CLASS 1 – INTRODUCTION

19CSE202 - DATABASE MANAGEMENT SYSTEMS

Vidhya. S
Assistant Professor(Sr. Gr)
Department of Computer Science and Engineering
Amrita Vishwa Vidyapeetham
Coimbatore

INTRODUCTION

Session 1

1) Database System Applications
2) Purpose of Database Systems
3) View of Data
    3.1) Data Abstraction
    3.2) Instances and Schemas
    3.3) Data Models
4)Database Languages
    4.1) Data Manipulation Language
    4.2) Data Definition Language

Session 2

5) Overview of Relational Databases, Database Design & Transactions
6)Database Architecture
7)Database User and Administrators

OBJECTIVES

- What databases have you experienced or interacted with?

- Define basic terminologies and database characteristics.

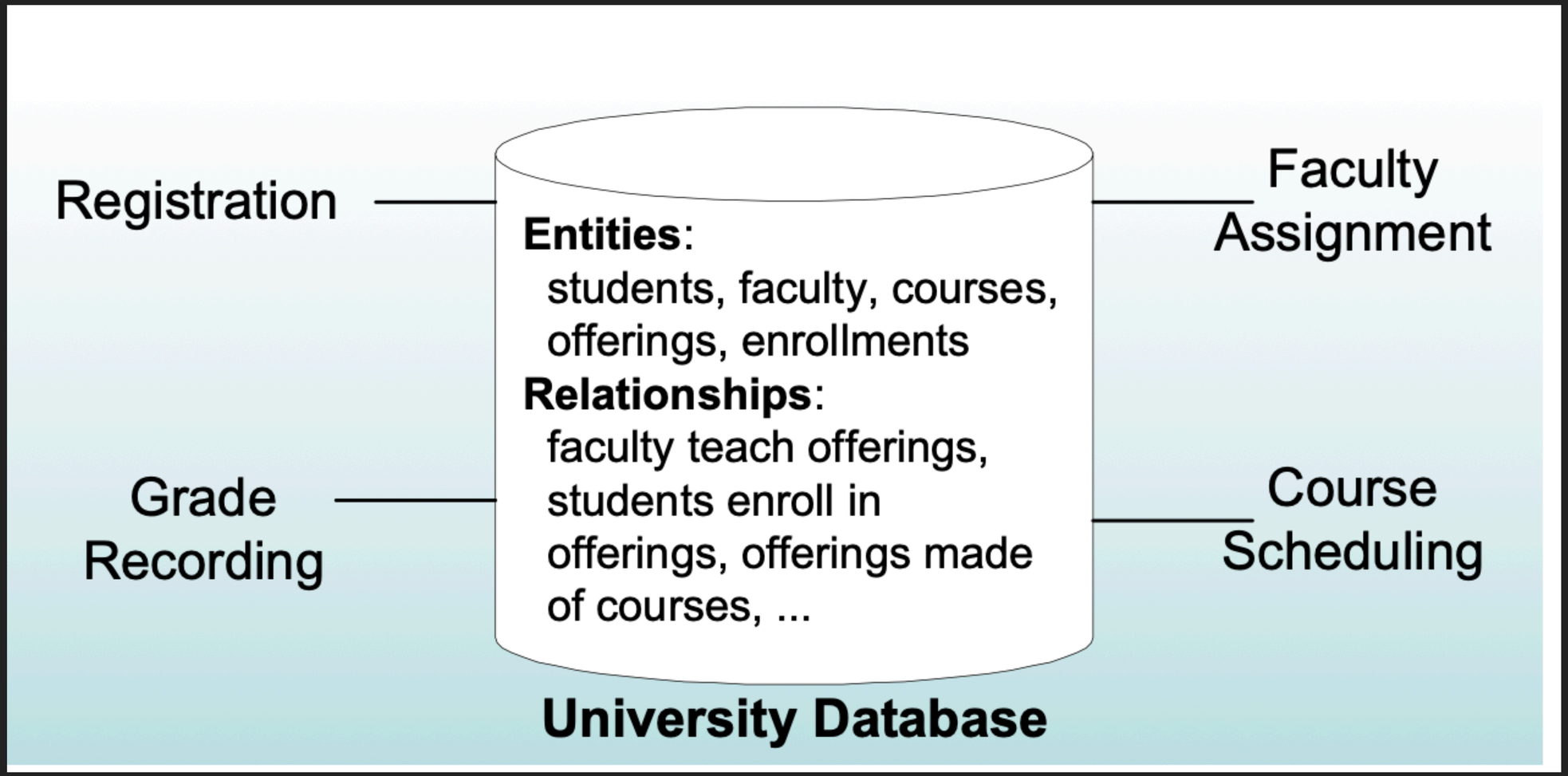
MOTIVATION

- Databases are crucial for daily operations and decision making in organisations
- Essential to organise data for retrieval and maintenance
- Database Management technology provides the foundation to manage long-term memory of organisations.

ESSENTIAL CHARACTERISTICS

- Persistent
- Inter-related
- Shared

UNIVERSITY DATABASE



FILE VS DATABASE

- Data redundancy and inconsistency
  - Multiple file formats, duplication of information in different files
- Difficulty in accessing data
  - Need to write a new program to carry out each new task
- Data isolation
  - Multiple files and formats
- Integrity problems
  - Integrity constraints (e.g., account balance > 0) become “buried” in program code rather than being stated explicitly
  - Hard to add new constraints or change existing ones

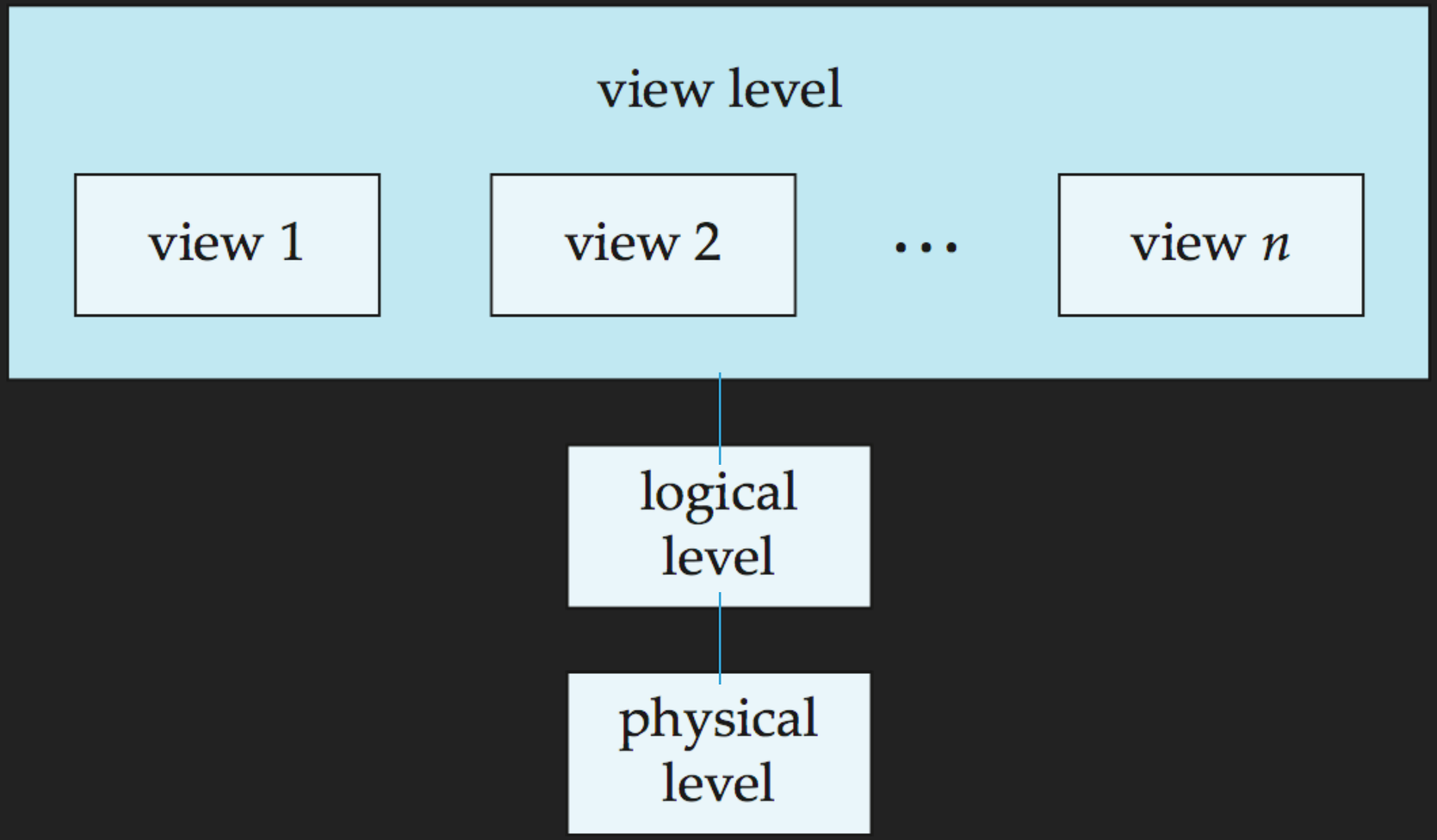
FILE VS DATABASE

- Atomicity of updates
  - Failures may leave database in an inconsistent state with partial updates carried out
  - Example: Transfer of funds from one account to another should either complete or not happen at all
- Concurrent access by multiple users
  - Concurrent access needed for performance
  - Uncontrolled concurrent accesses can lead to inconsistencies
    - Example: Two people reading a balance (say 100) and updating it by withdrawing money (say 50 each) at the same time
- Security problems
  - Hard to provide user access to some, but not all, data

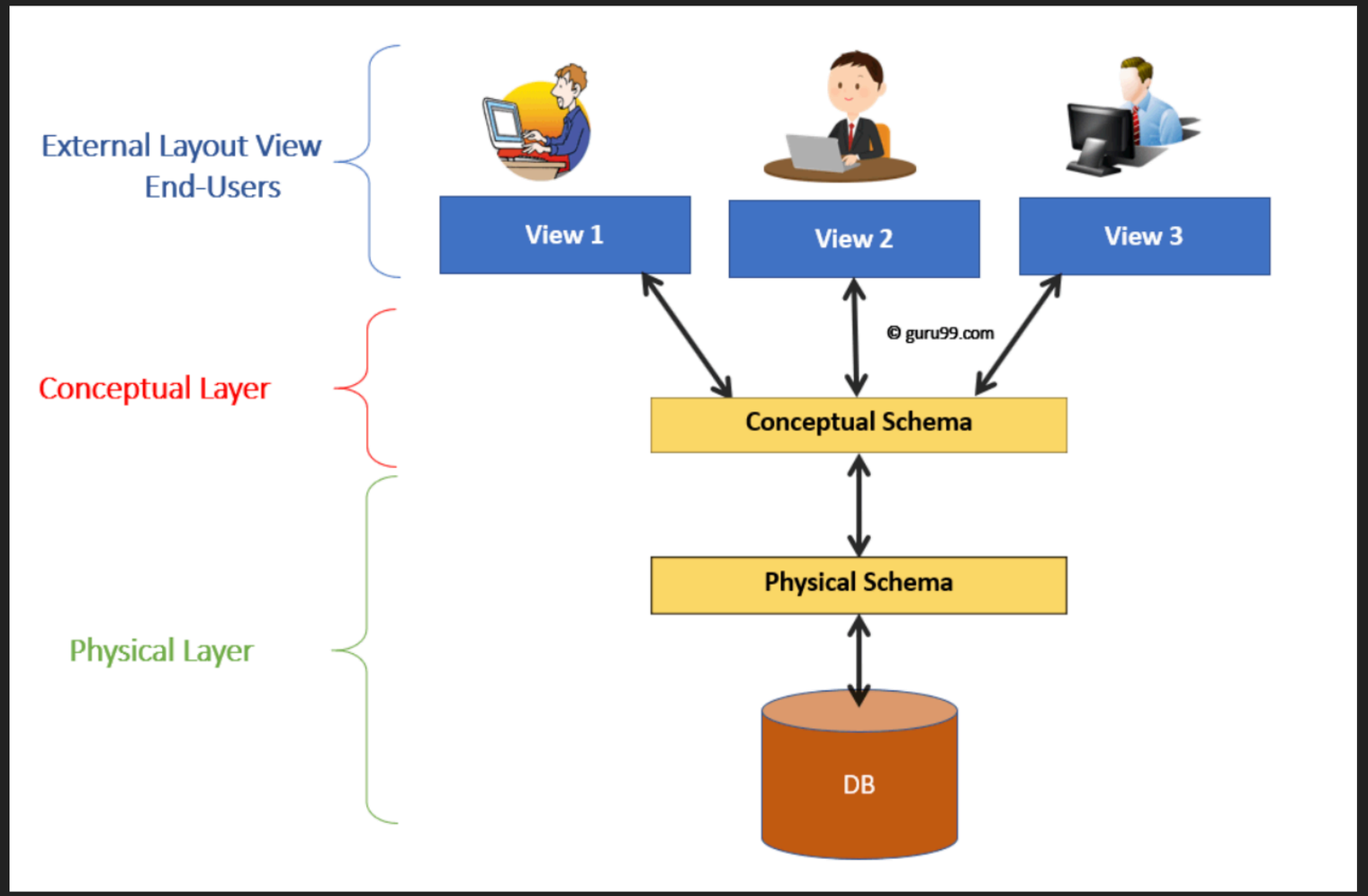
LEVELS OF ABSTRACTION

- Physical level: *how* the data are ac- tually stored. The physical level describes complex low-level data structures in detail.
- Logical level: describes *what* data are stored in the database, and what relationships exist among those data. The logical level thus describes the entire database in terms of a small number of relatively simple structures.
- View level: application programs hide details of data types. Views can also hide information (such as an employee's salary) for security purposes.

LEVEL OF ABSTRACTION



LEVEL OF ABSTRACTION



LEVELS OF ABSTRACTION

- Physical level: describes how a record (e.g., customer) is stored.
- Logical level: describes data stored in database, and the relationships among the data.

```
struct Students{
        ID : string;
        name : string;
        dept_name : string;
        salary : integer;
        };
```

- **View level:** Application programs hide details of data types. Views can also hide information (such as an employee's salary) for security purposes.

INSTANCES AND SCHEMAS

- Databases change over time as information is inserted and deleted. The collection of information stored in the database at a particular moment is called an **instance** of the database.
- The overall design of the database is called the database **schema**. Schemas are changed infrequently, if at all.

INSTANCES AND SCHEMAS

SCHEMA	INSTANCE
Visual representation of a database which is a set of rules that govern a database	Data stored in a database at a particular time
Formal description of the structure of the database	Set of information stored in a database at a particular time
Does not change frequently	Changes frequently

SCHEMAS

- Database systems have several schemas, partitioned according to the levels of abstraction.
- The P**hysical schema** describes the database design at the physical level,
- **Logical schema** describes the database design at the logical level.
- A database may also have several schemas at the view level, sometimes called **Subschemas**, that describe different views of the database.

DATA MODELS

- Definition: A collection of tools for describing
  - Data
  - Data relationships
  - Data semantics
  - Data constraints

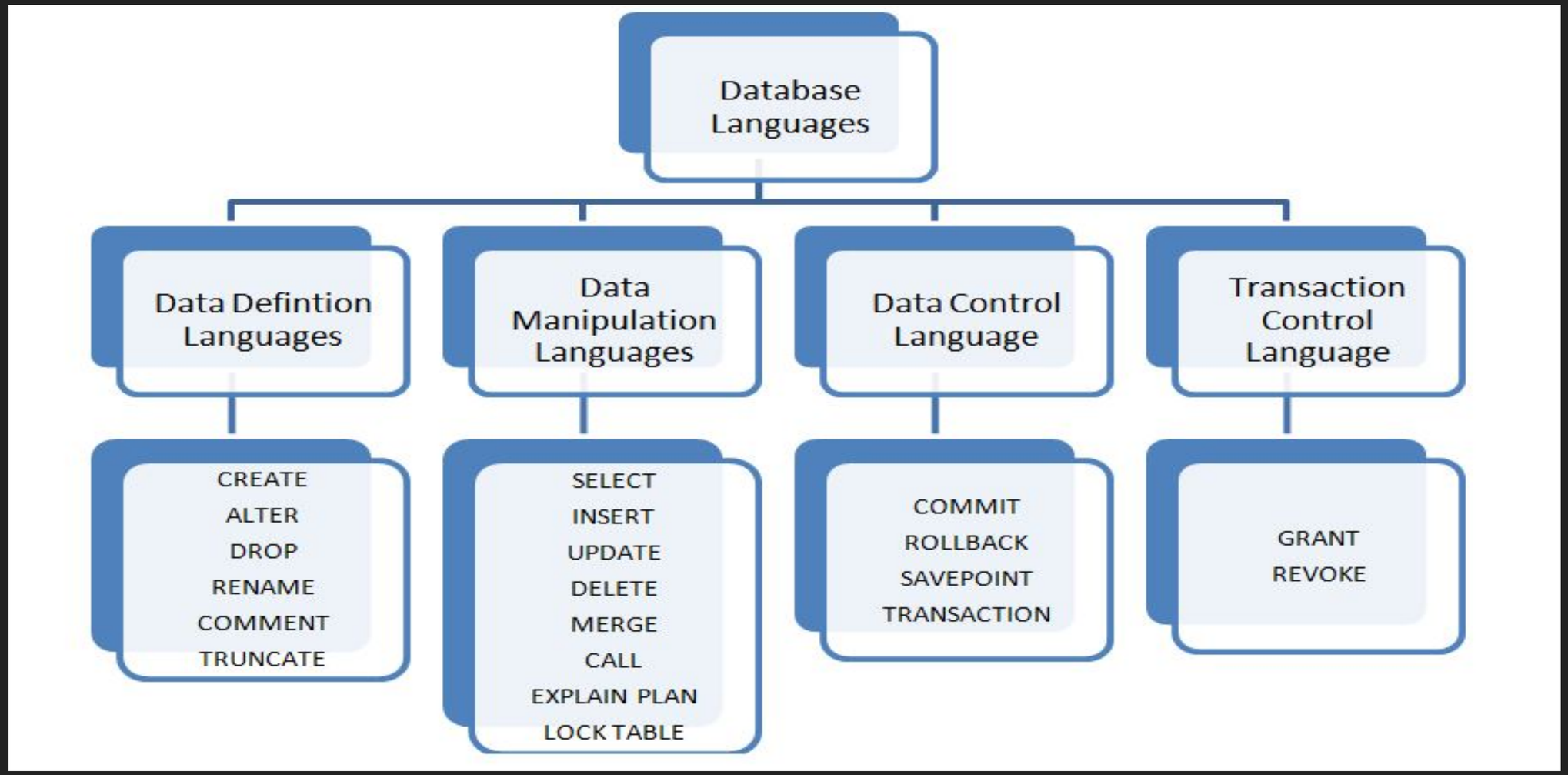
DATA MODELS

- Relational model
- Entity-Relationship data model (mainly for database design)
- Object-based data models (Object-oriented and Object-relational)
- Semistructured data model (XML)
- Other older models:
  - Network Model
  - Hierarchical model

DATABASE LANGUAGES

- D**ata-definition language** to specify the database schema
- **Data-manipulation language** to express database queries and updates.
- The data-definition and data-manipulation languages are not two separate languages; instead they simply form parts of a single database language, such as the widely used SQL language.

DATABASE LANGUAGES



Thank You