# Database Design Recap

## The E-R Model

# Lesson Objectives

✅ Understand the **Entity-Relationship (E-R) model**
✅ Define **entities, attributes and relationships**
✅ Create a **basic E-R schema**
✅ Transform the E-R model into a **relational schema**

# What is a Database?

📌 A database is an organized collection of data

📌 It allows managing, storing and retrieving information

# Data vs Information

📌 **Data** → numbers, raw text
📌 **Information** → data with meaning

# What is the E-R Model?

📌 A tool for designing databases
📌 Defines entities, attributes and relationships

# Elements of the E-R Model

- ✅ Entities
- ✅ Attributes
- ✅ Relationships
- ✅ Primary keys and cardinality

# Entities

📌 Represent real-world objects
📌 Examples: **Student, Book, Customer**

# Attributes

📌 Describe the properties of an entity
📌 Examples: **Name, Surname, Email, Age**

# Relationships

📌 Connect two or more entities

📌 Examples: **A student borrows a book**

# Primary Keys

📌 Uniquely identify an entity
📌 Example: **Student ID**

# Relationship Cardinality

📌 **1:1** → One to one
📌 **1:N** → One to many
📌 **N:M** → Many to many

# Case Study 1: University Library

📌 Objective: Manage book loans

# Library Database Entities

✅ Users
✅ Books

# Library Relationships

📌 A **user** can borrow **multiple books**
📌 A **book** can have multiple **available copies**

# Library E-R Schema (Textual)

```
Users (id, name, email, user_type)
Books (id, title, author, genre, publication_year, available_copies)

Relationships:
User -< Loan >- Book
```

# Case Study 2: Sports Swimming Pool

📌 Objective: Manage bookings and lanes

# Swimming Pool Database Entities

- ✅ Customers
- ✅ Subscriptions
- ✅ Lanes
- ✅ Swimming Sessions

# Swimming Pool Relationships

📌 A **customer** can book **multiple sessions**
📌 Each **session** is managed by **an instructor**
📌 Each **lane** has a limited number of spots

# Swimming Pool E-R Schema (Textual)

```
Customers (id, name, email, registration_date, subscription_type)
Subscriptions (id, type, price, duration)
Lanes (id, lane_number, depth, width)
Instructors (id, name, specialization)
Sessions (id, time, level, max_participants, instructor_id)
Bookings (id, customer_id, session_id, lane_id, booking_date)

Relationships:
Customer -< Booking >- Session -< Lane
Session -< Instructor
```

# Lesson Summary

✅ Definition of **entities, attributes and relationships**
✅ Design of the **E-R model**
✅ Creation of the **Library and Swimming Pool schemas**