved titles for last year
The query must be able to retrieve records from any one year past from date of query
 - Query 4 - View 100 best customers in terms of money paid to the company
 - Query 5 - View monthly revenue of the company for the 12 months
The query must be flexible to retrieve any previous 12 months from any date of query and exclude penalty charges

- Query 6- View the total amount of penalty incurred by each customer for movies and equipment respectively

D. Submission Template

Entity Relationship Diagram

A large, empty rectangular box with a thin black border, intended for the student to draw their Entity Relationship Diagram.

Database Diagram from SQL Server after tables creation with PK and FK

A large, empty rectangular box with a thin black border, intended for the student to paste or draw their Database Diagram from SQL Server.

Database Design Explanation

List all the tables and their fields. Indicate the PK and FK and their referenced tables.

Table	Purpose	Field	DataType	Primary Key	Foreign Key
Table 1		Field1		Field1	Field4 references Table 2 Field1
		Field2			
		Field3			
		Field4			
Table 2		Field1		Field1	
		Field2			
		Field3			
Table 3		Field1		Field1	
		Field2			
		Field3			

Table_– Name the table

Purpose – State what the table is used for and contains what details

Field – List all the columns of the table

DataType – State varchar, integer, decimal etc

Primary Key – List the PK (Simple or Composite)

Foreign Key – List the FK (Simple or Composite) and its reference table

SQL Queries and Results

Query 1	Query 1 Results
Query 2(i)	Query 2(i) Results
Query 2(ii)	Query 2(ii) Results
Query 3	Query 3 Results
Query 4	Query 4 Results

Query 5	Query 5 Results
Query 6	Query 6 Results

E. The Assessment Criteria

Components	Weightage	
Database Design (Database Diagram) <ul style="list-style-type: none"> The database supports the described business scenario. The chosen table names, field names and attributes are descriptive. The database is normalized. 	35%	
Database Creation <ul style="list-style-type: none"> The Create Table SQL script implements the database design, including the primary key and foreign key definition. The Insert Records SQL script creates enough data for testing. 	25%	
The Query Statements <ul style="list-style-type: none"> The SQL query statement implemented the query scenarios. The SQL query result shows that the design supports the query scenarios. <p>No mark will be given to the query if the database design cannot support the required query scenario.</p>	Qry1	6%
	Qry2(i)	3%
	Qry2(ii)	4%
	Qry3	4%
	Qry4	3%
	Qry5	4%
	Qry6	6%
CA1 Assignment Demo/Interview The CA1 Demo/Interview will be conducted where you have: <ul style="list-style-type: none"> To explain the database design and the submission To explain/answer questions given by the module tutor 	10%	
Total	100%	

*** End of Assignment Specification ***

F. Appendix

Catalog Information Screen

Video Store

[View Catalog](#) | [View Stores](#) | [View Employees](#) | [View Customers](#) | [View Transactions](#) | [Reports](#)

Catalog

Movies

[add new movie](#)

[edit](#) Batman Begins

[edit](#) Charlie and the Chocolate Factory

[edit](#) Harry Potter

[edit](#) Kung Fu

[edit](#) Madagascar

[edit](#) Mr. & Mrs. Smith

[edit](#) Star Wars: Episode III

[edit](#) Superman

[edit](#) The Chronicles of Narnia

[edit](#) War of the Worlds

[edit](#) Wedding Crashers

Video Cameras

[add new video camera](#)

[edit](#) Canon

[edit](#) Hitachi

[edit](#) Mitek

[edit](#) Sony

VCRs

[add new vcr](#)

[edit](#) Panasonic

[edit](#) Sony

[edit](#) Sylvania

[edit](#) Zenith

Movie Information Screen

Video Store

[View Catalog](#) | [View Stores](#) | [View Employees](#) | [View Customers](#) | [View Transactions](#) | [Reports](#)

Movie Name

Director

Producer

Charge Per Day

Actor

Actor 2

Image (URL)

Video Camera Information Screen

Video Store

[View Catalog](#) | [View Stores](#) | [View Employees](#) | [View Customers](#) | [View Transactions](#) | [Reports](#)

Video Camera Brand

Made By

Charge

Purchase Date

Image (URL)

VCR Information Screen

The screenshot shows a web application window titled "Video Store". At the top, there is a navigation bar with links: [View Catalog](#), [View Stores](#), [View Employees](#), [View Customers](#), [View Transactions](#), and [Reports](#). Below the navigation bar, the form contains the following fields:

- Type:
- Charge:
- VCR Brand:
- Made By:
- Purchase Date:
- Image (URL):

At the bottom of the form, there are two buttons: [Update](#) and [Cancel](#).

Stores Information Screen

The screenshot shows a web application window titled "Video Store". At the top, there is a navigation bar with links: [View Catalog](#), [View Stores](#), [View Employees](#), [View Customers](#), [View Transactions](#), and [Reports](#). Below the navigation bar, the form displays the following information:

Stores

[add new store](#)

[edit](#) Store # 1 Fort Lee, NJ

[edit](#) Store # 2 Newark, NJ

Add/Edit Store Information Screen

The screenshot shows a web application window titled "Video Store". At the top, there is a navigation bar with links: [View Catalog](#), [View Stores](#), [View Employees](#), [View Customers](#), [View Transactions](#), and [Reports](#). Below the navigation bar, the form contains the following fields:

- Location:
- Country:
- Street:
- State:
- City:
- Zip Code:

At the bottom of the form, there are two buttons: [Update](#) and [Cancel](#).

Employee Information Screen

The screenshot shows a web application window titled "Video Store". At the top, there is a navigation bar with links: [View Catalog](#), [View Stores](#), [View Employees](#), [View Customers](#), [View Transactions](#), and [Reports](#). Below the navigation bar, the form displays the following information:

Employees

[add new employee](#)

[edit](#) 1 Jane, Doe

[edit](#) 2 John, Doe Jr.

Add/Edit Employee Information Screen

The screenshot shows the 'Add/Edit Employee Information Screen' within the 'Video Store' application. The window has a title bar that says 'Video Store'. Below the title bar is a navigation bar with links: [View Catalog](#), [View Stores](#), [View Employees](#), [View Customers](#), [View Transactions](#), and [Reports](#). The main content area contains a form with the following fields: First Name, Last Name, Minit, Street, State, City, Zip Code, Country, Title, Pay Type (a dropdown menu currently showing 'Manager'), Pay Rate, and Store (a dropdown menu currently showing 'Fort Lee (Fort Lee, NJ)'). At the bottom of the form are two buttons: 'Update' and 'Cancel'.

Customer Information Screen

The screenshot shows the 'Customer Information Screen' within the 'Video Store' application. The window has a title bar that says 'Video Store'. Below the title bar is a navigation bar with links: [View Catalog](#), [View Stores](#), [View Employees](#), [View Customers](#), [View Transactions](#), and [Reports](#). The main content area displays the heading 'Customers' followed by a link [add new customer](#). Below this, there is a list of existing customers, each with an [edit](#) link: 'R, Robinson', 'Emily, Smith', and 'Jolanta, Solis'.

Add/Edit Customer Information Screen

The screenshot shows the 'Add/Edit Customer Information Screen' within the 'Video Store' application. The window has a title bar that says 'Video Store'. Below the title bar is a navigation bar with links: [View Catalog](#), [View Stores](#), [View Employees](#), [View Customers](#), [View Transactions](#), and [Reports](#). The main content area contains a form with the following fields: First Name, Last Name, Password, Phone, Driver License, Card Number, Card Type, Street, State, City, Zip Code, Country, and Minit. At the bottom of the form are two buttons: 'Update' and 'Cancel'.

Transaction Information Screen

Video Store

[View Catalog](#) | [View Stores](#) | [View Employees](#) | [View Customers](#) | [View Transactions](#) | [Reports](#)

Transactions
[add new transaction](#)

Requests
[edit](#) 1/1/2006 R Robinson

Rent
[edit](#) 1/1/2006 R Robinson
[edit](#) 1/1/2006 Emily Smith

Completed Transactions (returned items)

edit	1/1/2006	R Robinson
edit	1/1/2006	R Robinson
edit	4/27/2006	R Robinson
edit	1/1/2006	R Robinson
edit	1/1/2006	Emily Smith
edit	5/1/2006	Jolanta Solis
edit	1/1/2006	R Robinson

Add/Edit Transaction Information Screen

-Video Store

[View Catalog](#) | [View Stores](#) | [View Employees](#) | [View Customers](#) | [View Transactions](#) | [Reports](#)

Type:

Customer:

Due Date: / /

Store: