Mapping, pg.1

- **Mapping** is the process of transforming the components of an ERD or EERD into the logical schema of a database.

Entities

- Strong entities in an ERD become **relations/tables** in a database.
    - Tables contains an identifying attribute called a **primary key (PK)**.
- Weak entities become relations whose primary key is composed of both the PK of the owner entity and the entity's own PK.
    - **Composite Key-** A primary key made up of more than one component.
    - **Foreign Key (FK)-** An attribute that references a primary key.

Attributes

- Composite attributes are made into simple attributes for relations.
- Multivalued attributes are made into atomic attributes.
    - Reduces repeating data and storage use.

Mapping, pg.2

Associative Entities

- Create 3 relations: 1 for each entity in the original relationship and 1 for the associative entity type.
- If an associative entity does not have an identifier, it is given a composite key of PKs for each of the other entities.
- If an associative entity does have an identifier, the identifier becomes the PK.

Ternary Relationships

- Create a new associative relation with a composite key composed of the PKs pf each participating entity type.
- When mapping ternary relationships, a **surrogate key** may be utilized.
    - A **surrogate key** is an assigned primary key not based on an identifying attribute of the relation.
    - A surrogate key may be needed if one or more of the following conditions is true…
        - the relation has a composite PK.
        - the natural PK is inefficient or too complex.
        - the natural key is periodically reused and cannot be guaranteed to remain unique overtime.

Mapping, pg.3

Unary (or Recursive) Relationship

- In a 1:M or M:1 relationship between attributes…
  - a FK is added to the relation that references its PK.
- In a M:N relationship between attributes…
  - a second table, an associative relation, is created whose PK is a composite key made up of its own PK and the PK of the original table.

Binary Relationships

- In a 1:M or M:1 relationship…
  - The PK of the entity on the one-side of the relationship serves as a FK for the entity on the many-side.
- In a 1:1 relationship…
  - The PK of one of the entity types serves as FK for the other entity type.
- In a M:N relationship…
  - An additional relation is created whose PK is a composite key made of the PKs from all participating entities.

Mapping, pg.4

Supertype and Subtype Relationships

- Each entity is created as a separate relation and the PK of the supertype becomes a FK for each subtype. The supertype is also assigned a **subtype discriminator**.
    - A **subtype discriminator** is an attribute of the supertype entity that defines the target subtype of the specific instance.

Normalization

- **Normalization** in database design is the process of organizing data to reduce redundancy and improve data integrity.

First Normal Form (1NF)

- A relation is in 1NF when all of its attributes (columns) are single-valued.

Second Normal Form (2NF)

- A table is in 2NF when all **partial functional dependencies** have been removed.
    - A **partial functional dependency** is present when a non-key attribute is reliant on only part of the relation's PK. Each non-key attribute should rely on the whole PK.

Third Normal Form (3NF)

- A relation is in 3NF when all **transitive dependencies** have been removed.
    - A **transitive dependency** is present when a non-key attribute relies on another non-key attribute. All attributes should only be reliant on the PK.