Assignment 1

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Part 1

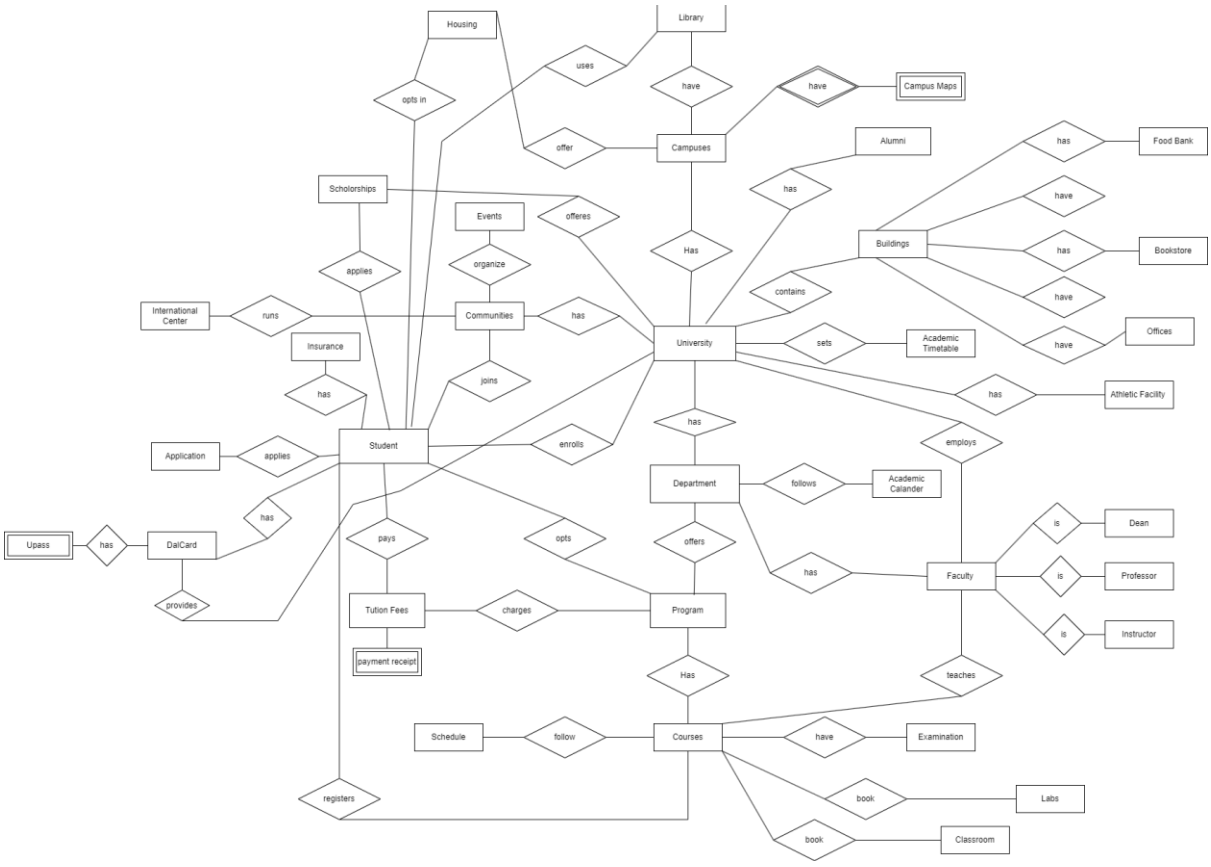
Identified the following entities from dal.ca

Entity	Description
1.University	University
2.Students	Students studying at the university
3.Department	University has various departments
4.Course	Courses are offered by departments
5.Schedule	Schedule followed by each course
6.Communities	Communities run and managed by students
7.Athletic facility	Athletic facilities like gym and grounds
8.Library	Libraries in the campus
9.UPass	UPass associated with the student ID card
10.Buildings	Various buildings hosting facilities/classes etc in the university
11.Application	Admission applications made by the student
12.Events	Events conducted by the communities
13.Examination	Exams are held for selected courses by the university
14.Foodbank	Foodbank initiative in one of the buildings at university.
15.International Centre	International centre to help international students.
16.Insurance	Insurance cover provided to student to meet medical expenses
17.Bookstore	Bookstore in the university building for students to buy books
18.Classrooms	Classrooms used to host various courses as mentioned in schedule
19.Programs	Programs offered by the university. Eg – MACS, MCS
20.Faculty	Faculty members teach various courses to students
21.Dean	Dean is a type of faculty member
22.Professor	Professor is a type of faculty member
24.Instructor	Instructor is a type of faculty member
25.Tution Fees	Tuition fees associated with every course
26.Scholorships	Scholarship rewards offered by university to meritorious students
27.Alumnis	Alumni are ex-students of the university
28.Laboratory	Laboratories used by courses to impart practical knowledge
29.Campuses	University is spread over various campuses
30.Housing	Housing available for students in various campuses
31.Offices	Offices for employees and students in the buildings
32.Dalcard	DalCard is a document to identify students at the university

Assumptions

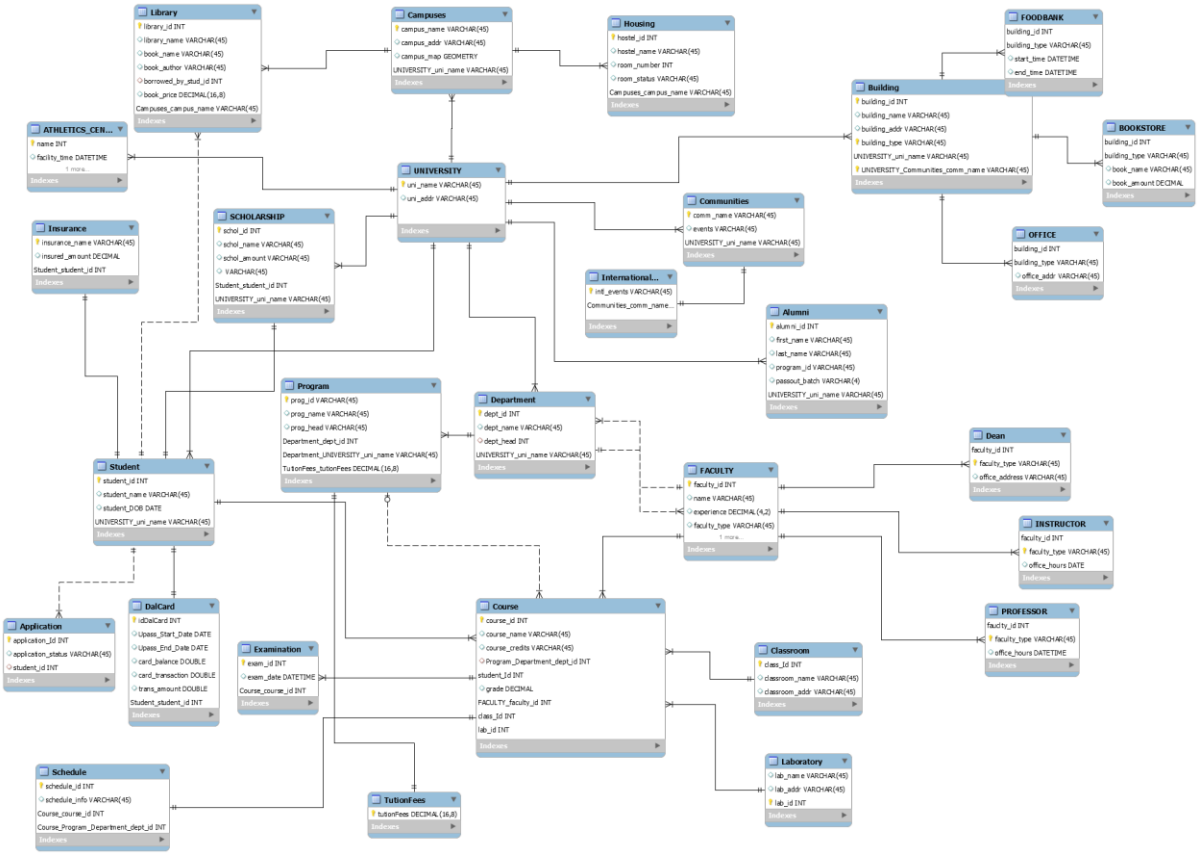
University has several departments, that follow an academic calendar, offering various programs. A student applies to get an admission into the university. Every program offers many courses which can be opted by a student. Courses follow a schedule and are conducted in a lab or classrooms. A classroom can host multiple courses but only one course is conducted at a time in a classroom or lab. Students pays tuition fees for the registered program. Faculty is employed by the university to teach courses. Faculty member **is a** dean, instructors, and professors. The university is spread over multiple campuses with which each campus having a library and housing option for its students. Maps help to navigate through campuses. A student can apply for one of the many scholarships offered by the university. Students can also register in student communities that host numerous events. International center is a student run community in the university. Every student is enrolled into an insurance plan and gets a DalCard with an inbuilt UPass. University has many buildings which **has** facilities like food bank, bookstore, offices. Athletic facilities are also provided in the university. University has an alumni base.

Conceptual phase of EER Model Designing



Logical phase of the EER Model designing (Crows feet model)

Logical model represents, all the above entities, their attributes as column names, relationships, and cardinality. Cardinality can be one to one, one to many, many to one and many to many. The below diagram includes all types of cardinalities.

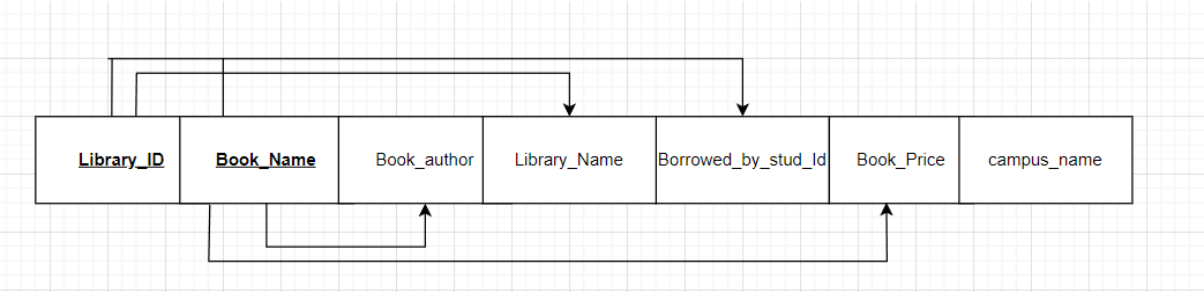


Performed normalization of the below tables.

Library -

1NF

Consider table Library where library_id and book_name is the primary key to uniquely identify every row. This table is in 1NF as every value is atomic and no group is repeating.



-> Problems with 1NF

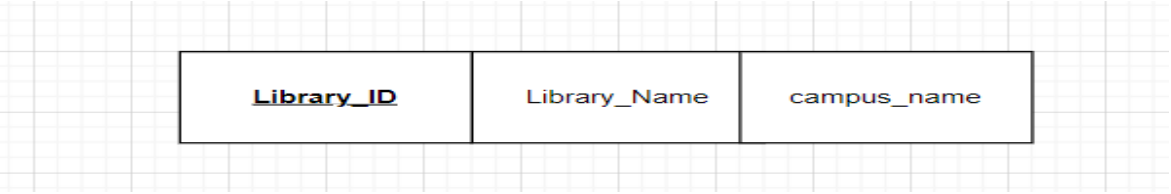
1.To add any new book, we must have to determine the library ID where it will be kept.

2.To delete a book we might delete information about the library.

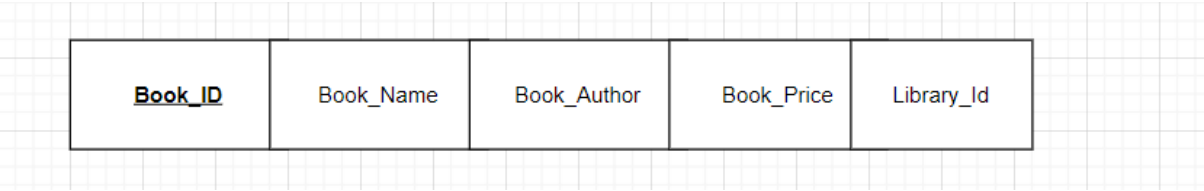
2NF

Library table has partial dependency. Book_author and Book_price can be identified from the **book_name** and library_name can be identified from just the **library_id**. To normalize it into 2NF we create the following tables –

Library



Books



BookBorrowed

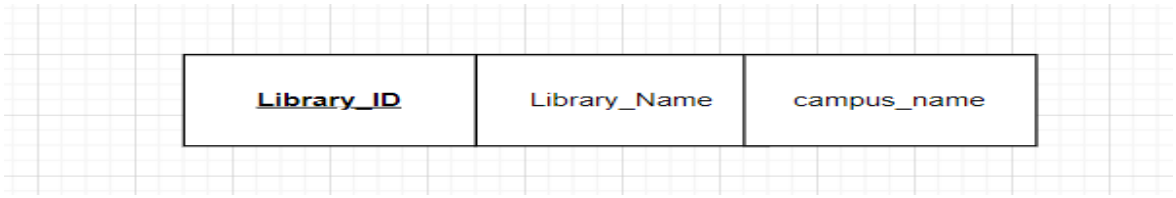
-> Problems with 2NF

If we delete a book record, we may delete information about author as well.

3NF

There is transitive dependency in the 2NF. To ensure no non-key attribute is functionally dependent on any non-key attribute, we create the following table.

Library

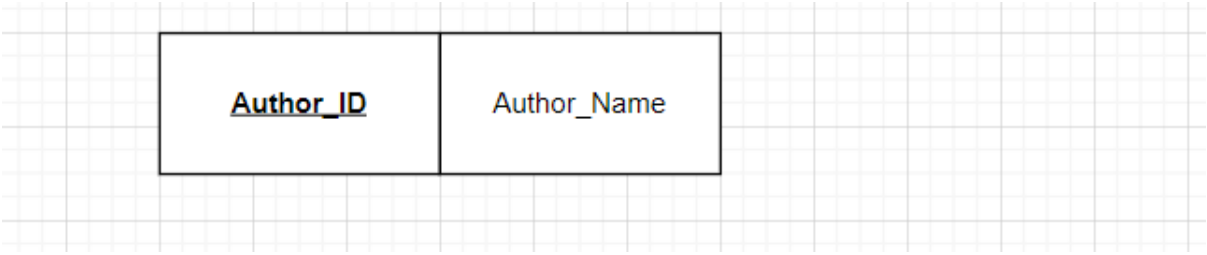


BookBorrowed

Book

Book_ID	Book_Name	Author_ID	Book_Price

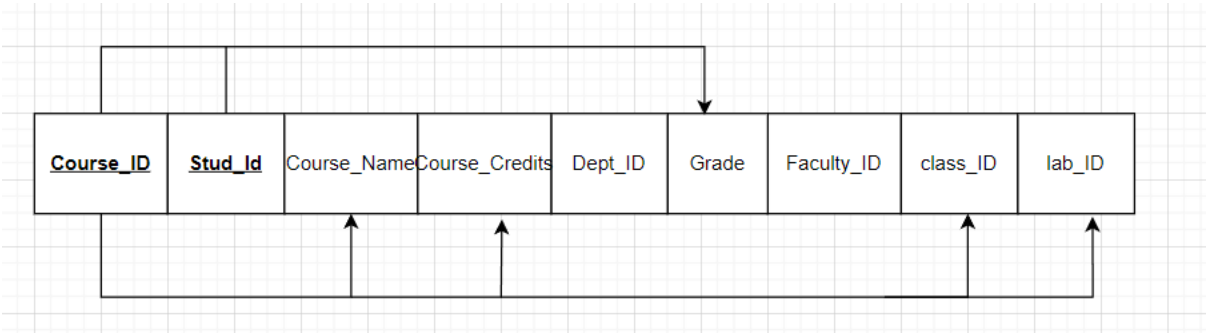
Author



2. Courses

Let's consider table **Course** –

Course_ID and **Stud_ID** forms the primary key as they uniquely identify each row in the table. As all values are atomic, data is in 1NF.



Problems with 1NF –

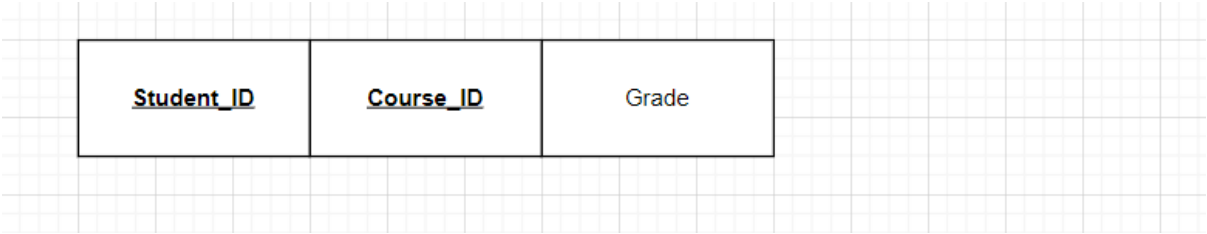
1.To add a course, we need a student.

2.If we delete a student, we may end up deleting some crucial course information as well.

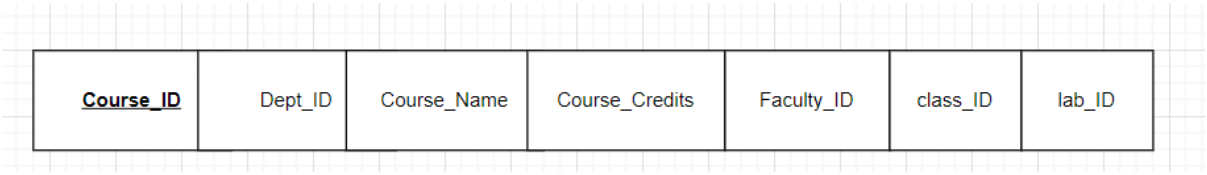
2NF

We notice that Grades depends on the partial key (Stud_Id, Course_Id) completely, but other attributes like Course_Name, Course_Credits can be identified from just the course_ID. This indicates partial dependency. We resolve this by creating the following tables -

StudentGrade



Course



Physical data model

(Table structure after normalization)