

# Hands-on Data Modeling & Optimization

## Task 1: Conceptual, Logical, and

## Physical Data Modeling Scenario:

You are designing a database for an **online bookstore** that tracks book sales. The company needs a structured data model for books, authors, customers, and orders.

The **business rules** are:

1. A book **must** have at least one author.
2. A customer **must** exist before placing an order.
3. An order **must** contain at least one book.
4. Each order has a **total amount** calculated based on order details.

Below are the main **entities and attributes**:

Entity	Attributes
Book	Book_ID, Title, ISBN, Genre, Price
Author	Author_ID, Name, Country
Customer	Customer_ID, Name, Email, Phone, Address
Order	Order_ID, Customer_ID, Order_Date, Total_Amount
OrderDetails	Order_ID, Book_ID, Quantity, Price_Per_Unit

## Deliverables:

**1.1. Conceptual Model:** Create an ER diagram showing entities, attributes, and relationships (hint: 1:1, 1:M, M:M)

**1.2. Logical Model:** Convert entities into tables with primary and foreign keys

**1.3. Physical Model:** Assign data types to attributes

## Task 2: Normalization (1NF → 2NF → 3NF)

**Scenario:** imagine you are designing a database for a restaurant management application. The initial table contains data about the company's employees and their job assignments.

Here is the unnormalized data for employees:

employee_id	name	job_code	job	state_code	home_state
E001	Alice	J01	Chef	26	Michigan
E001	Alice	J02	Waiter	26	Michigan
E002	Bob	J02	Waiter	56	Wyoming
E002	Bob	J03	Bartender	56	Wyoming
E003	Alice	J01	Chef	56	Wyoming

### Deliverables:

- ✓ **2NF:** Remove partial dependencies
- ✓ **3NF:** Remove transitive dependencies