COMP1140 Assignment Two

SEEC Resource Access Project

**Data Requirements**

Moveable Resources

* This entity refers to any resource or piece of equipment that can be moved from the location it is stored in. This includes objects such as; Books, Journals, Cameras, Microphones and other audio/visual equipment.
* The attributes of this entity are listed below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ResourceID | Description | Status | LocationID | CategoryID |
| Name | Manufacturer | Model | Year | assetValue |

Immovable Resources

* This entity refers to any resource that can be booked for usage but is restricted to a single location or is immovable. This includes resources such as; Computer Labs, Classrooms, Studio Spaces.
* The attributes of this entity are listed below:

|  |  |  |
| --- | --- | --- |
| ResourceID | Description | Status |
| LocationID | CategoryID | Capacity |

Category

* The resources available for booking fall into categories which group similar items together e.g. Recording Equipment – Camera, Microphone and Headphones. These categories assist in data organization in the system when querying to find resources.
* The attributes of this entity are listed below:

|  |  |  |  |
| --- | --- | --- | --- |
| CategoryID | Name | Description | maxTimeAllowed |

Location

* Each resource has a location where it is stored/found. For moveable objects this is most often a storage space while immoveable objects usually refer to a particular space themselves, making the need for this distinction unnecessary in those cases.
* The attributes of this entity are listed below:

|  |  |  |  |
| --- | --- | --- | --- |
| LocationID | Room | Building | Campus |

Staff Members

* These are the staff members (teachers or otherwise) that work in the School of SEEC. They can loan and book resources in the system and their records hold information such as:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| MemberID | Name | Address | Street | City | State |
| postcode | Phone | Email | Status | Comments | officeLocation |

Student Members

* These are the students who study within the School of SEEC. They can loan and book resources in the system depending on privileges afforded by the courses they are enrolled in.
* The attributes of this entity are listed below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| MemberID | Name | Address | Street | City | State |
| postcode | Phone | Email | Status | Comments | Points |

Course

* These are the courses available for studies to enroll in that run within the School of SEEC. Courses are offered each semester and afford privileges to students enrolled in them. Information stored on a course includes:

|  |  |  |  |
| --- | --- | --- | --- |
| OfferingID | CourseID | Name | semesterOffered |
| yearOffered | courseStartDate | courseEndDate |  |

Privilege

* A privilege is a level of access given to a student that allows specific loans of resource categories or limits on the number of loans. These privileges are different depending on the course that offers them. Information stored for a privilege includes:

|  |  |  |  |
| --- | --- | --- | --- |
| privilegeName | Description | CategoryID | maxResources |

Loan

* The loan record keeps information regarding a loan made by a staff or student member of a specific resource. It includes the following attributes:

|  |  |  |  |
| --- | --- | --- | --- |
| LoanID | ResourceID | MemberID | dateLoaned |
| timeLoaned | dateDue | timeDue |  |

Acquisition

* An acquisition record is created when a member requests a new additional resource to be added to the catalogue. It includes the following attributes:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| AcquisitionID | name | Manufacturer | Model | Year |
| Description | venderCode | Price | Urgency | Status |

Reservations

* Reservation records are used to keep information pertaining to when and item is due to be loaned out and when it is required to be returned. This is the documented information after a member books a resource for use ahead of time.
* The attributes of this entity are listed below:

|  |  |  |  |
| --- | --- | --- | --- |
| ReservationID | ResourceID | MemberID | dateRequired |
| timeRequired | dateDue | timeDue |  |

**Transaction Requirements**

**Data Manipulation Operations**

* Insert/update/delete a resource in the system.
* Insert/update/delete a course in the system.
* Insert/update/delete a member in the system.
* Insert/update/delete a category in the system.
* Insert/update/delete a location in the system.
* Insert/update/delete a privilege in the system.
* Insert/update/delete a reservation of a resource for use.
* Insert/update/delete a request for the acquisition of a new resource.
* Reset/amend the penalty points on a user record.
* Update/delete a record for a loan.

**Queries**

* Search for/list resources or transaction records based on unique ID or specific attribute.
* Search for/list records pertaining to a particular member/item in the database.
* Search for/list items by frequency of use in transactions.

**Business Rules**

* No limit on the number of resources used by staff.
* Student privileges are assigned based on course enrolled.
* No reservation time/date may clash with another reservation time/date.
* A student’s borrowing privileges expire when the current date is later than the end date of all their enrolled courses.
  + When these privileges expire, the status of the student is set to “disabled”.
* A student’s limit on loan/borrows of resources is determined by their privileges at any given time.
* Each student has a set total of 12 penalty points at the beginning of enrolment.
  + Each day a resource is overdue for return subtracts 3 penalty points from the student’s total.
  + When the penalty point total for a student reaches 0 their status is set to disabled which revokes resource access privileges.
  + The administrator can reset/amend penalty points.
* A resource reservation is cancelled if it is not picked up a day after the required date or due date, whichever is earlier.
  + Non-cancellation of a reservation by a member will incur a -1 to their penalty point total.
  + The administrator can cancel any reservation.
* The duration of a booking instance for a resource is determined by its category.

**Data Dictionary**

Entity Types

|  |  |  |  |
| --- | --- | --- | --- |
| **Entity Name** | **Description** | **Aliases** | **Occurrence** |
| Resource | This entity is a superclass and represents the shared attributes of the moveable and immovable resources entities. | Object, Item | A resource can be loaned by a member, reside in a location and belong to a category. |
| Moveable Resource | This entity represents any physically moveable resources that a member would take away from their location to use. | Book, Camera, Equipment | As a resource, these can be loaned out, reside in a location and belong to a category. |
| Immoveable Resource | This entity represents resources that cannot move and often references a room or space that can be used for activities. | Room, Lab, Studio | As a resource, these can be loaned out, reside in a location and belong to a category. |
| Category | This entity represents a collection of similar resources that can be group together into a category to simplify organization. | Group, Selection | A category may contain one or many resources that belong to it. |
| Location | This entity represents a physical location in which a resource resides. | Space, Storage | A location has one or many resources that reside at/inside it. |
| Member | This entity is a superclass and represents the shared attributes of the staff and student entities. | User, Person | A member can take loans of resources and can also submit acquisition request for new resources. |
| Staff | This entity represents any member who is a staff member. | Teacher, Lecturer | As a member these users can take loans of resources and submit acquisition requests. |
| Student | This entity represents any member who is a student. It includes attributes that a staff member does not possess. | Undergraduate, Postgraduate | As a member these users can take loans of resources and submit acquisition requests. Students may also enroll in course which provide certain privileges. |
| Course | This entity represents the courses available to be enrolled in. These are available to student members. | Class, Subject | A course is enrolled in by a student member and affords them certain privileges depending on the course. |
| Privilege | This entity represents privileges that are granted to students based on their enrolled courses. These privileges allow certain levels of resource access to a member. | Access, Permissions | A privilege is assigned to a particular course and then handed to the students that enroll in that course to allow them access to a certain level of resource loans. |
| Loan | This entity represents the record of a loan taken by a member. It also stores information on the resource loaned and when the loan took place. | Borrow | A loan of a resource is taken out by a member and the record of the loan is keep. A loan can be setup in advance by making a reservation of a resource. |
| Acquisition | This entity represents the records pertaining to an acquisition request for a new resource, made by a member. | Request | A member can submit an acquisition when they require a new resource to be added to the system. |
| Reservation | This entity represents the details of when/what a member wants to loan a specific resource. | Booking | A reservation is made by a member when they intend on loaning out a resource. Each loan will have adjoining reservation details. |

Relationship Types

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Entity Name** | **Multiplicity** | **Relationship** | **Multiplicity** | **Entity Name** |
| Member | 1…1 | Takes | 0…\* | Loan |
| Member | 1…1 | Submits | 0…1 | Acquisition |
| Student | 1…\* | Enrolls In | 0…\* | Course |
| Course | 0…\* | Provides | 0…\* | Privilege |
| Loan | 0…\* | Contains | 1…1 | Moveable Resource |
| Resource | 0…\* | Belongs To | 1…1 | Category |
| Resource | 0…\* | Resides In | 1…1 | Location |
| Member | 1…1 | Makes | 0…\* | Reservation |
| Reservation | 0…\* | Reserves | 1…1 | Resource |
| Privilege | 0…\* | Is For | 1…1 | Category |

Attributes

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Entity Name** | **Attributes** | **Description** | **Data Type** | **Nulls** | **Multi-Valued** | **Derived** | **Default** |
| Resource | ResourceID | This is a unique identifier for the resource entity. | VARCHAR(10) | N | N | N |  |
|  | Description | This is a description of a resource. | TEXT | Y | N | N |  |
|  | Status | This is the current status of the resource. | VARCHAR(50) | N | N | N |  |
| LocationID | A foreign key to link to the location table. | VARCHAR(10) | N | N | Y |  |
| CategoryID | A foreign key to link to the category table. | VARCHAR(10) | N | N | Y |  |
| Moveable Resource | Name | This is the name of resource | VARCHAR(255) | N | N | N |  |
|  | Manufacturer | This is the name of the manufacturer of the resource. | VARCHAR(100) | Y | N | N |  |
|  | Model | This is the model of the resource. | VARCHAR(100) | Y | N | N |  |
|  | Year | This is the year the resource was made. | YEAR() | N | N | N |  |
|  | Asset Value | This is value of the resource. | SMALLINT() | N | N | N |  |
| Immoveable Resource | Capacity | This is the capacity of the resource. | SMALLINT() | N | N | N |  |
| Category | CategoryID | This is a unique identifier for the category entity. | VARCHAR(10) | N | N | N |  |
|  | Name | This is the name of the category. | VARCHAR(50) | N | N | N |  |
|  | Description | This is the description of the category. | TEXT() | Y | N | N |  |
|  | MaxTimeAllowed | This is the max time allowed for a resource in this category to be loaned. | TIME() | N | N | N |  |
| Location | LocationID | This is a unique identifier for the location entity. | VARCHAR(10) | N | N | N |  |
|  | Room | This is the room that the location exists in. | VARCHAR(10) | N | N | N |  |
|  | Building | This is the building that the location exists in. | VARCHAR(20) | N | N | N |  |
|  | Campus | This is the campus that the location exists at. | VARCHAR(50) | N | N | N |  |
| Member | MemberID | This is a unique identifier for the member entity. | VARCHAR(10) | N | N | N |  |
|  | Name | This is the name of the member. | VARCHAR(50) | N | Y | N |  |
|  | Address | This is the address of the member. | TEXT() | N | Y | N |  |
|  | Phone | This is the phone number for the member. | VARCHAR(10) | N | Y | N |  |
|  | Email | This is the email address for the member. | VARCHAR(50) | N | Y | N |  |
|  | Status | This is the status of the member. (if they are allowed to loan) | VARCHAR(20) | N | N | N |  |
|  | Comments | These are comments regarding the member. | TEXT() | Y | N | N |  |
| Staff | officeLocation | This is the location of a staff members office. | VARCHAR(10) | N | Y | N |  |
| Student | Points | This represents ‘penalty points’ left remaining. At 0 status is disabled. | TINYINT() | N | N | N | Y |
| Course | OfferingID | This is a unique identifier for the offering of a course entity. | VARCHAR(10) | N | N | N |  |
|  | CourseID | This is a unique identifier for the course entity. | VARCHAR(10) | N | N | N |  |
|  | Name | This is the name of the course being offered. | VARCHAR(50) | N | N | N |  |
|  | semesterOffered | This is the semester that the course is offered. | VARCHAR(10) | N | Y | N |  |
|  | yearOffered | This is the year that the course is offered. | YEAR() | N | Y | N |  |
|  | courseStartDate | This is the starting date for the course. | DATE() | N | Y | N |  |
|  | courseEndDate | This is the ending date for the course. | DATE() | N | Y | N |  |
| Privilege | privilegeName | This is the name of the privilege. | VARCHAR(50) | N | N | N |  |
|  | Description | This is a description of the privilege. | TEXT() | Y | N | N |  |
|  | maxResources | This is the maximum amount of resources that this privilege allows a member to loan. | TINYINT() | N | N | N |  |
| Loan | LoanID | This is a unique identifier for the loan entity. | VARCHAR(10) | N | N | N |  |
|  | dateLoaned | This is the date that the loan started. | DATE() | N | N | N |  |
|  | timeLoaned | This is the time that the loan started. | TIME() | N | N | N |  |
|  | dateDue | This is the date that the loan will finish. | DATE() | N | N | N |  |
|  | timeDue | This is the time that the loan will finish. | TIME() | N | N | N |  |
| Acquisition | AcquisitionID | This is a unique identifier for the acquisition entity. | VARCHAR(10) | N | N | N |  |
|  | itemName | This is the name of the resource that the member would like acquired. | VARCHAR(200) | N | N | N |  |
|  | Manufacturer | This is the manufacturer of the requested resource. | VARCHAR(50) | N | N | N |  |
|  | Model | This is the model of the requested resource. | VARCHAR(50) | N | N | N |  |
|  | Year | This is the year the requested resource was made. | YEAR() | N | N | N |  |
|  | Description | This is a description of the requested resource. | TEXT() | N | N | N |  |
|  | Urgency | This is how urgently the member would like the resource added. | VARCHAR(50) | N | N | N |  |
|  | Status | This is the status of the resource request. | VARCHAR(20) | Y | N | N |  |
| Reservation | ReservationID | This is a unique identifier for the reservation entity. | VARCHAR(10) | N | N | N |  |
|  | dateRequired | This is the date that the resource is required to be loaned. | DATE() | N | N | N |  |
|  | timeRequired | This is the time that the resource is required to be loaned. | TIME() | N | N | N |  |
|  | dateDue | This is the date that the loan will be due to end. | DATE() | N | N | N |  |
|  | timeDue | This is the time that the loan will be due to end. | TIME() | N | N | N |  |

**EER Model**



**EER Entities with Attributes**





**Relational Model – Mapped from EER**

**Member**(MemberID, Name, Address, Street, City, State, postCode, Phone, Email, Status, Comments

**Primary Key** MemberID

**Foreign Key** City, State **references** City(City, State)

**StaffMember**(MemberID, officeLocation)

**Primary Key** MemberID

**Foreign Key** MemberID **references** Member(MemberID)

**StudentMemeber**(MemberID, Points, OfferingID)

**Primary Key** MemberID

**Foreign Key** MemberID **references** Member(MemberID)

**Foreign Key** OfferingID **references** Course(OfferingID)

**Resource**(ResourceID, Description, Status, LocationID, CategoryID

**Foreign Key** LocationID **references** Location(LocationID)

**Foreign Key** CategoryID **references** Category(CategoryID)

**MoveableResource** (ResourceID, Name, Manufacturer, Model, Year, Asset Value)

**Primary Key** Resource ID

**Foreign Key** ResourceID **references** Resource(ResourceID)

**ImmoveableResource** (ResourceID, Capacity)

**Primary Key** Resource ID

**Foreign Key** ResourceID **references** Resource(ResourceID)

**Reservations** (ReservationID, ResourceID, MemberID, dateRequired, timeRequired, dateDue, timeDue)

**Primary Key** ReservationID

**Foreign Key** ResourceID **references** Resource(ResourceID)

**Foreign Key** MemberID **references** Member(MemberID)

**Loan** (LoanID, ResourceID, MemberID, dateLoaned, timeLoaned, dateDue, timeDue)

**Primary Key** LoanID

**Foreign Key** ResourceID **references** Resource(ResourceID)

**Foreign Key** MemberID **references** Member(MemberID)

**Acquisition** (AcquisitionID, name, Manufacturer, Model, Year, Description, vendorCode, Price, Urgency, Status)

**Primary Key** AcquisitionID

**Foreign Key** MemberID **references** Member(MemberID)

**Location** (LocationID, Room, Building, Campus)

**Primary Key** LocationID

**Course** (OfferingID, CourseID, Name, semesterOffered, yearOffered, courseStartDate, courseEndDate privilegeName)

**Primary Key** OfferingID

**Foreign Key** privilegeName **references** Privilege(privilegeName)

**Privilege** (privilegeName, Description, CategoryID, maxResources)

**Primary Key** privilegeName

**Foreign Key** CategoryID **references** Category(CategoryID)

**Category** (CategoryID, Name, Description, maxTimeAllowed)

**Primary Key** CategoryID

**Normalizing Relational Schema**

**1st Normal Form (1NF)**: All relations listed above are in 1st normal form as each attribute is a single atomic value. They must all be in 1st NF as it is a correct relational model.

Comment: Many relations that have been normalized to 2NF also meet the requirements of 3NF and have been labeled as such.

**Member (1st Normal Form 1NF – 3rd Normal Form 3NF)**

**Member** (MemberID, Name, Address, Street, City, State, postCode, Phone, Email, Status, Comments, officeLocation)

Functional Dependencies

FD1: MemberID -> Name, Address, Street, City, Phone, Email, Status, Comments, officeLocation

FD2: City, State -> Postcode

Solution

Member (MemberID, Name, Address, Street, City, Phone, Email, Status, Comments, officeLocation)

City (City, State, Postcode)

**StaffMember (Boyce-Codd Normal Form BCNF)**

This relation cannot be normalized any further.

**StaffMember** (MemberID, officeLocation)

**StudentMember (1st Normal Form 1NF – 3rd Normal Form 3NF)**

This relation cannot be normalized any further.

**StudentMemeber** (MemberID, Points, OfferingID)

**Resource (1st Normal Form 1NF – 3rd Normal Form 3NF)**

This relation cannot be normalized any further.

**Resource** (ResourceID, Description, LocationID, CategoryID, Status)

**MoveableResource (1st Normal Form 1NF – 3rd Normal Form 3NF)**

**MoveableResource** (ResourceID, Name, Manufacturer, Model, Year, assetValue)

Functional Dependencies

FD1: ResourceID -> Name, Manufacturer, Model

FD2: Manufacturer, Model -> Year, Asset Value

Solution

MoveableResource (ResourceID, Name, Manufacturer, Model)

ResourceModel (Manufacturer, Model, Year, assetValue)

**ImmoveableResource (Boyce-Codd Normal Form BCNF)**

This relation cannot be normalized any further.

**ImmoveableResource** (ResourceID, Capacity)

**Reservations (Boyce-Codd Normal Form BCNF)**

This relation cannot be normalized any further.

**Reservations** (ReservationID, ResourceID, MemberID, dateRequired, timeRequired, dateDue, timeDue)

**Loan (****Boyce-Codd Normal Form BCNF)**

This relation cannot be normalized any further.

**Loan** (LoanID, ResourceID, MemberID, dateLoaned, timeLoaned, dateDue, timeDue)

**Acquisition (1st Normal Form 1NF – 3rd Normal Form 3NF)**

**Acquisition** (AcquisitionID, name, Manufacturer, Model, Year, Description, vendorCode, assetValue, Urgency, Status)

Functional Dependencies

FD1: AcquisitionID -> name, Manufacturer, Model, Urgency, Status

FD2: Manufacturer, Model -> Year, Description, vendorCode, assetValue

Solution

Acquisition (AcquisitionID, name, Manufacturer, Model, Urgency, Status)

ResourceModel (Manufacturer, Model, Year, Description, vendorCode, assetValue)

**Location (1st Normal Form 1NF – 3rd Normal Form 3NF)**

**Location** (LocationID, Room, Building, Campus)

Functional Dependencies

FD1: LocationID -> Room, Building

FD2: Building -> Campus

Solution

Location (LocationID, Room, Building)

BuildingInfo (Building, Campus)

**Course (1st Normal Form 1NF – 3rd Normal Form 3NF)**

**Course** (OfferingID, CourseID, Name, semesterOffered, yearOffered, courseStartDate, courseEndDate, privilegeName)

Functional Dependencies

FD1: OfferingID -> CourseID, courseStartDate, courseEndDate, semesterOffered, yearOffered

FD2: CourseID -> Name, privilegeName

Solution

CourseOffering (OfferingID, CourseID, courseStartDate, courseEndDate, semesterOffered, yearOffered)

Course (CourseID, Name, privilegeName)

**Privilege (Boyce-Codd Normal Form BCNF)**

This relation cannot be normalized any further.

**Privilege** (privilegeName, Description, CategoryID, maxResources)

**Category (Boyce-Codd Normal Form BCNF)**

This relation cannot be normalized any further.

**Category** (CategoryID, Name, Description, maxTimeAllowed)

**Final Normalized Relational Schema**

**Member(**MemberID, Name, Address, Street, City, State, Phone, Email, Status, Comments)

**Primary Key** MemberID

**Foreign Key** City, State **references** City(City, State)

**StaffMember** (MemberID, officeLocation)

**Primary Key** MemberID

**Foreign Key** MemberID **references** Member(MemberID)

**StudentMember** (MemberID, Points, offeringID)

**Primary Key** MemberID

**Foreign Key** MemberID **references** Member(MemberID)

**Foreign Key** offeringID **references** CourseOffering(offeringID)

**City** (City, State, Postcode)

**Primary Key** City, State

**Resource**(ResourceID, Description, LocationID, CategoryID, Status)

**Primary Key** ResourceID

**Foreign Key** LocationID **references** Location(LocationID)

**Foreign Key** CategoryID **references** Category(CategoryID)

**MoveableResource** (ResourceID, Name, Manufacturer, Model)

**Primary Key** ResourceID

**Foreign Key** ResourceID **references** Resource(ResourceID)

**Foreign Key** Manufacturer, Model **references** ResourceModel(Manufacturer, Model)

**ImmovableResource** (ResourceID, Capacity)

**Primary Key** ResourceID

**Foreign Key** ResourceID **references** Resource(ResourceID)

**ResourceModel** (Manufacturer, Model, Year, Description, vendorCode, assetValue)

**Primary Key** Manufacturer, Model

**Reservations** (ReservationID, ResourceID, MemberID, dateRequired, timeRequired, dateDue, timeDue)

**Primary Key** ReservationID

**Foreign Key** ResourceID **references** Resource(ResourceID)

**Foreign Key** MemberID **references** Member(MemberID)

**Loan** (LoanID, ResourceID, MemberID, dateLoaned, timeLoaned, dateDue, timeDue)

**Primary Key** LoanID

**Foreign Key** ResourceID **references** Resource(ResourceID)

**Foreign Key** MemberID **references** Member(MemberID)

**Acquisition** (AcquisitionID, name, Manufacturer, Model, Urgency, Status)

**Primary Key** AcquisitionID

**Foreign Key** Manufacturer, Model **references** ResourceModel(Manufacturer, Model)

**Location** (LocationID, Room, Building)

**Primary Key** LocationID

**Foreign Key** Building **references** Building(Building)

**Building** (Building, Campus)

**Primary Key** Building

**Course** (CourseID, Name, privilegeName)

**Primary Key** CourseID

**Foreign Key** privilegeName **references** Privilege(privilegeName)

**CourseOffering** (OfferingID, CourseID, courseStartDate, courseEndDate, semesterOffered, yearOffered)

**Primary Key** OfferingID

**Foreign Key** CourseID **references** Course(CourseID)

**Privilege** (privilegeName, Description, CategoryID, maxResources)

**Primary Key** privilegeName

**Foreign Key** CategoryID **references** Category(CategoryID)

**Category** (CategoryID, Name, Description, maxTimeAllowed)

**Primary Key** CategoryID