

Lecture 4

DATABASE MANAGEMENT SYSTEM

Weak entity types – 1/2

- Entity types that do not have key attributes are called weak entity types.
- Entities that belong to a weak entity type are **identified by being related to specific entities from another entity type** in combination with one of their attribute values.
- This entity type is called an **identifying** or **owner entity type**.
- The relationship that relates the identifying entity type with the weak entity type is called an **identifying relationship**.

Weak entity types – 2/2

- **A weak entity type always has a total participation constraint with respect to the identifying relationship, because a weak entity cannot exist without its owner.**
- Not all existence dependencies result in a weak entity type; if an entity has a key attribute then it is not a weak entity.
- **A weak entity type usually has a partial key, which is the set of attributes that can uniquely identify weak entities that are *related to the same owner entity*.**

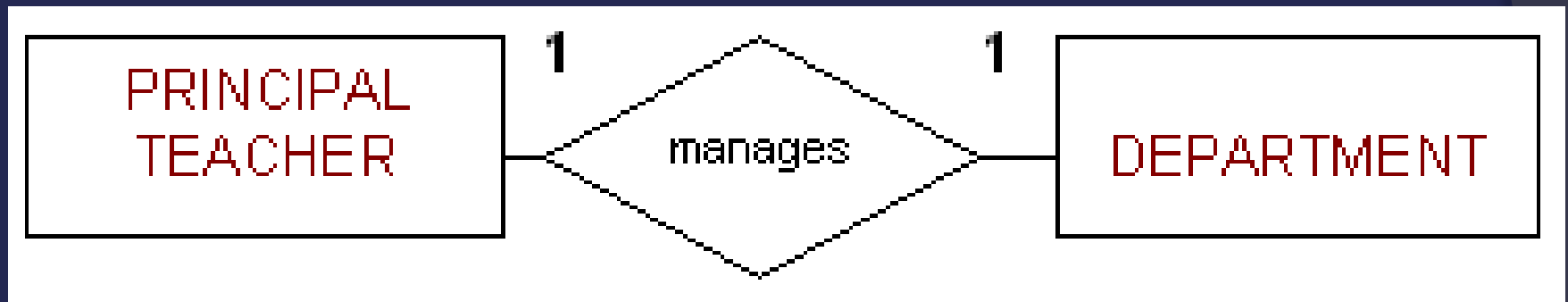
Constraints on Relationship Types

- Relationship types have certain constraints that limit the possible combination of entities that may participate in relationship.
- There are **two main types** of relationship constraints
 - Cardinality ratio
 - Participation

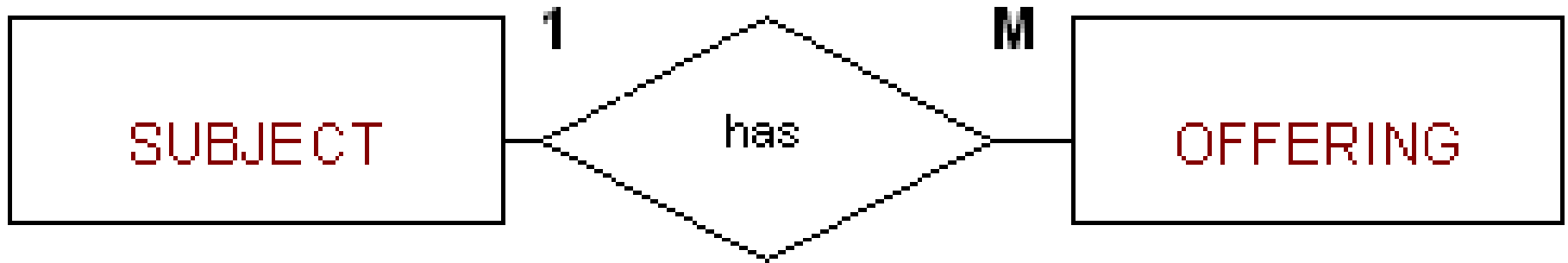
Cardinality ratio

- Binary relationships are relationships between exactly two entities.
- The cardinality ratio specifies the maximum number of relationship instances that an entity can participate in.
- The possible cardinality ratios for binary relationship types are: 1:1, 1:N, N:1, M:N.
- Cardinality ratios are shown on ER diagrams by displaying 1, M and N on the diamonds.

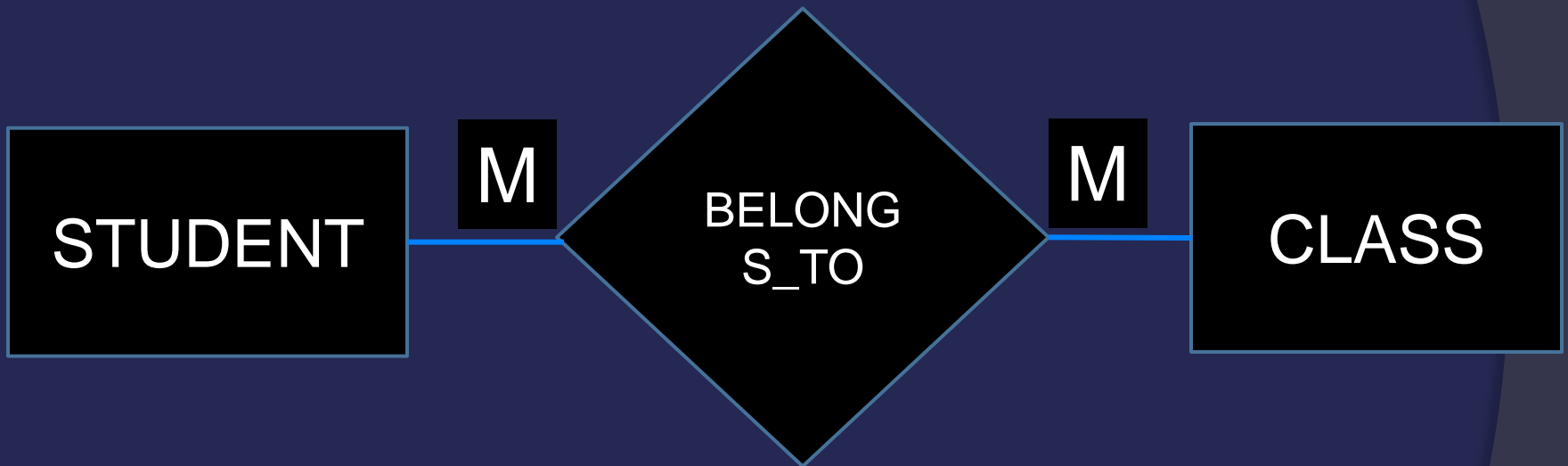
1:1 (one-to-one)



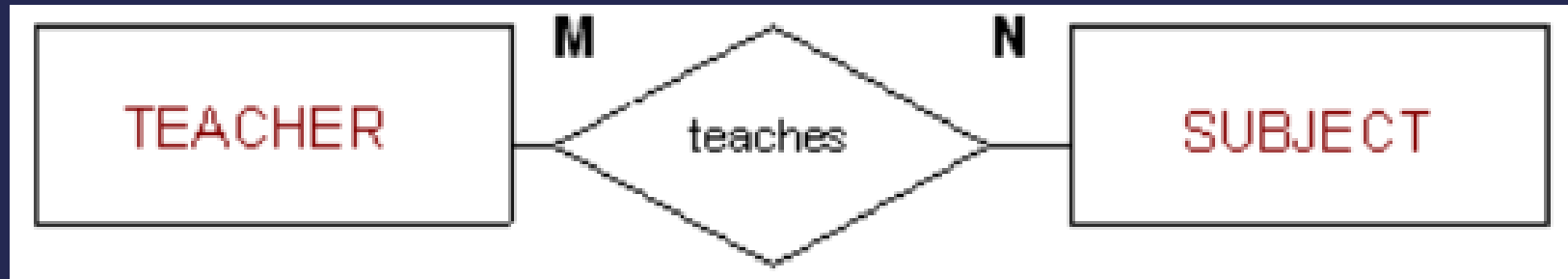
1:N (one-to-many)



N:1 (many-to-one)



M:n (many-to-many)



Participation

- ⦿ The participation constraint specifies whether the **existence of an entity depends on its being related to another entity via the relationship type.**
- ⦿ The **constraint specifies the minimum number of relationship instances that each entity can participate in.**
- ⦿ There are **two types of participation constraints**:
 - Total
 - Partial

Total participation – 1/2

- ⦿ **If an entity can exist, only if it participates in at least one relationship instance, then that is called total participation, meaning that every entity in one set, must be related to at least one entity in a designated entity set.**
- ⦿ An example would be the Employee and Department relationship. If company policy states that every employee must work for a department, then an employee can exist only if it participates in at least one relationship instance (i.e. an employee can't exist without a department)

Total participation – 2/2

- ⦿ It is also sometimes called an existence dependency.
- ⦿ Total participation is **represented by a double line**, going from the relationship to the dependent entity.

Partial participation

- ⦿ If only a part of the set of entities participate in a relationship, then it is called **partial participation**.
- ⦿ Using the Company example, every employee will not be a manager of a department, so the participation of an employee in the “Manages” relationship is partial.
- ⦿ Partial participation is **represented by a single line**.

Attributes of relationship types – 1/2

- ⦿ **Relationships can have attributes similar to entity types.**
- ⦿ For example, in the relationship Works_On, between the Employee entity and the Department entity we would like to keep track of the number of hours an employee works on a project. Therefore we can include Number of Hours as an attribute of the relationship.

Attributes of relationship types – 2/2

- Another example is for the “manages” relationship between employee and department, we can add Start Date as an attribute of the Manages relationship.
- For some relationships (1:1, or 1:N), the attribute can be placed on one of the participating entity types. For example the “Manages” relationship is 1:1, StartDate can either be migrated to Employee or Department.

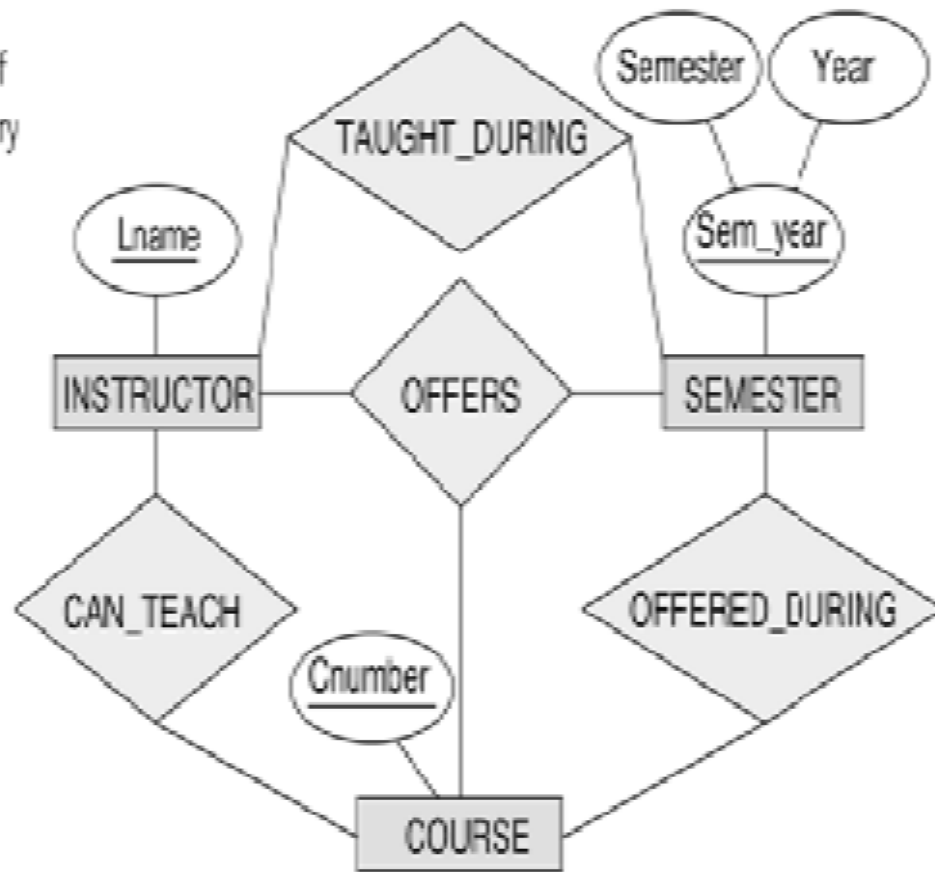
Relationships of higher degree

- Relationship types of degree 2 are called binary
- Relationship types of degree 3 are called ternary
- Relationship types of degree n are called n -ary


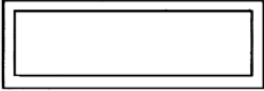
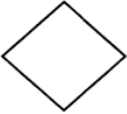
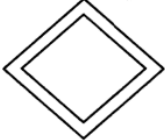
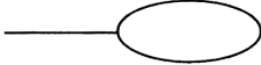
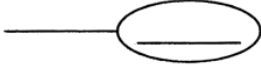

Ternary Relationships

Figure 3.18

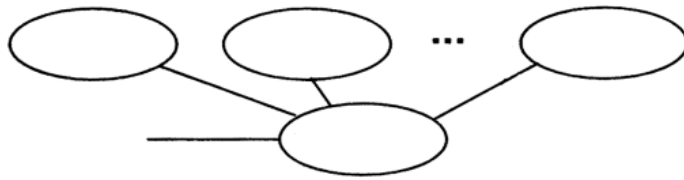
Another example of ternary versus binary relationship types.



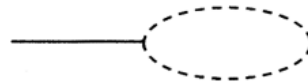
ER Notations – 1/2

<u>Symbol</u>	<u>Meaning</u>
	ENTITY
	WEAK ENTITY
	RELATIONSHIP
	IDENTIFYING RELATIONSHIP
	ATTRIBUTE
	KEY ATTRIBUTE
	MULTIVALUED ATTRIBUTE

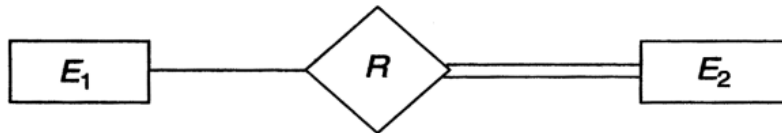
ER Notations – 2/2



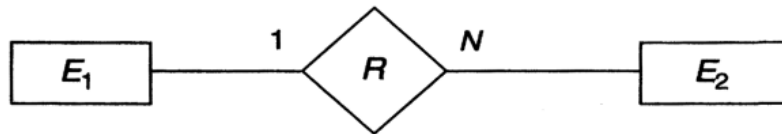
COMPOSITE ATTRIBUTE



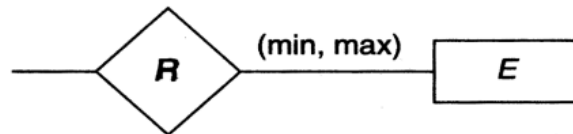
DERIVED ATTRIBUTE



TOTAL PARTICIPATION OF E_2 IN R



CARDINALITY RATIO 1: N FOR $E_1:E_2$ IN R



STRUCTURAL CONSTRAINT (min, max)
ON PARTICIPATION OF E IN R

An ER schema diagram for the COMPANY database

