UNIT -1
## Enhanced Entity-Relationship Model (EER model)

EER is a high-level data model that incorporates the extensions to the original ER model. Enhanced ER Diagrams are high level models that represent the requirements and complexities of complex database.

In addition to ER model concepts EE-R includes −

- Subclasses and Super classes.
- Specialization and Generalization.
- Category or union type.
- Aggregation.

Subclasses and Super class

- o Super class is an entity that can be divided into further subtype.
- For **example** − consider Shape super class.
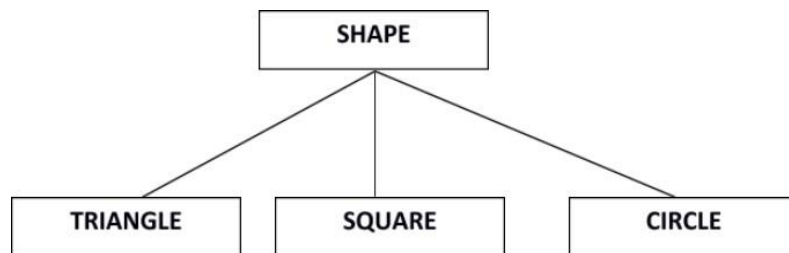
- Super class shape has sub groups: Triangle, Square and Circle.
- Sub classes are the group of entities with some unique attributes. Subclass inherits the properties and attributes from super class.

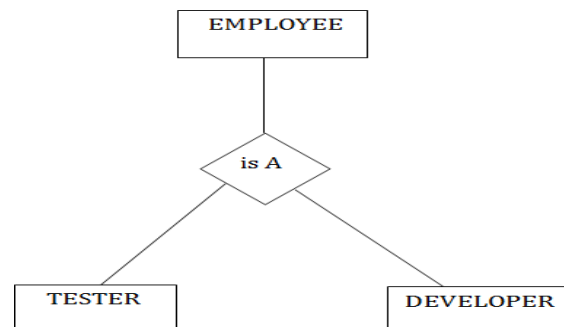### Specialization and Generalization

- **Generalization** is like a bottom-up approach in which two or more entities of lower level combine to form a higher level entity if they have some attributes in common.
- In generalization, entities are combined to form a more generalized entity, i.e., subclasses are combined to make a superclass.

For example, Faculty and Student entities can be generalized and create a higher level entity Person.
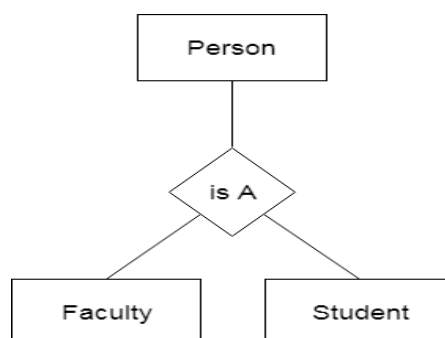
- **Specialization** is a top-down approach, and it is opposite to Generalization. In specialization, one higher level entity can be broken down into two lower level entities.
- Specialization is used to identify the subset of an entity set that shares some distinguishing characteristics.
- Normally, the superclass is defined first, the subclass and its related attributes are defined next, and relationship set are then added.

For example: In an Employee management system, EMPLOYEE entity can be specialized as TESTER or DEVELOPER based on what role they play in the company.


For example, in the bellow diagram we have 3 sub entities Car, Truck and Motorcycle. The three entities can be generalized into one super class named as **Vehicle (Generalization).**

Specialization is a process of identifying subsets of an entity that share some different characteristic. It is a top down approach in which one entity is broken down into low level entity i.e., Vehicle entity can be a Car, Truck or Motorcycle (**Specializations**).
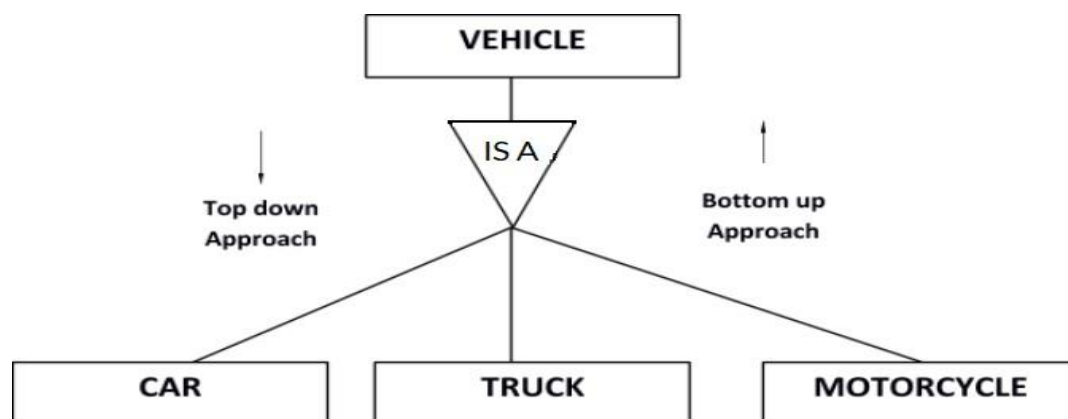
- Relationship of one super or sub class with more than one super class.
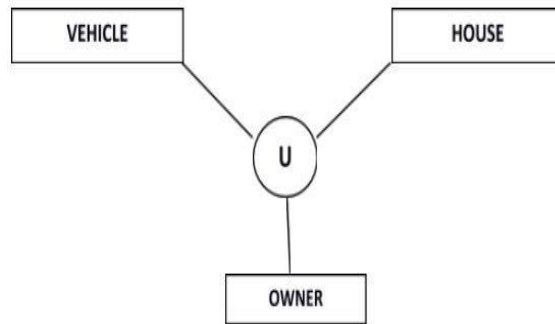
- Owner is the subset of two super class: Vehicle and House.

Aggregation

In aggregation, the relation between two entities is treated as a single entity. In aggregation, relationship with its corresponding entities is aggregated into a higher level entity.

For example: Centre entity offers the Course entity act as a single entity in the relationship which is in a relationship with another entity visitor. In the real world, if a visitor visits a coaching Centre then he will never enquiry about the Course only or just about the Centre instead he will ask the enquiry about both.
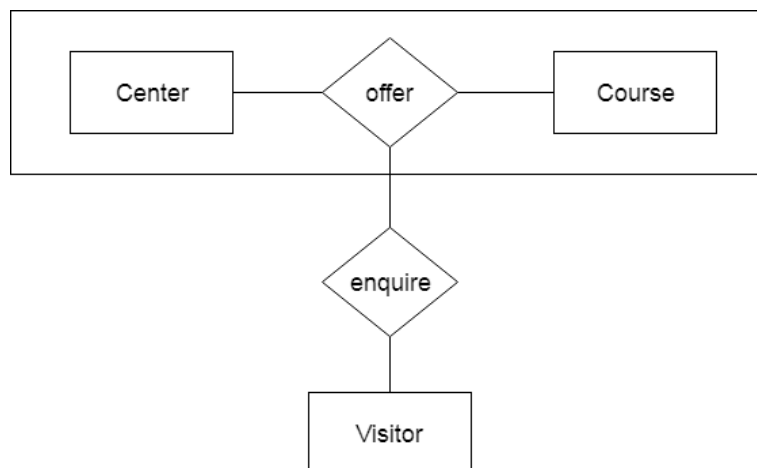

IsA Relationship and Attribute Inheritance

This relationship is called *IsA*. Some texts will call this an IsA relationship, but **do not confuse** with the concept of relationship between entities.

- Freshman IsA Student, an eagle IsA bird
- The two entities represented by IsA are always descriptions of the same real-world object
- Typically used in databases to be implemented as Object Oriented Models.

- The upper entity type (connected to the apex of the IsA triangle) is the more abstract/general entity type (super type) from which the lower entities inherit its attributes.
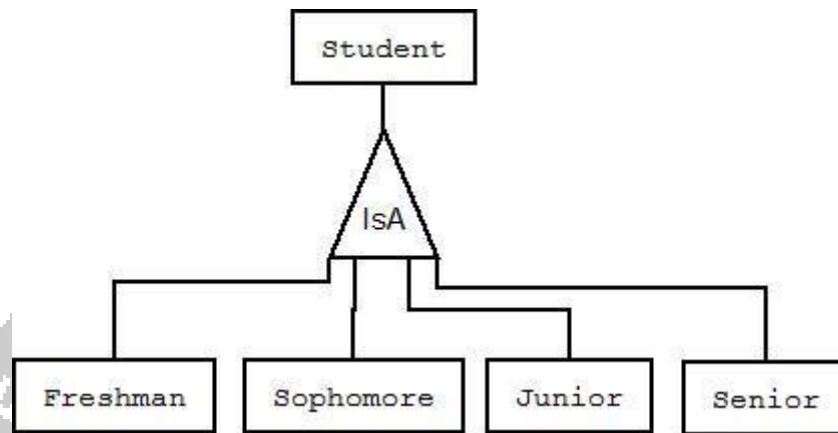
Properties of IsA

1. Inheritance - All attributes of the supertype apply to the subtype.

- E.g., *An a*ttribute of **Student** applies to **Freshman**
- *The subtype inherits all attributes of its supertype.*
- The key of the supertype is also the key of the subtype

2. Transitivity - This property creates a hierarchy of IsA relationships

- **Student** is subtype of **Person**,
  Freshman is subtype of **Student**,
  therefore **Freshman** is also a subtype of **Person**