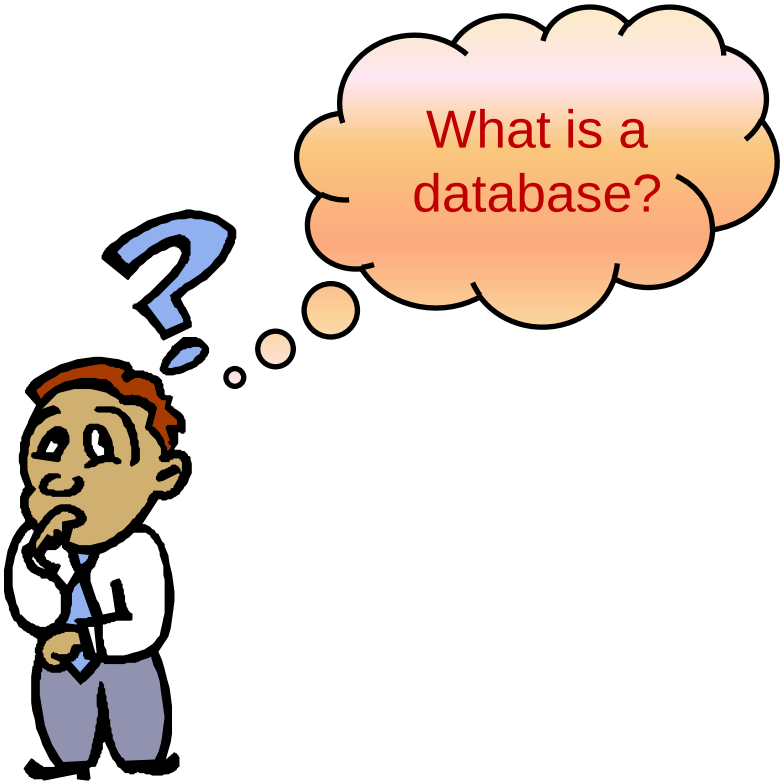
Rationale

- Database is an integral part of an organization. Aspiring database developers should be able to efficiently design and implement databases.
- Knowledge of these will enable the developers to build robust database solutions.
- This module will help students to understand the concepts related to relational databases.

Objectives

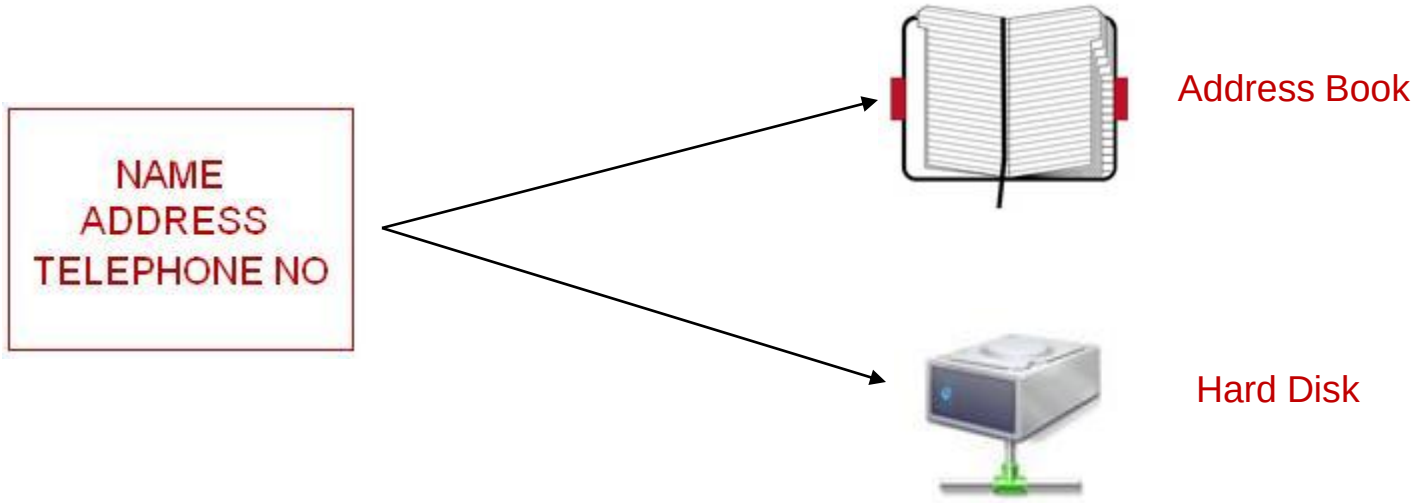
- In this session, you will learn to:
  - Define a database management system
  - Describe the types of data models

Database Management Systems



Database Management Systems (Contd.)

- A database is a collection of logically related data.
- Data means known facts, which are meaningful and can be recorded.
- For example:



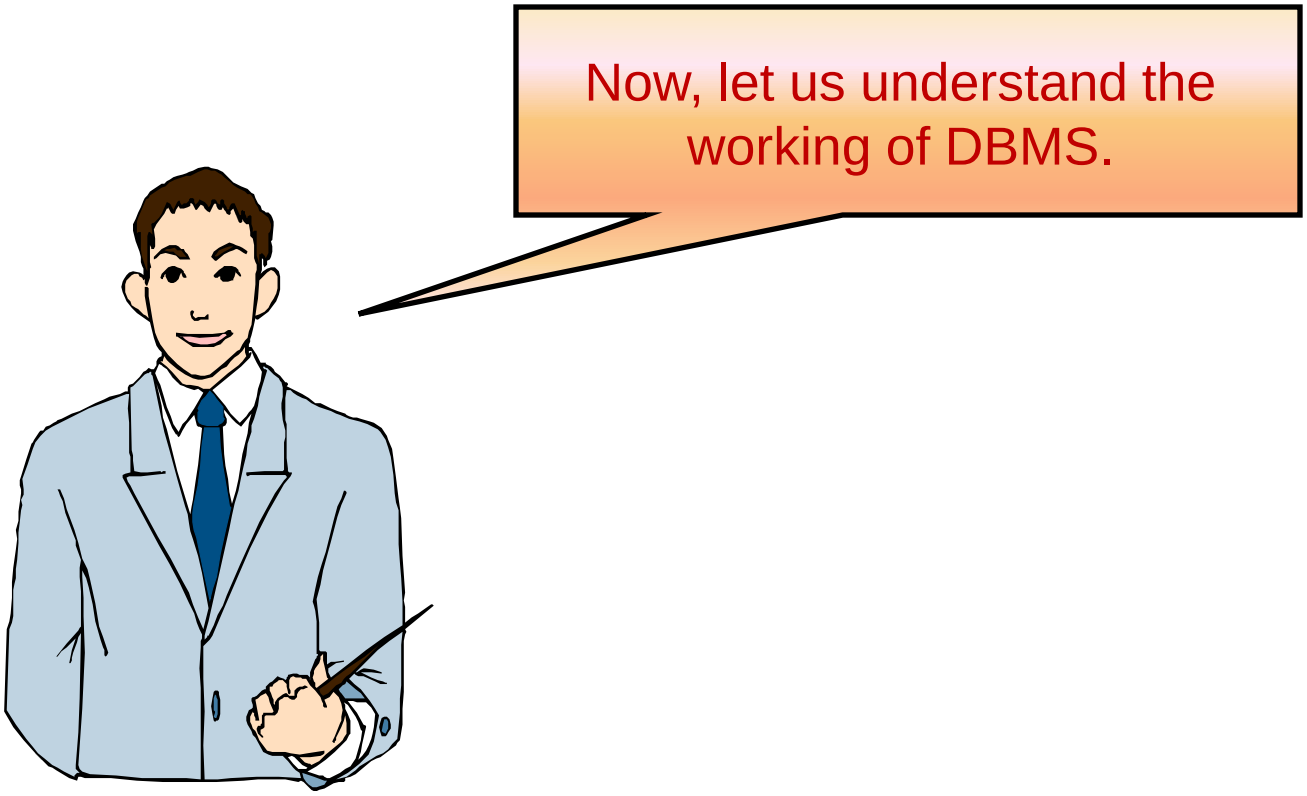
Database Management Systems (Contd.)

- Database Management Systems (DBMS) is the software required to perform the task of maintaining databases.
- Management of data involves:
  - Defining structures for data storage.
  - Providing methods for data manipulation, such as adding, editing, and deleting data.
  - Providing data security against unauthorized access.

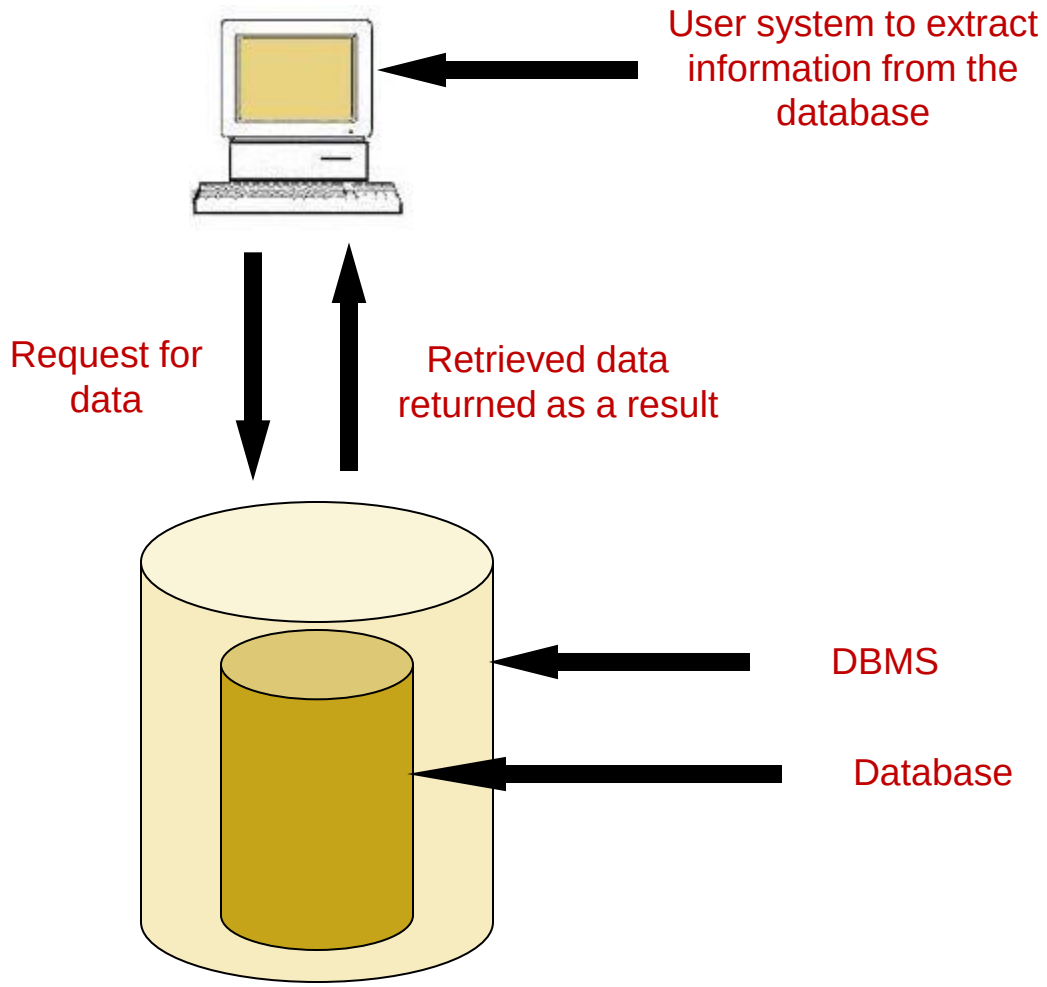
Database Management Systems (Contd.)

- The main objectives of any DBMS are to:
  - Provide an efficient and easy way to store, update, and retrieve data from a database.
  - Manage information about users who interact with the DBMS, and the tasks that these users can perform on the data.

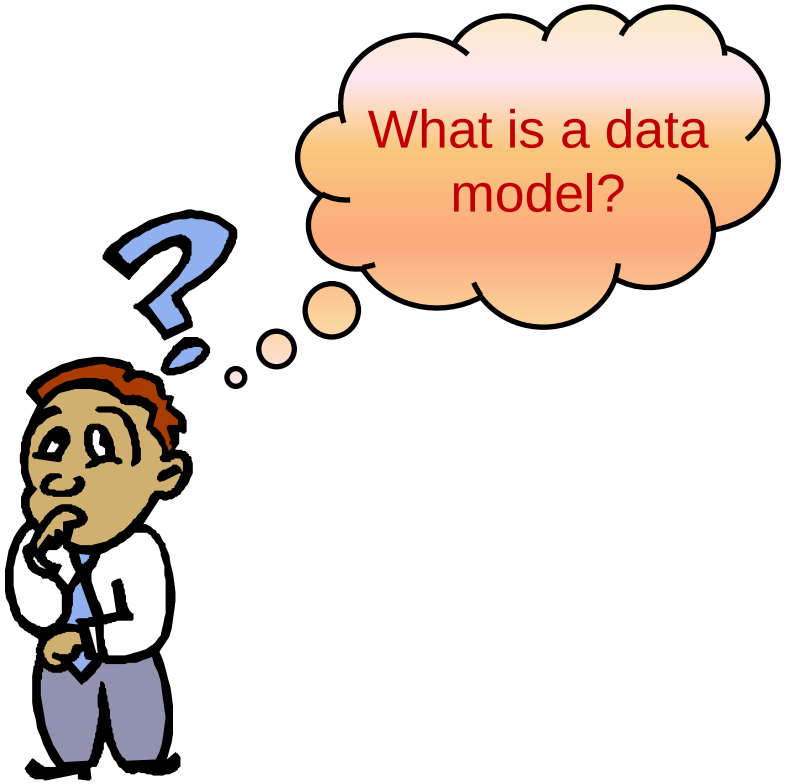
Database Management Systems (Contd.)



Database Management Systems (Contd.)



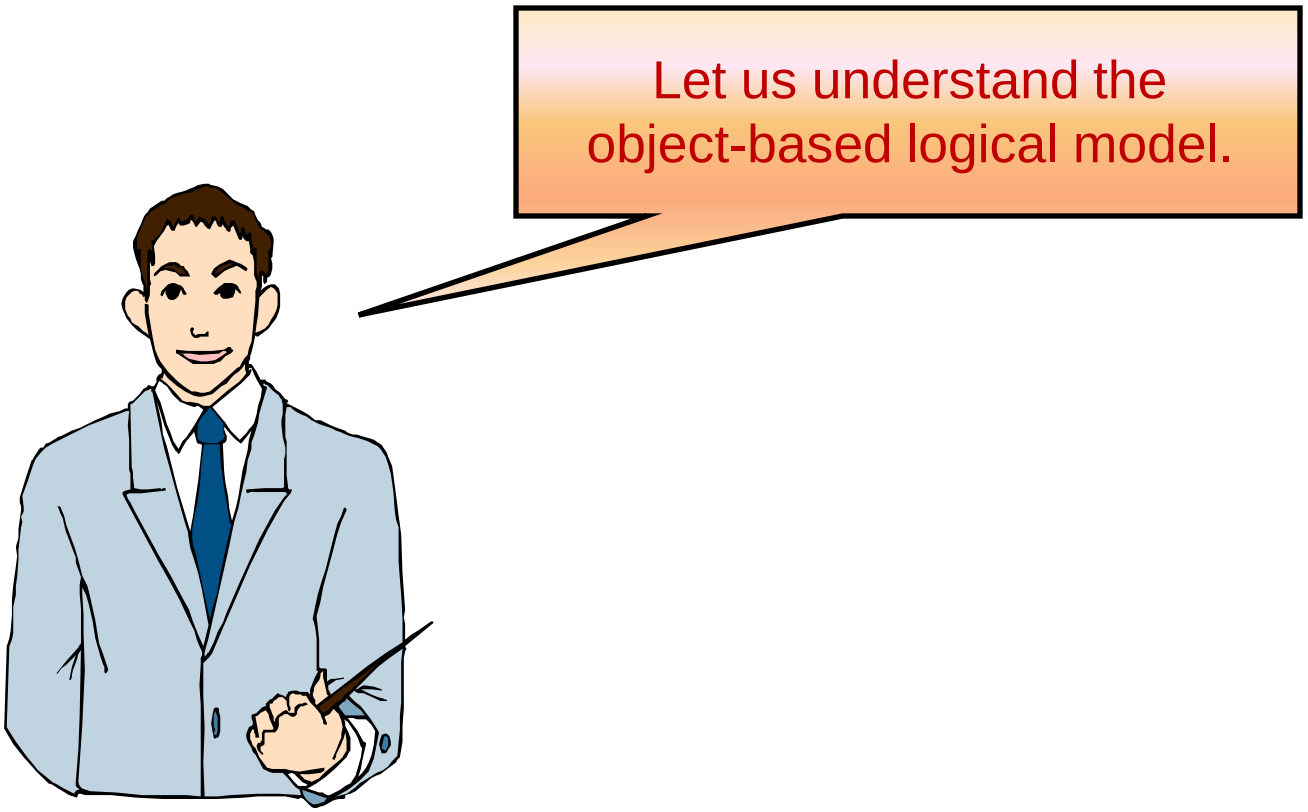
Data Models



Data Models (Contd.)

- A data model is a description of the data in a database.
- Data models can be broadly classified into the following categories:
  - Object-based logical model:
    - Focuses on describing the data, the relationship among the data, and any constraints defined.
  - Record-based logical model:
    - Focuses on specifying the logical structuring of the database.

Object-Based Logical Model

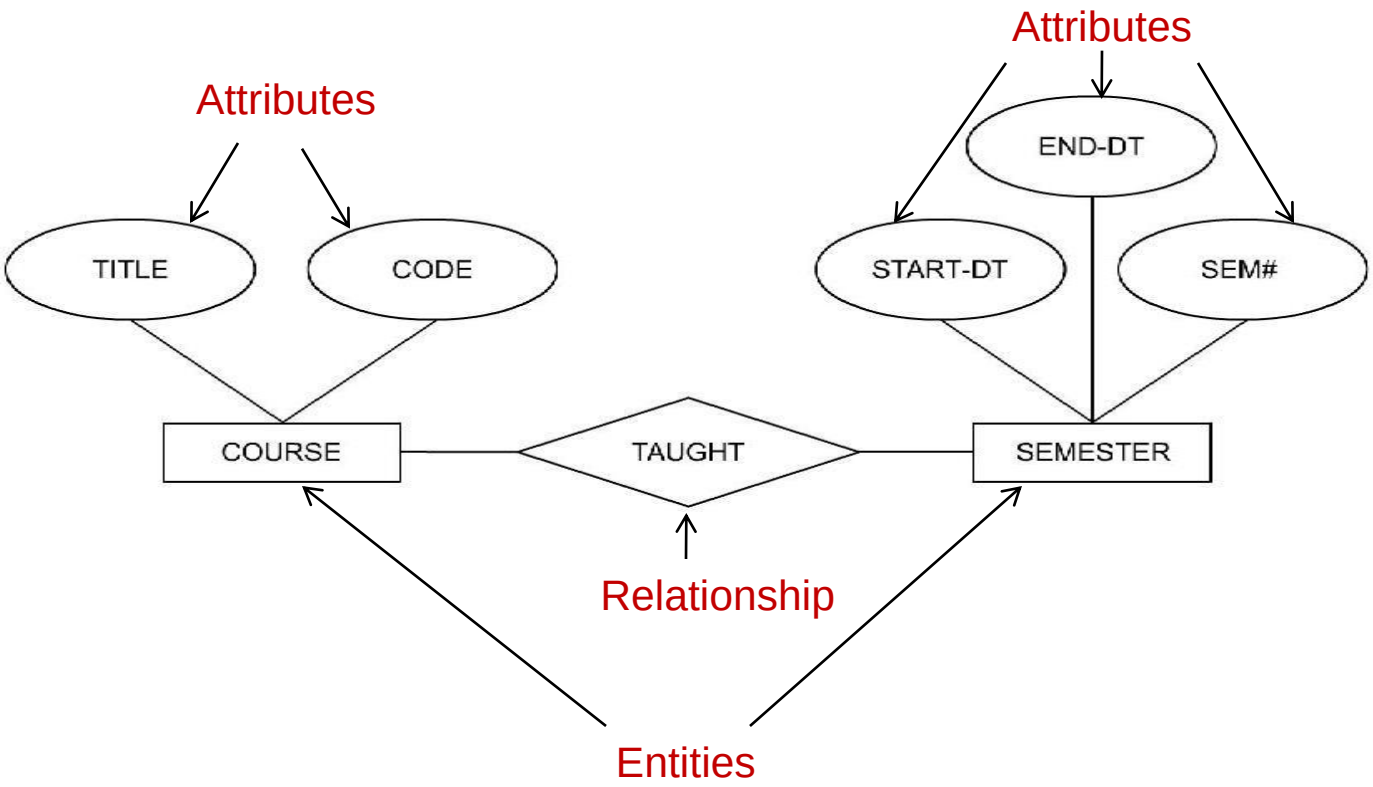


Object-Based Logical Model (Contd.)

- The ER model:
  - Views the real world as a collection of objects or entities and the relationship among them.
  - Has a corresponding diagramming technique.

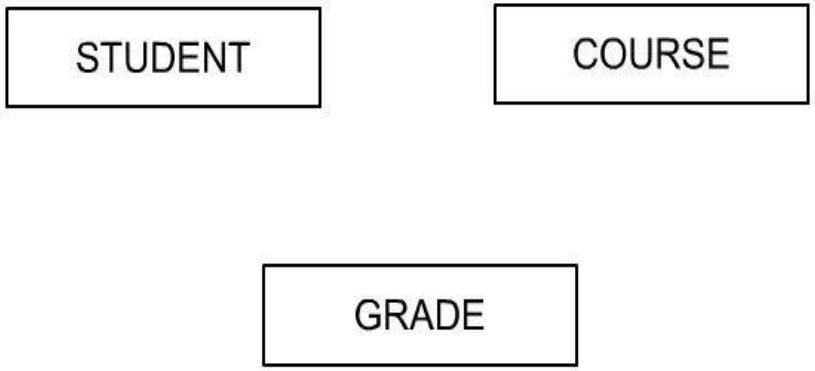
Object-Based Logical Model (Contd.)

- The following diagram shows various components and depicts the relationship between them.



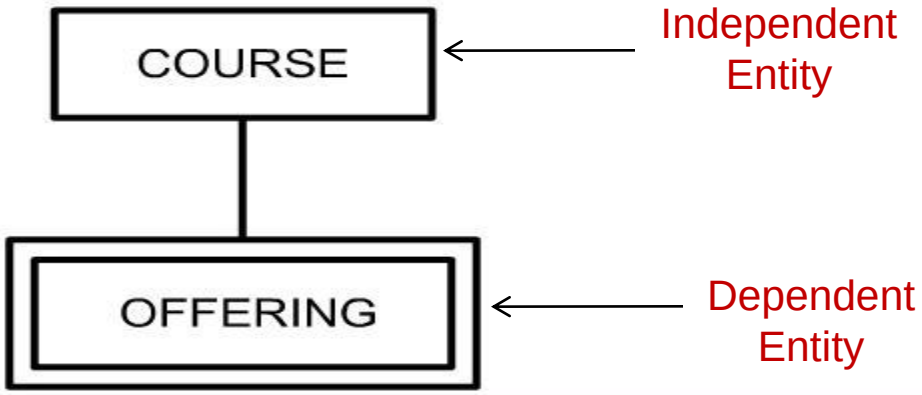
Object-Based Logical Model (Contd.)

- An entity:
  - Is any object, place, person, or activity about which the data is recorded.
  - Can be categorized as entity type and entity instance.
- In the ER model diagramming technique, entities are named and represented inside a box.
- For example:



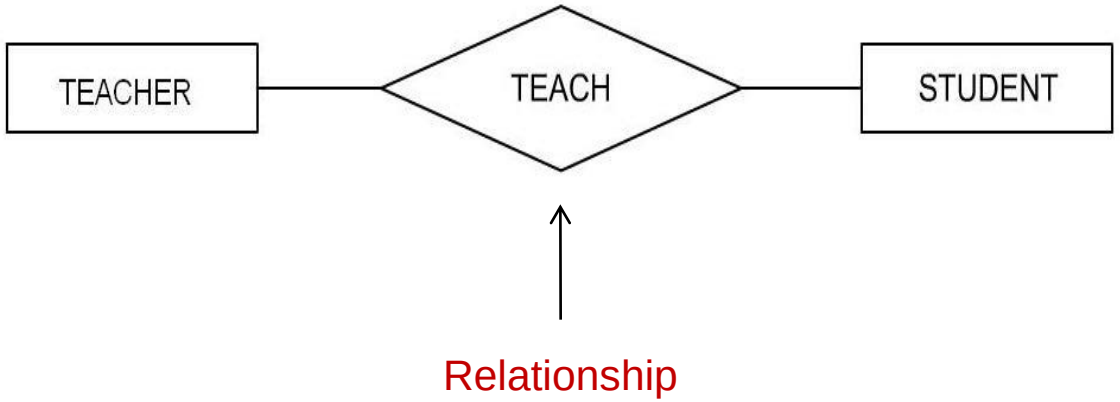
Object-Based Logical Model (Contd.)

- Entity can be of the following types:
  - Dependent entity:
    - Depends on another entity for existence.
    - Is also called as a weak entity.
  - Independent entity:
    - Does not depend on any other entity for existence.
    - Is also called as a regular entity.
- The following diagram consists of an entity, OFFERING, which is dependent on an entity, COURSE.



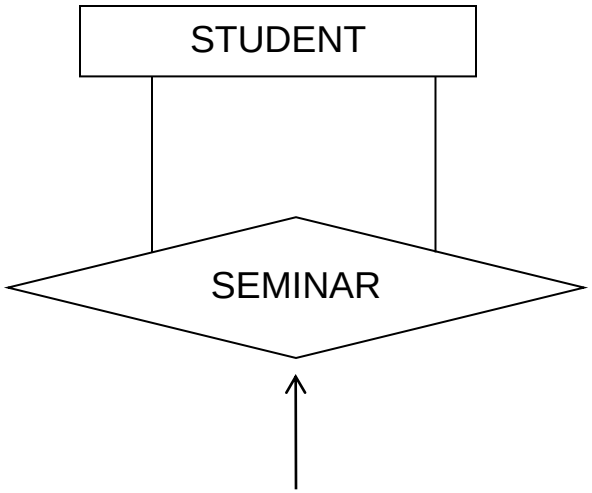
Object-Based Logical Model (Contd.)

- Chen defined a relationship as “an association among entities”.
- A relationship is depicted as a diamond with the name of the relationship type.
- For example:



Object-Based Logical Model (Contd.)

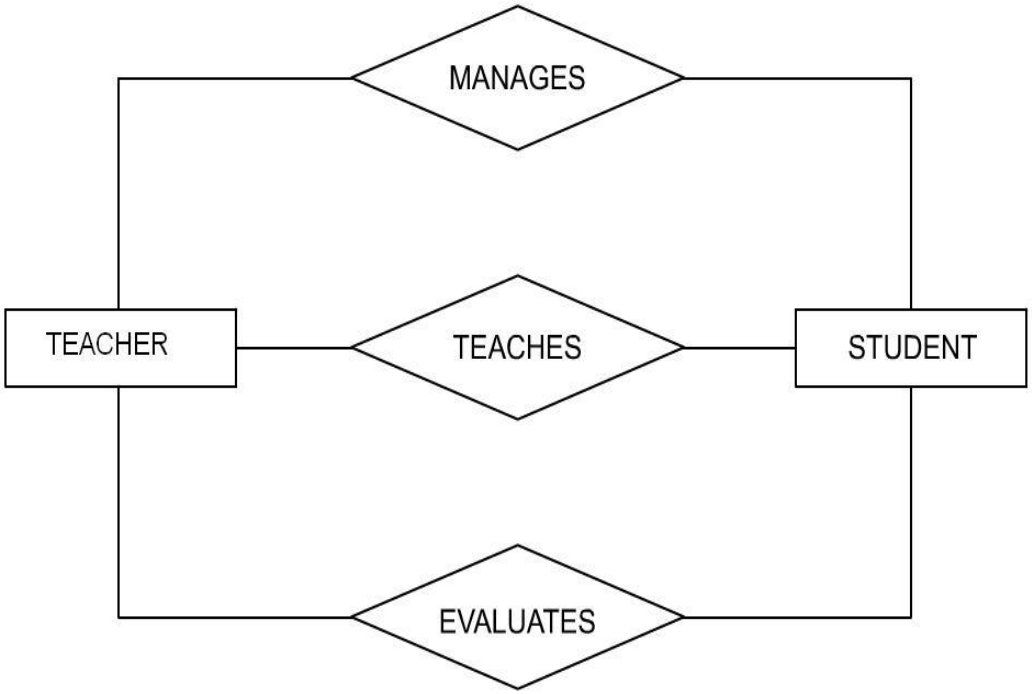
- The following diagram represents the association of an entity with itself.



An entity associating with itself can be a student giving a seminar presentation to other students.

Object-Based Logical Model (Contd.)

- The following diagram represents multiple relationships between the entities, TEACHER and STUDENT.



Just a minute

- The following statement has been extracted from a case presented by a manufacturer regarding the maintenance of their data: “A supplier ships certain parts”. Identify the entities mentioned in this statement, and their relationship. Draw a diagram depicting the relationship.

- Solution:
  - Entities: SUPPLIER, PARTS
  - Relationship: SHIP or SUPPLIES

Object-Based Logical Model (Contd.)

- There are three types of relationships:
  - One-to-one
  - One-to-many (or Many-to-one)
  - Many-to-many

Object-Based Logical Model (Contd.)

- The following diagram represents the one-to-one relationship between DEPARTMENT and DEPARTMENT HEAD.

For a particular DEPARTMENT there can be only one DEPARTMENT HEAD.

Object-Based Logical Model (Contd.)

- The following diagram represents the many-to-one relationship between STUDENT and MAJOR.

A STUDENT can MAJOR in only one course, but many STUDENTs can register for a given MAJOR course.

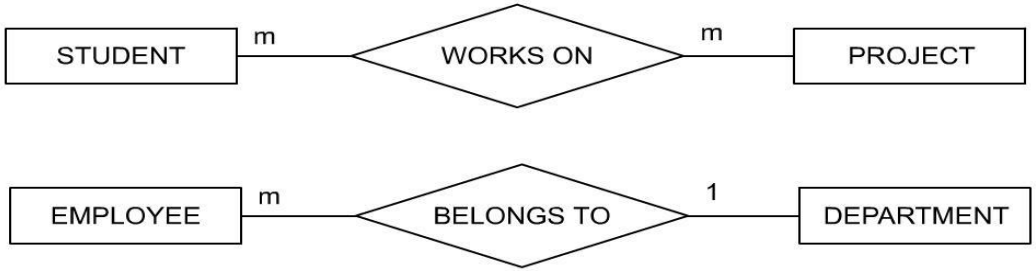
Object-Based Logical Model (Contd.)

- The following diagram represents the many-to-many relationship between STUDENT and COURSE.

A STUDENT can take many COURSEs and many STUDENTs can register for a given COURSE.

Just a minute

- What do the following ER diagrams represent?



- Solution:
  - Many students can work on many projects.
  - Many employees belong to only one department.

Just a minute

- Consider the following statement of a manufacturing company:

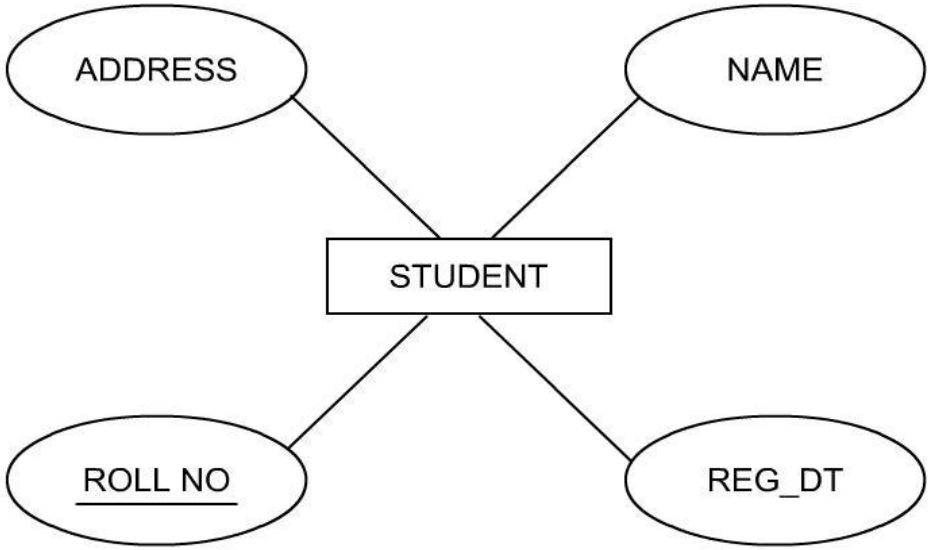
  "A supplier supplies certain parts. A particular part is not necessarily supplied by only one supplier. No supplier supplies only a single part."

  What type of relationship is this? Draw a diagram to depict the relationship.

- Solution:
  - Many-to-many relationship

Object-Based Logical Model (Contd.)

- An attribute:
  - Is a property of a given entity.
  - Is depicted as ellipses, labeled with the name of the property.
- The following diagram shows the various attributes of the entity, STUDENT.

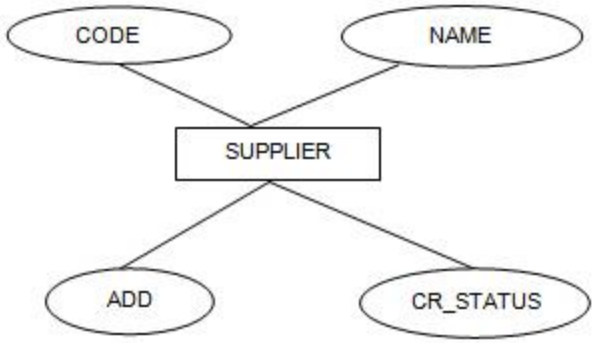


Just a minute

- A manufacturer needs to maintain the following details about the supplier:
  - Name
  - Address
  - Credit status
  - Assigned code number

  Draw a diagram to depict this information.

- Solution:



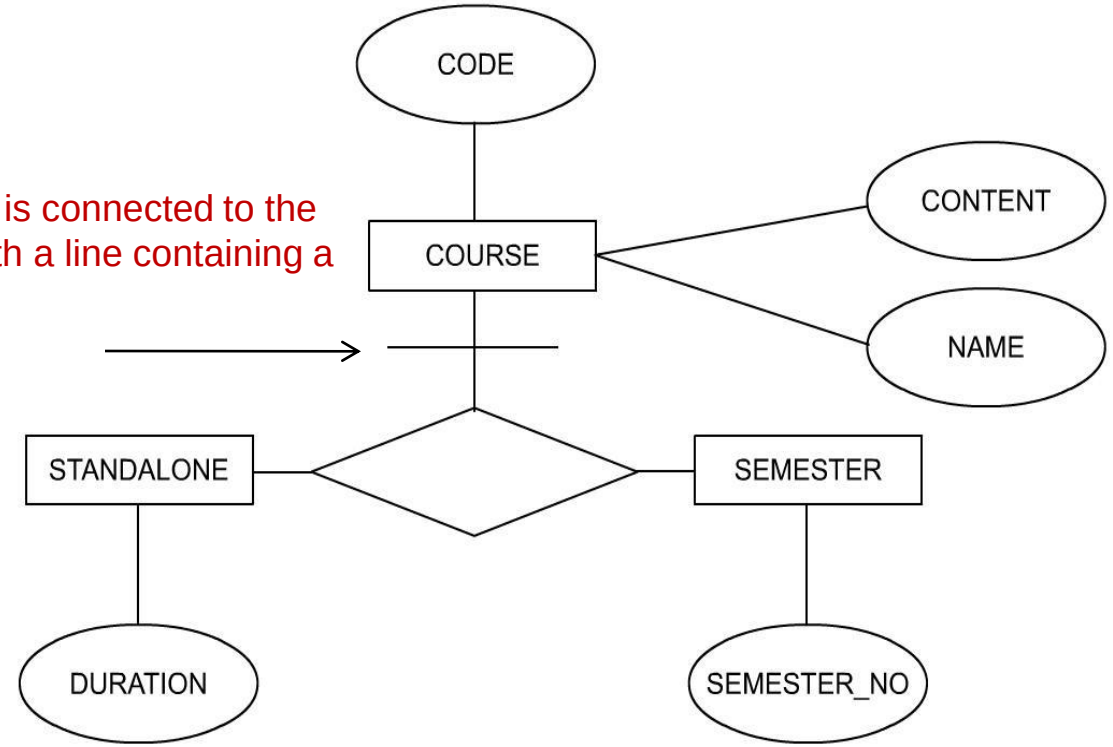
Object-Based Logical Model (Contd.)

- A subtype:
  - Is a subset of another entity.
  - Is always dependent on the supertype for its existence.
- The attributes of a supertype apply to all of its subtypes.

Object-Based Logical Model (Contd.)

- The following diagram shows the relationship between supertype (COURSE) and subtypes (STANDLONE and SEMESTER).

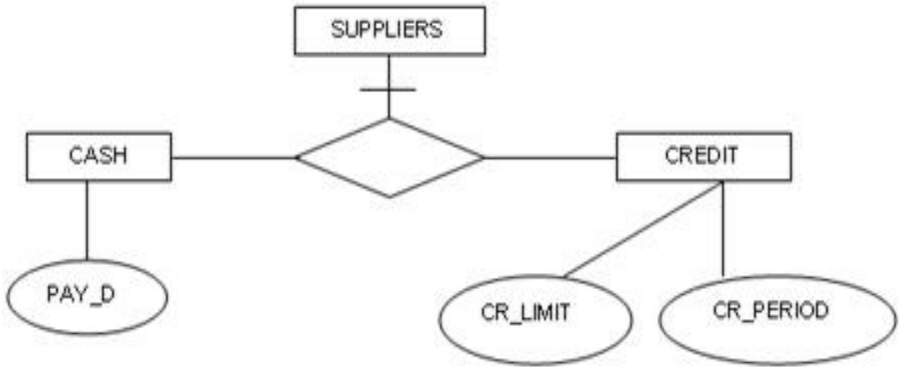
The supertype is connected to the relationship with a line containing a crossbar.



Just a minute

- There are two types of suppliers. One type of supplier allows credit, while the other type insists on payment in cash before delivery. The manufacturer wishes to maintain separate information on these two types of suppliers. For the credit supplier, “credit period” and “credit limit” have to be recorded. For the cash supplier, “date of payment” has to be stored. Represent this information diagrammatically.

- Solution:



Summary

- In this session, you learned that:
  - Data models can be classified as:
    - Object-based logical model
    - Record-based logical model
  - In the ER diagramming technique:
    - Entities are represented as rectangles.
    - Relationships are represented as diamonds.
    - Attributes are represented as ellipses.
  - Relationships, whether many-to-many, one-to-many, or one-to-one are represented symbolically.
  - Weak entities are represented by double-lined boxes.
  - Subtypes are connected to the supertype by an unnamed relationship, marked with a crossbar on top.