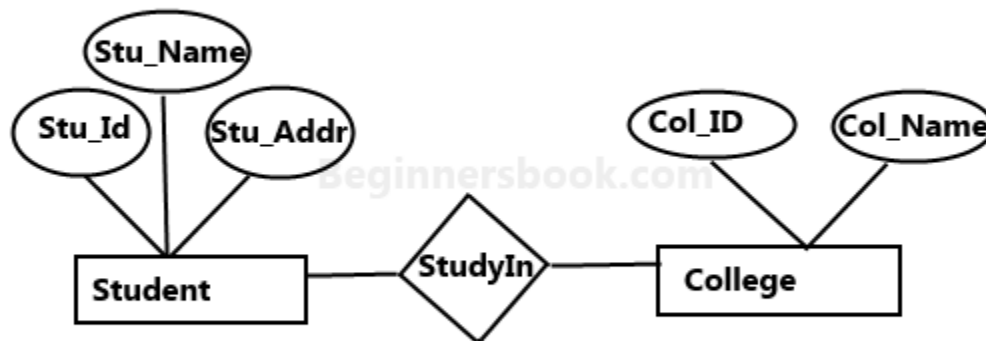**ER Diagram in DBMS:**

➢ An **Entity–relationship model (ER model)** describes the structure of a database with the help of a diagram, which is known as **Entity Relationship Diagram (ER Diagram)**.
➢ An ER model is a design or blueprint of a database that can later be implemented as a database.
➢ The main components of E-R model are: entity set and relationship set.

A simple ER Diagram:

Sample E-R Diagram

➢ In the above diagram we have **two** entities **Student** and **College** and their **relationship**.
➢ The relationship between Student and College is **many** to **one** as a college can have many students however a student cannot study in multiple colleges at the same time.
➢ Student entity has attributes such as Stu_Id, Stu_Name & Stu_Addr.
➢ College entity has attributes such as Col_ID & Col_Name.

Components of a ER Diagram
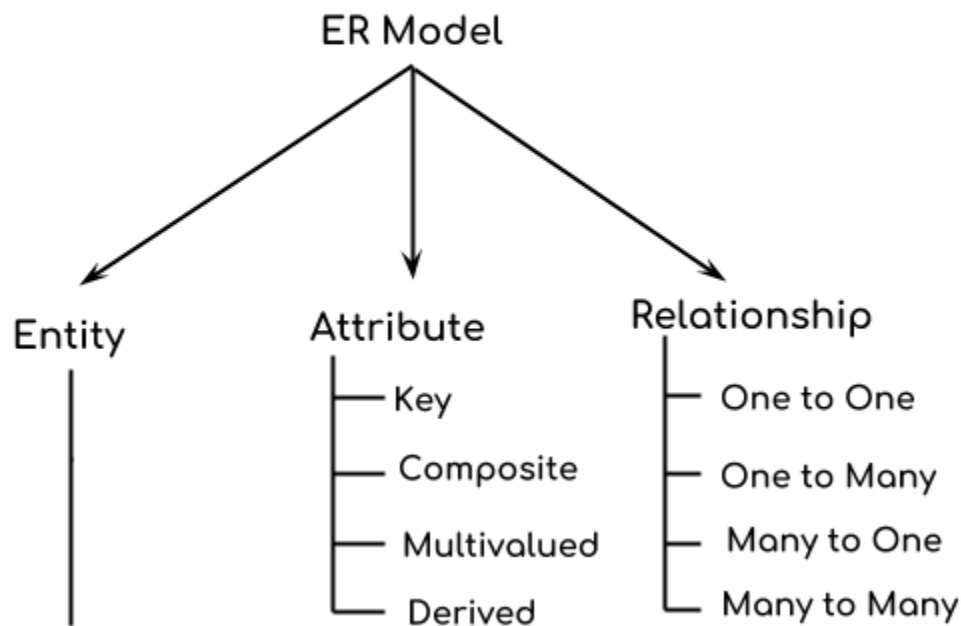
As shown in the above diagram, an ER diagram has three main components:
1. Entity
2. Attribute
3. Relationship

1. Entity

An entity is an object or component of data. An entity is represented as rectangle in an ER diagram.

For example: In the following ER diagram we have two entities Student and College and these two entities have many to one relationship as many students study in a single college. We will read more about relationships later, for now focus on entities.
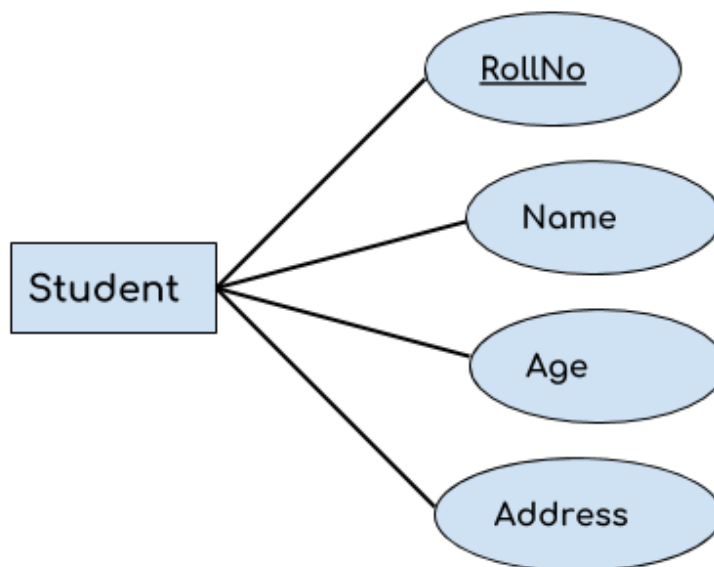
2. Attribute

An attribute describes the property of an entity. An attribute is represented as Oval in an ER diagram. There are four types of attributes:
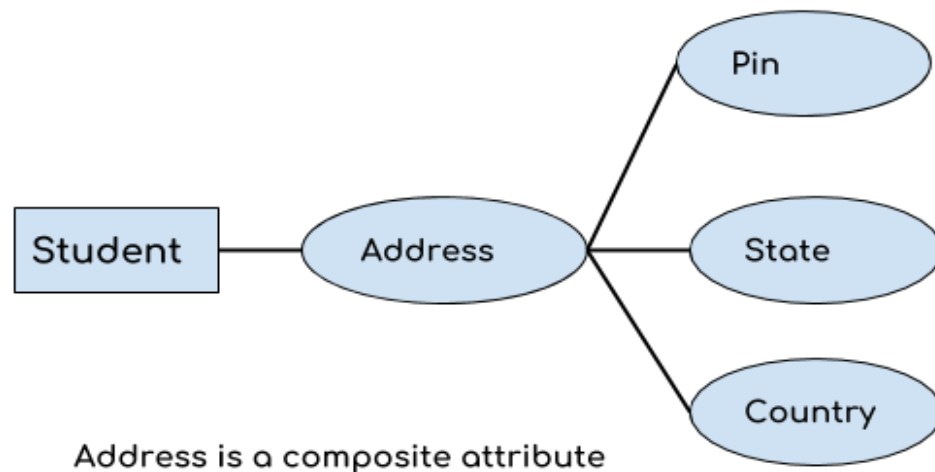
1. Key attribute
2. Composite attribute
3. Multivalued attribute
4. Derived attribute

1. Key attribute:

A key attribute can uniquely identify an entity from an entity set. For example, student roll number can uniquely identify a student from a set of students. Key attribute is represented by oval same as other attributes however the **text of key attribute is underlined**.

2. Composite attribute:


Address is a composite attribute

An attribute that is a combination of other attributes is known as composite attribute. For example, In student entity, the student address is a composite attribute as an address is composed of other attributes such as pin code, state, country.

3. Multivalued attribute:

An attribute that can hold multiple values is known as multivalued attribute. It is represented with **double ovals** in an ER Diagram. For example – A person can have more than one phone numbers so the phone number attribute is multivalued.

4. Derived attribute:

A derived attribute is one whose value is dynamic and derived from another attribute. It is represented by **dashed oval** in an ER Diagram. For example – Person age is a derived attribute as it changes over time and can be derived from another attribute (Date of birth).
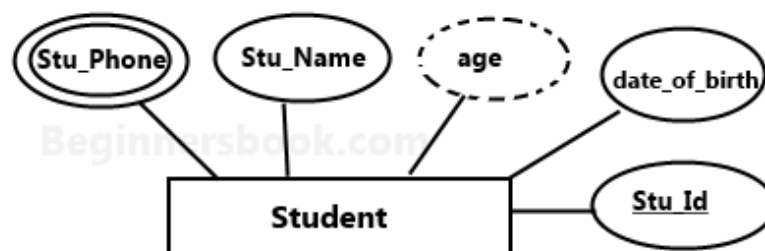
3. Relationship

A relationship is represented by diamond shape in ER diagram, it shows the relationship among entities. There are four types of relationships:

1. One to One
2. One to Many
3. Many to One
4. Many to Many

1. One to One Relationship

Person ——1——— < has > ——1——— Passport

When a single instance of an entity is associated with a single instance of another entity then it is called one to one relationship. For example, a person has only one passport and a passport is given to one person.

2. One to Many Relationship

Customer ——1——— < placed > ——M——— Order

When a single instance of an entity is associated with more than one instances of another entity then it is called one to many relationship. For example – a customer can place many orders but a order cannot be placed by many customers.

3. Many to One Relationship

Student —M Study 1— College

When more than one instances of an entity is associated with a single instance of another entity then it is called many to one relationship. For example – many students can study in a single college but a student cannot study in many colleges at the same time.

4. Many to Many Relationship

Student —M Assigned M— Project

When more than one instances of an entity is associated with more than one instances of another entity then it is called many to many relationship. For example, a can be assigned to many projects and a project can be assigned to many students.