CL2005 - Database Systems Lab

4th Semester

Department of Computer Science

Section: 4D/4F

Prepared by

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Entity Relationship Diagram (ERD)

Objective:

- To understand the process of designing complex ER diagrams using **Chen notation**.
- To model real-world database scenarios with **entities, attributes, and relationships**.
- To apply concepts such as **weak entities, generalization, specialization, aggregation, and cardinality constraints**.

NOTE: Carefully read the following instructions

1. Submit a detailed ER diagram (Chen notation) for each case study.

2. Clearly label entities, attributes, relationships, and cardinality constraints.

3. Provide a written description of design decisions.

4. Submit a PDF document with your solutions.

5. Submission must be done on **Google Classroom** before the **deadline**: 10-February-2025, 1:40 PM

Task 1 | Airline Reservation	| 10 Marks

A global airline company requires a database system to manage flights, passengers, tickets, and crew members. The database must store information about flights, passengers, bookings, crew assignments, and baggage handling.

Entities and Attributes:

1. **Passenger** (*PassengerID, Name, Age, ContactNo, PassportNo*)
2. **Flight** (*FlightNo, Airline, DepartureTime, ArrivalTime, Source, Destination*)
3. **Ticket** (*TicketID, BookingDate, SeatNo, Price, Class, Status*)
4. **Crew** (*CrewID, Name, Role, Experience, ContactNo*)
5. **Baggage** (*BaggageID, Weight, Type, Status*)

Relationships:

- Passenger books Flight *(M:N)* (A passenger can book multiple flights, and a flight can have multiple passengers.)
- Passenger holds Ticket *(1:1)* (Each ticket is associated with a single passenger.)
- Crew is assigned to Flight *(M:N)* (A flight has multiple crew members, and each crew member can be assigned to multiple flights.)
- Passenger checks in Baggage *(1:M)* (Each passenger can check in multiple baggage items.)

Tasks:

1. Identify primary keys.
2. Draw an ER diagram using Chen notation.
3. Define cardinality constraints.
4. Identify weak entities (if applicable) and their relationships.

Task 2 | Hospital Management System	| 10 Marks

A large multi-specialty hospital needs a database system to manage patients, doctors, treatments, wards, and billing information. The system must also track surgeries, insurance, and patient medical history.

Entities and Attributes:
1. **Patient** (*PatientID, Name, Age, Gender, ContactNo, Address, BloodType*)
2. **Doctor** (*DoctorID, Name, Specialization, Experience, ContactNo*)
3. **Treatment** (*TreatmentID, Type, Cost, Duration*)
4. **Ward** (*WardNo, Type, Capacity, ChargesPerDay*)
5. **Bill** (*BillID, Amount, PaymentMethod, InsuranceCovered*)

6. **Insurance** (*PolicyNo, Provider, CoverageAmount, ExpiryDate*)

Relationships:

- Patient undergoes Treatment *(M:N)* (A patient may undergo multiple treatments, and each treatment can be given to multiple patients.)
- Doctor prescribes Treatment *(1:M)* (A doctor can prescribe multiple treatments, but each treatment is prescribed by a single doctor.)
- Patient is admitted to Ward *(1:1)* (Each patient is admitted to a single ward at a time.)
- Patient is billed under Bill *(1:1)* (Each patient has exactly one bill for a treatment.)
- Bill is covered by Insurance *(0:1)* (A bill may or may not be covered by insurance.)

Tasks:

1. Identify all entities, attributes, and relationships.
2. Draw an ER diagram using Chen notation.
3. Define weak entities and their dependency relationships.
4. Identify cardinality constraints.

Task 3	University Library Management System	10 Marks

A university library wants to maintain a record of books, students, faculty members, book loans, and publishers. The system should also track overdue books and associated fines.

Entities and Attributes:

1. **Book** *(BookID, Title, Author, ISBN, Genre, Edition, CopiesAvailable)*
2. **Student** *(StudentID, Name, Department, Email, PhoneNo, MembershipStatus)*
3. **Faculty** *(FacultyID, Name, Department, Email, PhoneNo, MembershipStatus)*
4. **Loan** *(LoanID, IssueDate, DueDate, ReturnDate, Status)*
5. **Publisher** *(PublisherID, Name, Address, ContactNo)*
6. **Fine** *(FineID, Amount, Reason, PaidStatus)*

Relationships:

- Student borrows Book (M:N) (A student can borrow multiple books, and each book can be borrowed by multiple students over time.)
- Faculty borrows Book (M:N) (A faculty member can borrow multiple books.)

- Loan is associated with Book and Student/Faculty (M:N) (Each loan refers to a book and a borrower.)
- Book is published by Publisher (M:1) (A book is published by one publisher, but a publisher can publish multiple books.)
- Fine is imposed on Student/Faculty (1:M) (A student or faculty member may have multiple fines.)

Tasks:

- Define all entities, attributes, and relationships.
- Design an ER diagram using Chen notation.
- Define cardinality constraints.
- Apply weak entity representation if needed.