Structured Query Language
SQL - Day 3

Agenda

- **ER Diagram**
- **Relationship**
  - ➤ **One : One**
  - ➤ **One : Many**
  - ➤ **Many : One**
  - ➤ **Many : Many**
- **Cardinality Ratio.**
- **Strong Entity**
- **Weak Entity**
- **Weak Relationship**
- **Identifying Relationship**
- **Participation**
  - ➤ **Total Participation**
  - ➤ **Partial Participation**
- **Diagrams/Notations Used in ER Diagram.**
- **Case Study**

What is an ER Diagram?

An Entity relationship diagram (ERD) shows the relationships of entity sets stored in a database. By defining the entities, their attributes, and showing the relationships between them, an ER diagram illustrates the logical structure of databases. ER diagrams are used to sketch out the design of a database.
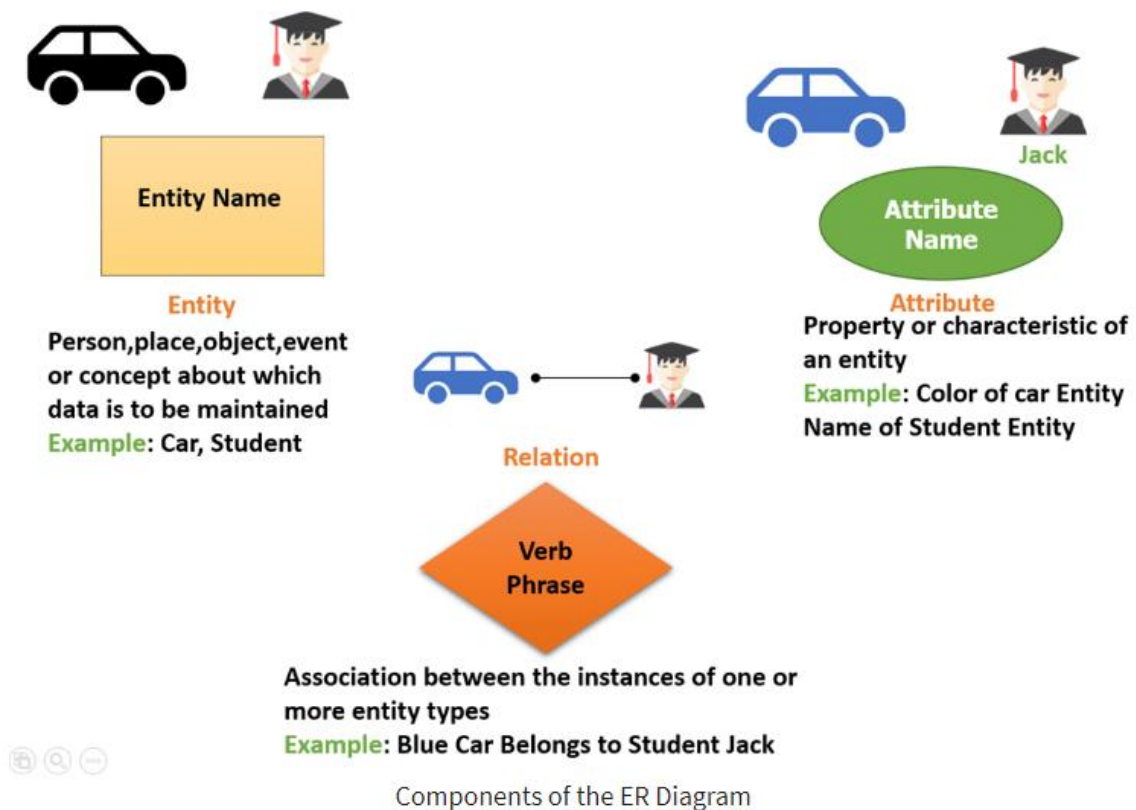
Why ER Diagram?

ER diagram helps to analyse data requirements systematically to produce a well-designed database. So, it is considered a best practice to complete ER modelling before implementing your database.

Example of ER Diagram?

For example, in a University database, we might have entities for Students, Courses, and Lecturers. Student's entity can have attributes like Rollno, Name, and DeptID. They might have relationships with Courses and Lecturers.

Entity
Person,place,object,event or concept about which data is to be maintained
Example: Car, Student

Relation
Association between the instances of one or more entity types
Example: Blue Car Belongs to Student Jack

Attribute
Property or characteristic of an entity
Example: Color of car Entity Name of Student Entity

Components of the ER Diagram

Relationship/ Cardinality Ratio & Types of Relationship

What is Relationship/ Cardinality Ratio?

Association between two entities is considered as relationship.

Cardinality tells how many times the entity of an entity set participates in a relationship
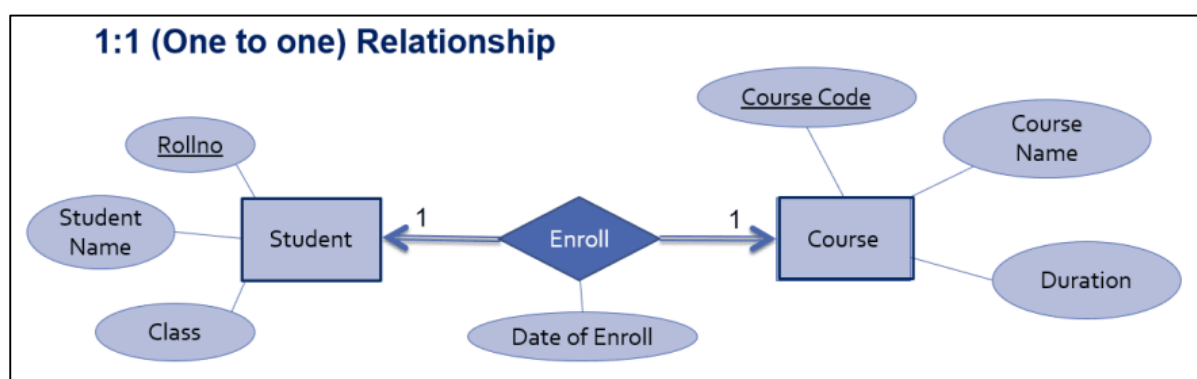
Types of Relationship/ Cardinality Ratio:

- One : one
- One : Many
- Many : Many
- Many : One

One : One Relationship

In One-to-one relationship, one record in a table is associated with one and only one record in another table.

For Example:

Consider same relationship set enroll exist between entity sets student and course , which means one student can enroll in only one courses

One : Many Relationship

A one-to-many relationship occurs when one record in a table are associated with multiple records in another table.

For Example:

Consider 1:M relationship set enrolled exist between entity sets student and course as follow.
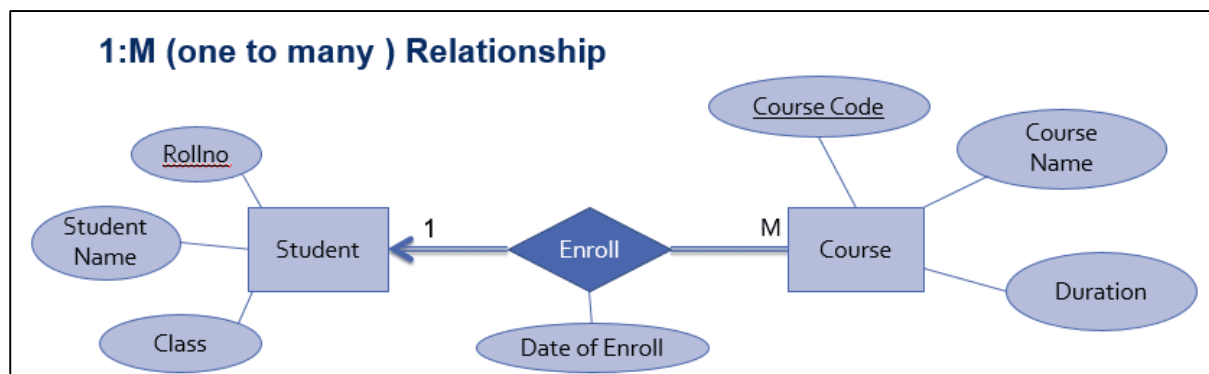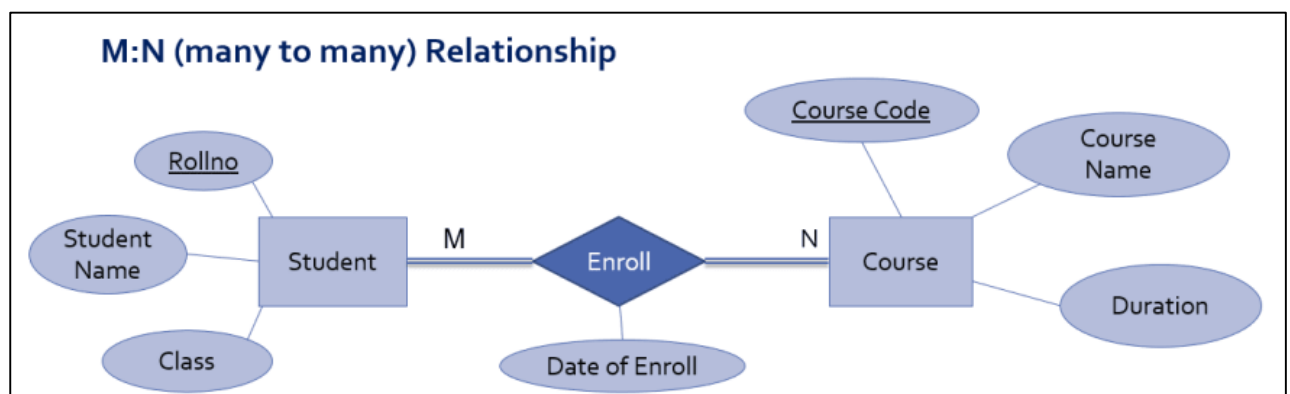

Many : Many Relationship.

A many-to-many relationship occurs when multiple records in a table are associated with multiple records in another table.

For Example:

Consider same relationship set enrolled exist between entity sets student and course ,which means multiple student can enroll in multiple courses.
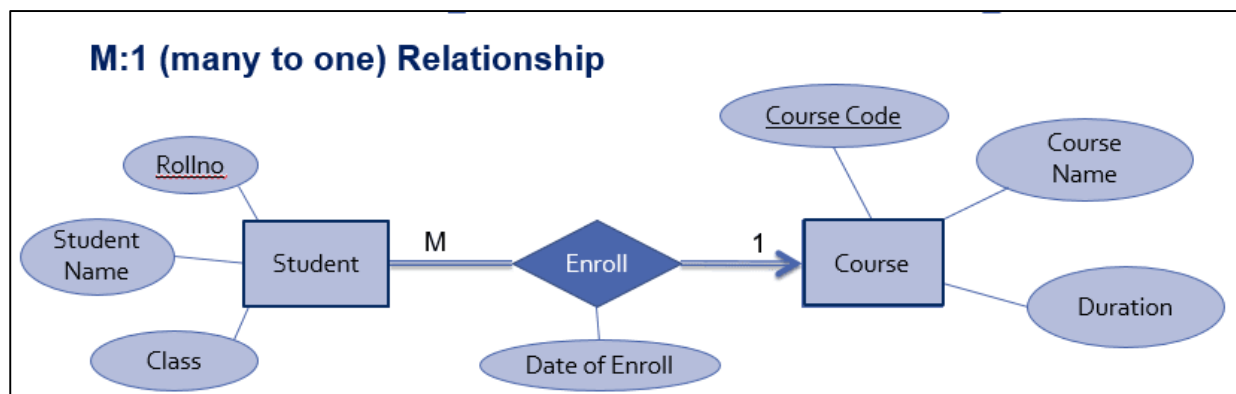
Many : One Relationship.

In Many-to-one relationship many side will keep reference of the one side.

For Example:

Consider same relationship set enroll exist between entity sets student and course . but here student is many side entity set while course is one side entity set. Which means many student can enroll in one course.

What is Week Entity.?

A weak entity is an entity set that does not have sufficient attributes for Unique Identification of its records. Simply a weak entity is nothing but an entity which does not have a primary key attribute.

Representation:

A double rectangle is used for representing a weak entity set

The double diamond symbol is used for representing the relationship between a strong entity and weak entity which is known as identifying relationship

Double lines are used for presenting the connection with a weak entity set with relationship.

Example for weak entity

In the ER diagram, we have two entities building and apartment.

Building is a strong entity because it has a primary key attribute called building number which is capable of uniquely identifying all the flats present in the apartment.

Unlike building, apartment is weak entity because it does not have any primary key and door number here acts only as a discriminator because door number cannot be used as a primary key, there might be multiple flats in the building with the same door number or on different floors.
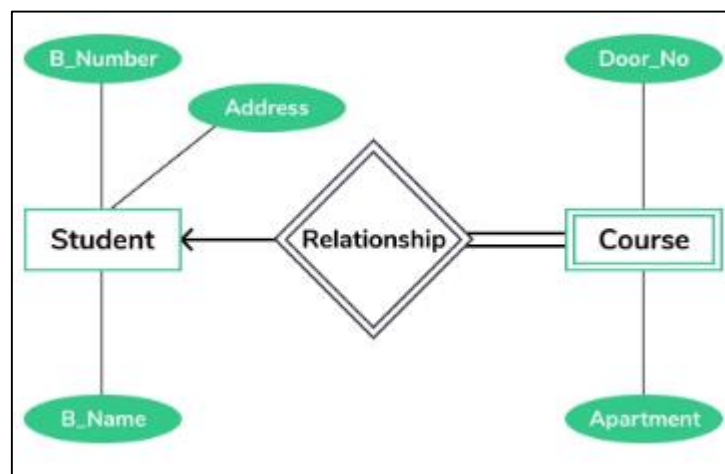
What is Strong entity?

A strong entity set is an entity that contains sufficient attributes to uniquely identify all its entities. Simply strong entity is nothing but an entity set having a primary key attribute or a table which consists of a primary key column.

The primary key of the strong entity is represented by underlining it.

Representation

The strong entity is represented by a single rectangle.

Relationship between two strong entities is represented by a single diamond.

Examples for the strong entity

Consider the ER diagram which consists of two entities student and course

Student entity is a strong entity because it consists of a primary key called student id which is enough for accessing each record uniquely

The same way, course entity contains of course ID attribute which is capable of uniquely accessing each row it is each course details
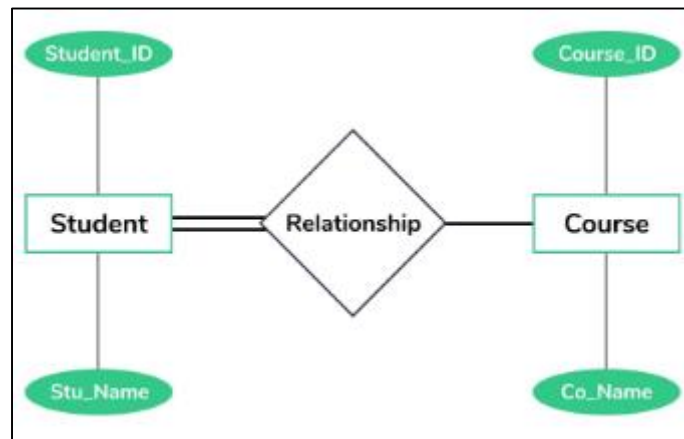
Difference between Strong Entity and Week Entity.

Strong Entity	Week Entity
1) Strong entity always has a primary key.	1) Will not have a primary key but it has partial discriminator key
2) It is not dependent on any other entity.	2) Which entity is dependent on the strong entity
3) Represented by a single rectangle.	3) Represented by double rectangle
4) Relationship between two strong entities is represented by a single diamond.	4) Relationship between a strong entity and the weak entity is represented by double Diamond.
5) A strong entity has **may or may not have total participation**	5) It has always total participation.

What is identifying relationship.?

An identifying relationship is a relationship between two entities in which an instance of a child entity is identified through its association with a parent entity, which means the child entity is dependent on the parent entity for its identity and cannot exist without it.

What is Total Participation.?

Total Participation is when each entity in the entity set occurs in at least one relationship in that relationship set."

For example, Consider three entities Users, Buyers and Sellers, if a company policy states that every User must be a Seller or Buyer, then a User entity cannot be existing without being a Buyer or Seller. So, this participation is called total participation meaning that every entity in the total set of User entities must be related to a Buyer or Seller entity.

What is Partial Participation.?

Partial Participation is when each entity in the entity set may not occur in at least one relationship in that relationship set"

For example, consider two entities Person and Student related with the help of relationship Status. Here, not all Persons are expected to be a Student (also there may be employees, retiree etc.), so the participation is called partial participation.
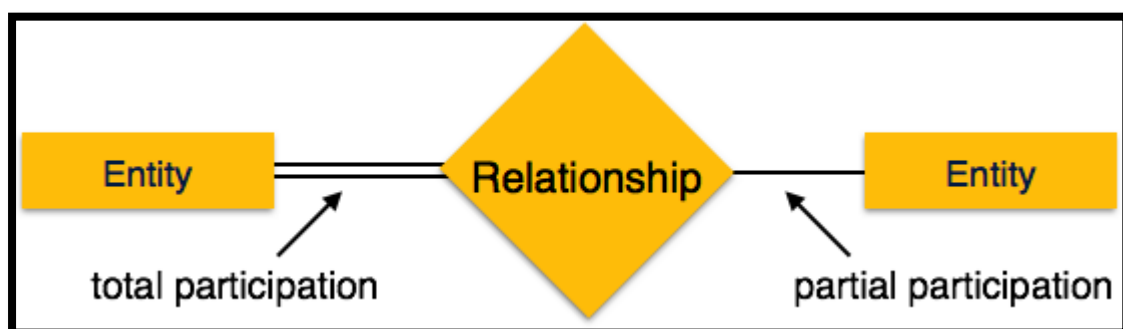
Different Symbols of ER Model

Symbol	Meaning
▭	Represents Entity
◯	Represents Attribute
◇	Represents Relationship
—	Links Attribute(s) to entity set(s) or Entity set(s) to Relationship set(s)
◎ (double ellipse)	Represents Multivalued Attributes
⬭ (dotted ellipse)	Represents Derived Attributes
= (double line)	Represents Total Participation of Entity
▭ (double rectangle)	Represents Weak Entity
◈ (double diamond)	Represents Weak Relationships
(composite ellipses)	Represents Composite Attributes
⊖ (ellipse with underline)	Represents Key Attributes / Single Valued Attributes

Case Study:

University ER Diagram

In university, a student enrols in courses. A student can enrol to one or more courses. Each course is taught by a single professor. To maintain instruction quality, a professor can deliver only one course.

Steps to create ER Diagram.

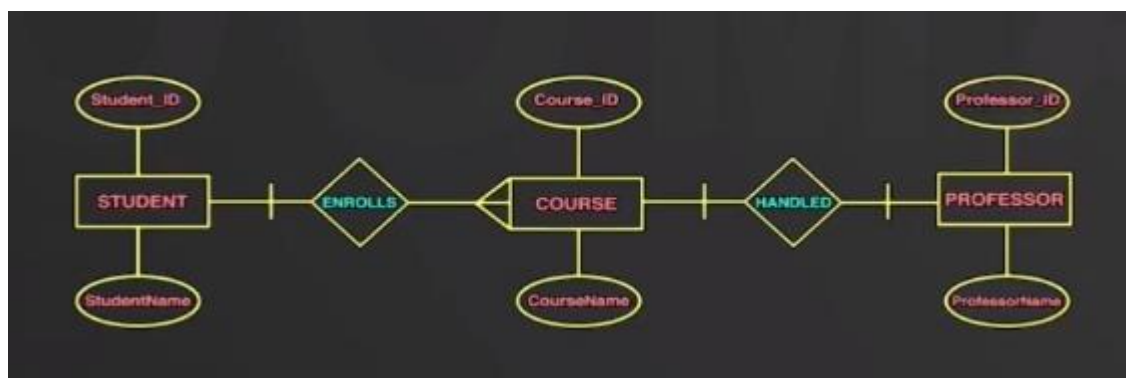Step 1: Identify the number of entities.

Step 2: Establish the relationship between the entities.

Step 3: Identify the cardinal ratio between the entities.

Step 4: Identify the number of attributes associated to each entity.

Step 5: Identity the type of each attribute.

ER Diagram.

Thank You☺☺