

# Final Project

PROG2111

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## Phase 1: Project Idea & Use Case

### Project Overview

This application is a small bookstore management system that will support various CRUD features and database queries for books and customers. We assume no co-publishing and no edge cases for simplicity.

The system will keep track of all registered customers including their names, phone number, address and email. It will also manage the individual details of each book such as title, publisher, author, stock and genre. The bookstore will manage the customer orders and the details of each order. An order will consist of a customer and order date while the order details will consist of the book, order, quantity and price. We treat publishers as direct suppliers who provide inventory to the bookstore.

Each of these entities will contain various relationships with each other through associative entities and identifiable keys.

You will be operating from the perspective of the bookstore employee, you will be able to search for customer information, orders, and books. Customers will be found by either name or customer ID. Orders will be found through order ID, and books will be found through author, genre, or title. You will be able to add and remove customers from the database, add and remove books, create new orders and update book/customer information.

### GitHub-Repo

<https://github.com/Zumh/RMDB2025Final.git>

## Phase 2: Data Modeling & ER Diagram

### Key Entities and Attributes:

1. Customer - customerID (Primary Key) - customerName - customerAddress - customerPhoneNumber - customerEmail	2. Book - bookID (Primary Key) - bookTitle - bookISBN - bookAuthor - bookPrice - bookStock - publisherID (Foreign Key) - categoryID (Foreign Key)	3. OrderDetail - detailID (Primary Key) - orderID (Foreign Key) - bookID (Foreign Key) - quantity - bookPrice
4. Category - categoryID (Primary Key) - categoryName	5. Order - orderID (Primary Key) - orderDate - totalAmount - customerID (Foreign Key)	6. Publisher - publisherID (Primary Key) - publisherName

### Key Relationships

1. Publisher ↔ Book (1:N)

- One publisher publishes multiple books
- A book is published by one publisher

2. Category ↔ Book (1:N)

- One category contains multiple books
- A book belongs to one category

3. Customer ↔ Order (1:N)

- One customer can place multiple orders
- An order is placed by one customer

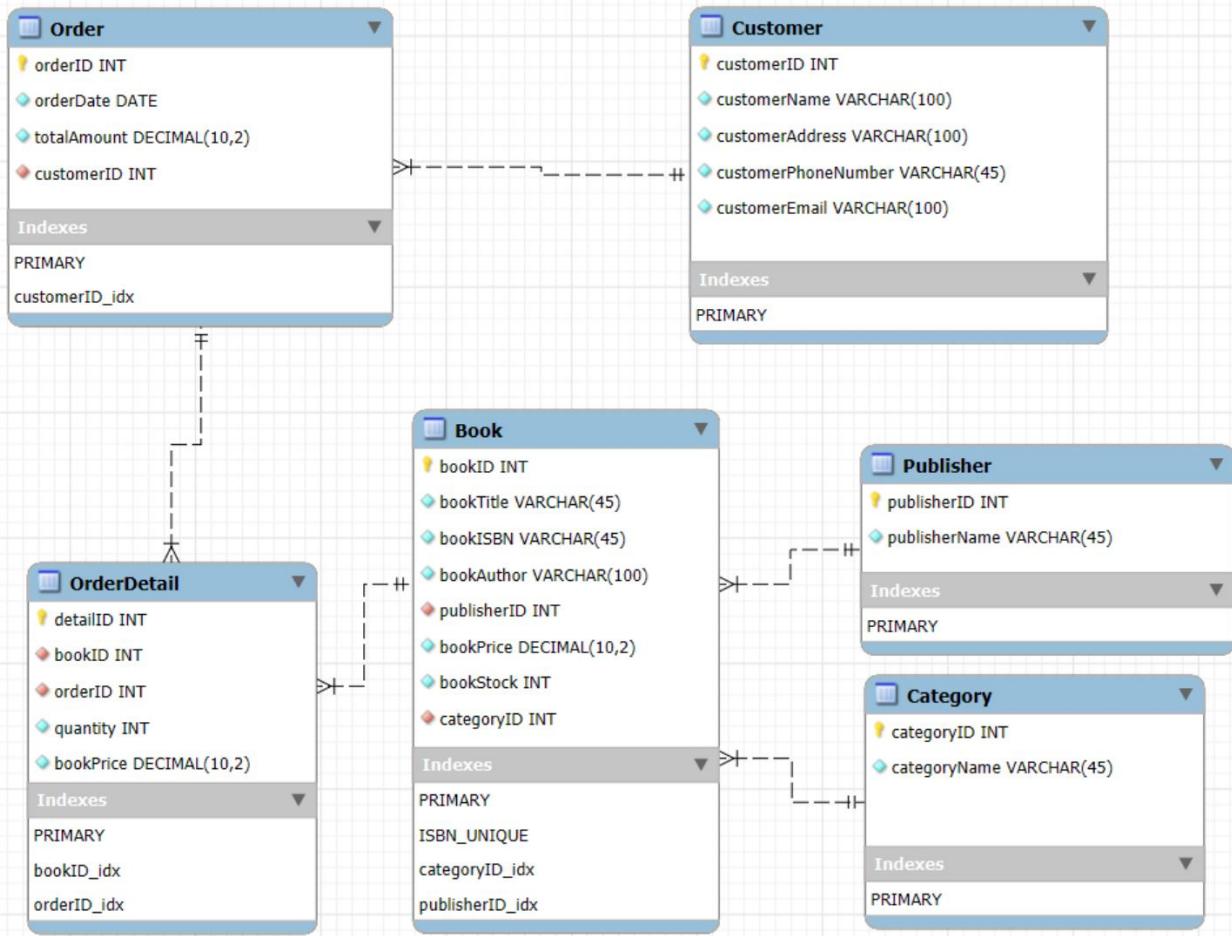
4. Order ↔ OrderDetail (1:N)

- One order can have multiple order details
- An order detail belongs to one order

5. Book ↔ OrderDetail (1:N)

- One book can appear in multiple order details
- An order detail references one book

## ER Diagram



## Phase 3: Normalization

### Original Data (Unnormalized Form)

OrderID	CustomerInfo	BookInfo	PublishInfo	OrderDate	TotalPrice
1001	D Beckham, C001, david@gmail.com, 7 ManU st, Madrid, ON, M7U R7D, 777-777-2323	FreeKickMaster: B001: 2 : ISBN 978-1-4028-9462-6 : Sports Last Dance: B004: 1 : ISBN 978-0-545-01022-1 : Autobiography	FIFABook: P001, MyLifeBook: P002	11/30/2025	54.97
1002	C Ronaldo, C002, CR7@gmail.com, 7 Real st, Porto, ON, R7D P7G, 777-777-7777	How To Be Winner: B002: 1 : ISBN 978-1-59327-584-6 : Autobiography	MyLifeBook: P002	11/29/2025	29.99
1003	D Beckham, C001, david@gmail.com, 7 ManU st, Madrid, ON, M7U R7D, 777-777-2323	Become a Rich: B005: 1 : ISBN 978-0-306-40615-7 : Investment	FIFABook: P001	11/28/2025	34.99
1004	L Messi, C003, Goat@gmail.com, 9 Nukamp, Barcia, ON, B9N A9H, 999-999-9999	G.O.A.T!: B003: 1 : ISBN 978-1-250-03095-7 : Autobiography Last Dance: B004: 2 : ISBN 978-1-118-02212-8 : Autobiography	AnimalBook: P003  MyLifeBook: P002	11/27/2025	54.48

### Issues and Redundancy

- Multiple Values in One Cell:** The CustomerInfo column has name, ID, email, and address all together. We cannot search for just a name or email.
- Repeating Groups:** The BookInfo column has multiple books separated by commas. It is hard to know how many books were sold.
- Redundancy:** The same customer information (D Beckham) is repeated in rows 1001 and 1003.

**First Normal Form(1NF)****Do:**

- Split Information:** We separated CustomerInfo into CustomerID, CustomerName, Email, Address, and Phone. We did the same for BookInfo
- Removed Repeating Groups:** For Order 1001 (which has 2 books), we created two separate rows. Now, each row has only one book.

-Order

Order ID	Customer ID	Customer Name	Customer Email	CustomerAddress	Customer Phone	OrderDate	Book ID	BookTitle	BookISBN	Category	Qty	UnitPrice	Publisher ID	Publisher Name	Total Price
1001	C001	D Beckham	david@gmai.com	7 ManU st, Madrid, ON, M7U R7D	777-777-2323	11/30/2025	B001	FreeKickMaster	978-1-4028-9462-6	Sports	2	20	P001	FIFABook	54.97
1001	C001	D Beckham	david@gmai.com	7 ManU st, Madrid, ON, M7U R7D	777-777-2323	11/30/2025	B004	Last Dance	978-0-545-01022-1	Autobiography	1	14.97	P002	MyLifeBook	54.97
1002	C002	C Ronaldo	CR7@gmai.com	7 Real st, Porto, ON, R7D P7G	777-777-777	11/29/2025	B002	How To Be Winner	978-1-59327-584-6	Autobiography	1	29.99	P002	MyLifeBook	29.99
1003	C001	D Beckham	david@gmai.com	7 ManU st, Madrid, ON, M7U R7D	777-777-2323	11/28/2025	B005	Become a Rich	978-0-306-40615-7	Investment	1	34.99	P001	FIFABook	34.99
1004	C003	L Messi	Goat@gmai.com	9 Nukamp, Barcia, ON, B9N A9H	999-999-9999	11/27/2025	B003	G.O.A.T!	978-1-250-03095-7	Autobiography	1	24.5	P003	AnimalBook	54.48
1004	C003	L Messi	Goat@gmai.com	9 Nukamp, Barcia, ON, B9N A9H	999-999-9999	11/27/2025	B004	Last Dance	978-1-118-02212-8	Autobiography	2	14.99	P002	MyLifeBook	54.48

## Second Normal Form(2NF)

**Problem:** The Primary Key is (OrderID, BookID).

- CustomerName depends only on OrderID. It has nothing to do with BookID. This is a partial dependency.
- BookTitle depends only on BookID. It has nothing to do with OrderID.

**Solution:** We split the table into three parts:

- Orders Table: Keeps information about the order (Customer, Date) → depends on OrderID.
- Books Table: Keeps information about the book (Title, Category, Publisher) → depends on BookID.
- OrderDetails Table: Keeps Qty because quantity depends on both Order and Book.

- Orders

OrderID	Customer ID	Customer Name	Customer Email	CustomerAddress	Customer Phone	OrderDate	Total Price
1001	C001	D Beckham	david@gmaiil.com	7 ManU st, Madrid, ON, M7U R7D	777-777-2323	11/30/2025	54.97
1002	C002	C Ronaldo	CR7@gmaiLcom	7 Real st, Porto, ON, R7D P7G	777-777-7777	11/29/2025	29.99
1003	C001	D Beckham	david@gmaiil.com	7 ManU st, Madrid, ON, M7U R7D	777-777-2323	11/28/2025	34.99
1004	C003	L Messi	Goat@gmaiil.com	9 Nukamp, Barcia, ON, B9N A9H	999-999-9999	11/27/2025	54.48

- Books

BookID	BookTitle	BookISBN	UnitPrice	Category	PublisherID	PublisherName
B001	FreeKickMaster	978-1-4028-9462-6	20	Sports	P001	FIFABook
B002	How To Be Winner	978-1-59327-584-6	29.99	Autobiography	P002	MyLifeBook
B003	G.O.A.T!	978-1-250-03095-7	24.5	Autobiography	P003	AnimalBook
B004	Last Dance	978-0-545-01022-1	14.97	Autobiography	P002	MyLifeBook
B005	Become a Rich	978-0-306-40615-7	34.99	Investment	P001	FIFABook

- OrderDetails

OrderID	BookID	Qty
1001	B001	2
1001	B004	1
1002	B002	1
1003	B005	1
1004	B003	1
1004	B004	2

### Third Normal Form(3NF)

#### Problem:

- In the Orders table, CustomerName depends on CustomerID, not OrderID. ( $\text{OrderID} \rightarrow \text{CustomerID} \rightarrow \text{CustomerName}$ ). This is a transitive dependency.
- In the Books table, PublisherName depends on PublisherID, and Category (name) is repeated text.

**Solution:** We moved these dependent columns to their own tables.

- Created a Customer Table. Now Orders only keeps CustomerID.
- Created a Publisher Table. Now Books only keeps PublisherID.
- Created a Category Table. Now Books only keeps CategoryID.

- Customer

CustomerID (PK)	CustomerName	CustomerEmail	CustomerAddress	CustomerPhone
C001	D Beckham	<a href="mailto:david@gmail.com">david@gmail.com</a>	7 ManU st, Madrid, ON, M7U R7D	777-777-2323
C002	C Ronaldo	<a href="mailto:CR7@gmail.com">CR7@gmail.com</a>	7 Real st, Porto, ON, R7D P7G	777-777-7777
C003	L Messi	<a href="mailto:Goat@gmail.com">Goat@gmail.com</a>	9 Nukamp, Barcia, ON, B9N A9H	999-999-9999

- Book

<b>BookID (PK)</b>	<b>BookTitle</b>	<b>BookISBN</b>	<b>BookPrice</b>	<b>BookStock</b>	<b>PublisherID (FK)</b>	<b>CategoryID (FK)</b>
B001	FreeKickMaster	978-1-4028-9462-6	20	15	P001	CAT001
B002	How To Be Winner	978-1-5932-7-584-6	29.99	8	P002	CAT002
B003	G.O.A.T!	978-1-250-03095-7	24.5	12	P003	CAT002
B004	Last Dance	978-0-545-01022-1	14.97	20	P002	CAT002
B005	Become a Rich	978-0-306-40615-7	34.99	10	P001	CAT003

- Order

<b>OrderID (PK)</b>	<b>OrderDate</b>	<b>TotalAmount</b>	<b>CustomerID (FK)</b>
1001	11/30/2025	54.97	C001
1002	11/29/2025	29.99	C002
1003	11/28/2025	34.99	C001
1004	11/27/2025	54.48	C003

- OrderDetail

<b>OrderDetailID (PK)</b>	<b>OrderID (FK)</b>	<b>BookID (FK)</b>	<b>Qty</b>	<b>UnitPrice</b>
1	1001	B001	2	20
2	1001	B004	1	14.97
3	1002	B002	1	29.99
4	1003	B005	1	34.99
5	1004	B003	1	24.5
6	1004	B004	2	14.99

- Publisher

PublisherID <b>(PK)</b>	PublisherName
P001	FIFABook
P002	MyLifeBook
P003	AnimalBook

- Category

CategoryID <b>(PK)</b>	CategoryName
CAT001	Sports
CAT002	Autobiography
CAT003	Investment

## Phase 4: DDL statement

