- **Database**: *Database is a single, large, organized collection of data that can be used simultaneously by many departments and users.*
- **Relational Database Design:** *Database design is the organisation of data according to a database model. In the relational model, data are represented in the form of tables. Each table has multiple columns, and each column has a unique name. Each row of the table represents one piece of information.*
- **Database Management System (DBMS):** *DBMS is software that manages and controls access to the database.*
- **Candidate Key**: *An attribute, or smallest set of attributes, that uniquely identifies a record within a relation.*
- **Primary key**: *Candidate key selected to identify records uniquely within relation.*
- **Foreign Key**: *A foreign key (FK) is a "copy" of a primary key that has been exported from one table and added as a new column in another table to represent the relationship between them*
- **Entity**: *a distinct object (a person, place, thing, etc) in the organisation that is to be represented in the database.*
- **Attribute**: *a property that describes some aspect of the object that we wish to record.*
- **Relationship**: *an association between entities.*
- **Base Relation**: *Named relation corresponding to a relation in conceptual schema, whose tuples are physically stored in a database.*
- **View**: *A virtual relation that does not necessarily exist in the database, with contents defined as a query on one or more base relations.*
- **Data Independence and the ANSI-SPARC Three-Level Architecture** (slide 13 of Ch. 2)
  - ***External Level:*** *Describes that part of database that is relevant to a particular user*
  - ***Conceptual Level****: Describes what data is stored in database and relationships among the data.*
  - ***Internal Level:*** *Physical representation of the database on the computer, describes how the data is stored in the database.*

- **Domain constraint**: *data type of attributes and the set of allowable values for one or more attributes.*

- **Entity integrity:** *In a base relation, no attribute of a primary key can be null.*

- **Referential integrity:** *If foreign key exists in a relation, either foreign key value must match a candidate key value of some record in its home relation or foreign key value must be wholly null.*

- **Database Design** (slide 4 of Ch. 10): The process of properly organizing the data to support the enterprise's mission statement and the mission objectives for the required database system
  - ***Three phases of Relational Database Design:***
    - ***Conceptual:*** *to build the conceptual representation of the database, which includes identification of the important relations, relationships, and attributes*
    - ***Logical:*** *to translate the conceptual data model into a logical data model and then to validate this model to check that it is structurally correct and able to support the required transactions*
    - ***Physical:*** *Process of producing a description of the implementation of the database on secondary storage; it describes the base relations, file organizations, and indexes used to achieve efficient access to the data, and any associated integrity constraints and security measures*

- **ER Modeling:** a top-down approach of DB design
  - ***Composite Attribute:*** *Attribute composed of multiple components, each with an independent existence. E.g. address attribute can be subdivided into street, city.*
  - ***Multi-valued Attribute:*** *Attribute that holds multiple values for each occurrence of an entity type. E.g. each occurrence of the Branch entity type can have multiple values for the telNo attribute.*
  - ***Derived Attribute:*** *Attribute that represents a value that is derivable from the value of a related attribute, or set of attributes, not necessarily in the same entity type. E.g. the duration attribute of the Lease entity is calculated from the rentStart and rentFinish attributes.*
  - ***Weak entity:*** *a weak entity cannot exist in the database unless another type of entity also exists in the database, but does not require that the*

identifier of that other entity be included as part of its own identifier.

- *A **binary relationship** is so called because it contains two entities and one association between them.*
- *A **ternary relationship** is so called because it contains three entities and two associations among them.*
- ***Recursive / unary relationship** is the relationship type where the same entity type participates more than once in different roles.*

- **Enhanced ER Modeling**
  - ***Disjoint constraint:** Describes relationship between members of the subclasses and indicates whether member of a superclass can be a member of one, or more than one, subclass.*
  - ***Participation constraint:** Determines whether every member in superclass must participate as a member of a subclass. May be mandatory or optional, represented as {Mandatory} and {Optional} respectively.*
  - ***Specialization:** Process of **maximizing differences** between members of an entity by identifying their distinguishing characteristics. Sub-classes are created as a result.*
  - ***Generalization:** Process of **identifying their common characteristics** among entities. Superclass is created as a result.*

- **Normalization:** a bottom-up approach of DB design
  - ***Determinant:** The **determinant** of a functional dependency refers to the attribute or group of attributes on the left-hand side of the arrow of a functional dependency.*
  - ***Full functional dependency:** the determinant has the *minimal* number of attributes necessary to maintain the dependency with the attribute(s) on the right hand-side.*
  - ***1NF:** A relation in which the intersection of each row and column contains one and only one value.*
  - ***2NF:** A relation that is in 1NF and every non-primary-key attribute is fully functionally dependent on the primary key.*

- ***3NF:*** *A relation that is in 1NF and 2NF and in which no non-primary-key attribute is transitively dependent on the primary key.*
- ***BCNF:*** *A relation is in BCNF if and only if every determinant is a candidate key.*

- **SQL (Structured Query Language)**
  - ***DDL (Data Definition Language):*** *for defining database structure:*
  - ***DML (Data Manipulation Language):*** *for retrieving and updating data*