DATABASE SYSTEMS

WEEK 5 LECTURE 2

AQSA IFTIKHAR

Topics to Cover

- Relationships in E-R Data Model
- Types of Relationships (Degree)
- Cardinality Constraints
- Participation Constraints

Relationship

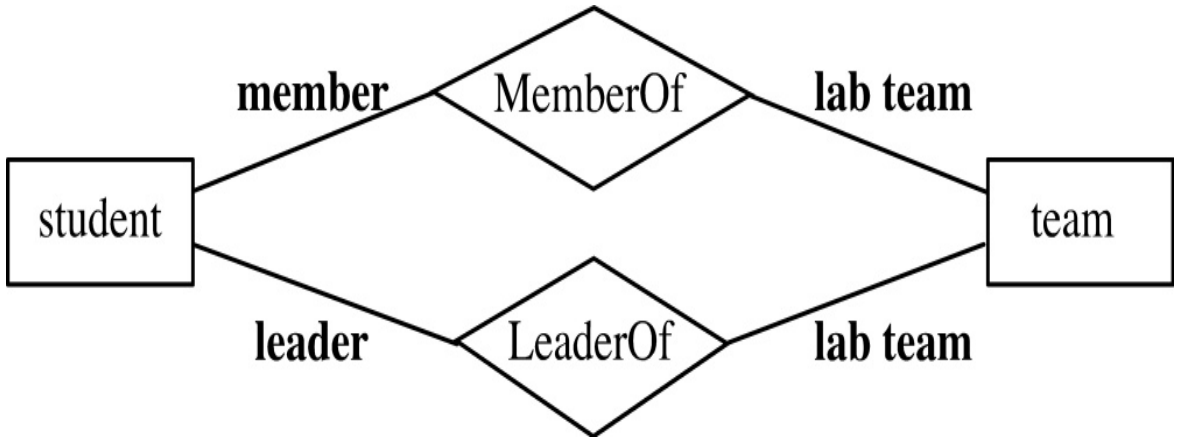
- Relationship represents an association between two or more entities.
- Each relationship has a name, an optionality (optional or mandatory), and a degree (how many).

Relationship

- **Naming Relationships:** If there is no proper name of the association in the system then participants' names of abbreviations are used. STUDENT and CLASS have ENROLL relationship. However, it can also be named as STD_CLS.

Roles in relationship

- Roles are indicated in ER diagrams by labeling the lines that connect diamonds to rectangles. Roles are optional. They clarify semantics of a relationship.



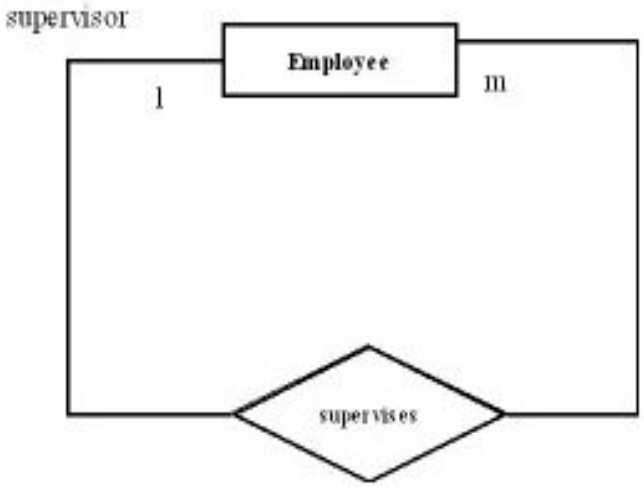
Types of Relationship

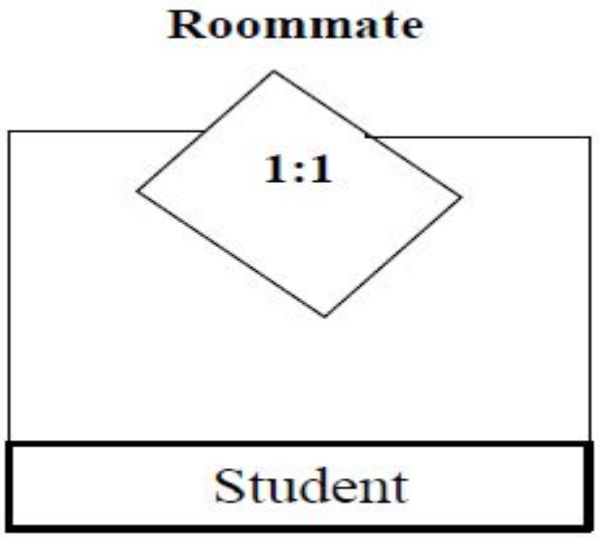
- Relationships have the following types (also known as degree of relationship):
- Unary
- Binary
- Ternary
- N-ary

Types of Relationship

Unary Relationship:

- An ENTITY TYPE linked with itself, also called recursive relationship. Example Roommate, where STUDENT is linked with STUDENT

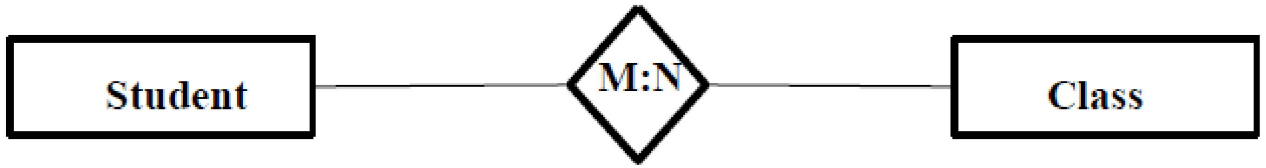




Types of Relationship

Binary Relationship:

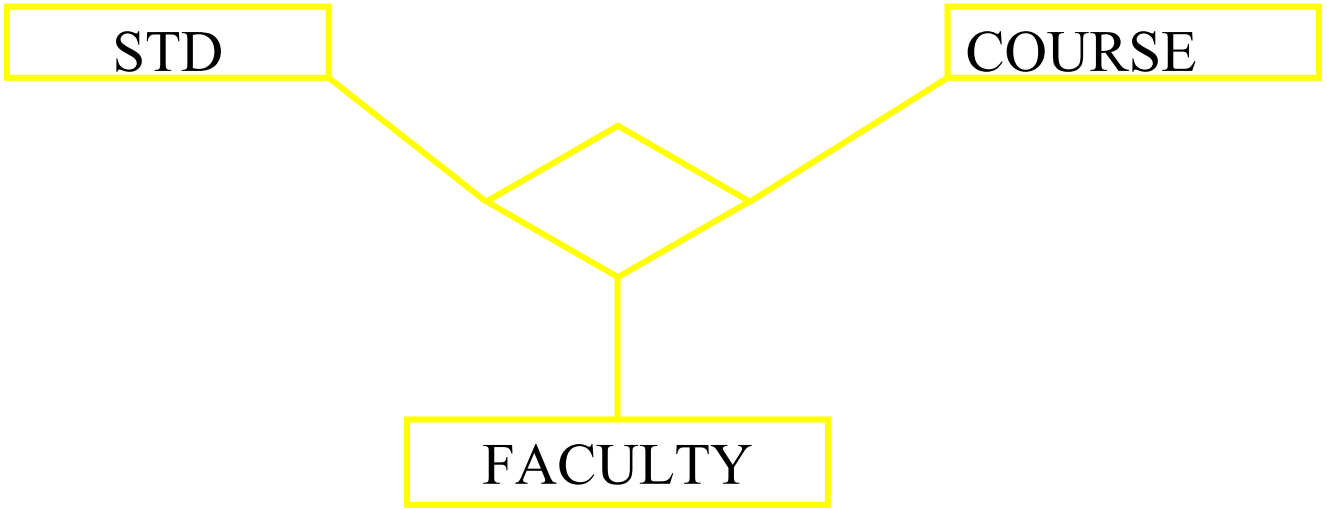
- A Binary relationship is the one that links two entities sets e.g. STUDENT-CLASS.
- Relationships can be formally described in an ordered pair form.
- Enroll = {(S1001, ART103A), (S1020, CS201A), (S1002, CSC201A)}



Types of Relationship

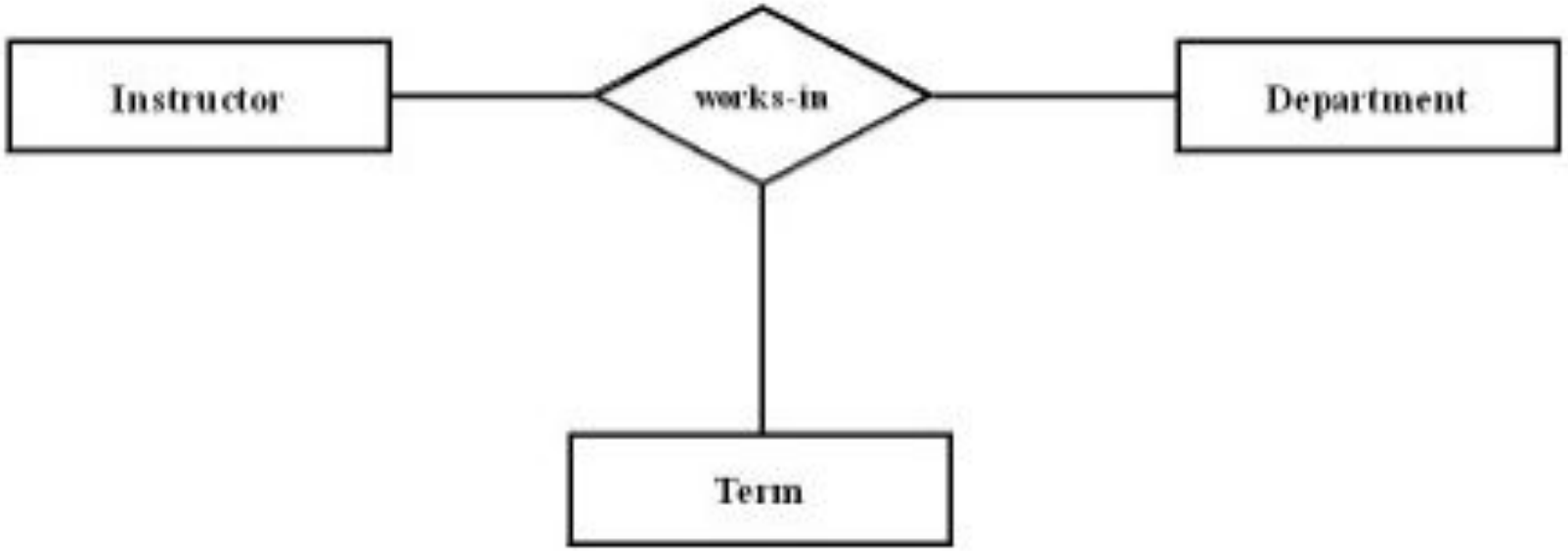
Ternary Relationship:

- A Ternary relationship is the one that involves three entities e.g. STUDENT-CLASS-FACULTY.
- Instances in ordered triples: {(S1013, MCS4, Adnan), (S1023, MCS3, Fasih)}



Types of Relationship

Ternary Relationship:



Types of Relationship

N-ary Relationship:

- Relationships in data model are binary or at most ternary but we could define a relationship set linking any number of entity sets i.e. n-ary relationship.

Cardinality

- Cardinality is a constraint on a relationship specifying the number of entity instances that a specific entity may be related to via the relationship.
- When we ask How many employees can work in a single department?
- How many departments can an employee work in?
- We are asking questions regarding the cardinality of the relationship.

Cardinality

Types of cardinalities include:

- One to one
- One to many
- Many to one
- Many to many

Cardinality

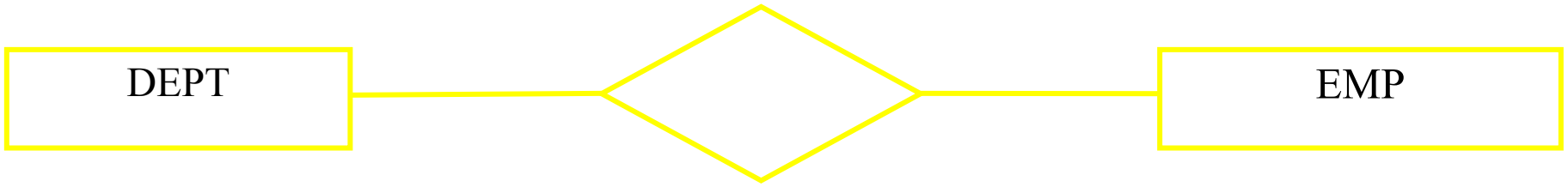
- **One-to-One:**
- Suppose we have People and Vehicles. Assume that we are only concerned with the current driver of a vehicle, and that we are only concerned with the current vehicle that a driver is operating.
- Then, we have a one-to-one relationship between Vehicle and Person.

Cardinality

- **One-to-Many:** This type of relationship has 1 and n specified for cardinalities, and is very common in database designs.
- Suppose we have customers and orders and the business rules:
- an order is related to one customer
- a customer can have any number (zero or more) of orders.

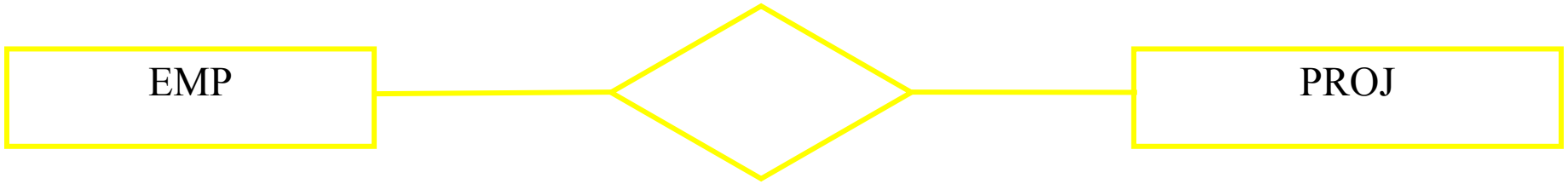
Cardinality

- **One-to-Many/ Many-to-one**.



Cardinality

- **Many-to-Many:**



Cardinality

- Many-to-many relationships have "many" specified for both cardinalities, and are also very common.
- However, should you examine a data model in some business, there is a good chance you will not see any many-to-many relationships on the diagram.
- In those cases, the data modeler has resolved the many-to-many relationships into two one-to-many relationships.

Cardinality

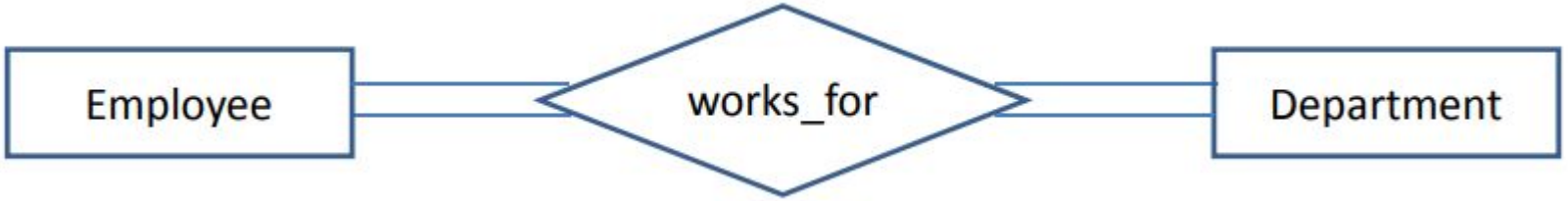
- Suppose we are interested in courses and students and the fact that students register for courses.
- A student may take several courses, A course may be taken by several students.
- This situation is represented with a many-to-many relationship between Course and Student:

Participation Constraints

- **Total Participation:** Each entity in the entity set **must participate** in the relationship. If each student must enroll in a course, the participation of student will be total.
- That is why, it is also called as **mandatory participation.**
- Total participation is represented using a double line between the entity set and relationship set.
- It specifies that each student must be enrolled in at least one course.

Participation Constraints

- **Total Participation:**
- Employee “works for” department.
- Total Participation from department side (how?)
- Assume that the company has 3 departments.
- Should all departments have employees working in them ?
- If the answer is yes: (Total Participation) (represented by two lines)
- If the answer is No: (Partial Participation) (represented by one line)
- In our case the answer is yes.



Participation Constraints

- **Partial Participation:** The entity in the entity set **may or may NOT participate** in the relationship. That is why, it is also called as **optional participation.**
- Partial participation is represented using a single line between the entity set and relationship set.
- Here, single line between the entity set “Course” and relationship set “Enrolled in” signifies partial participation.
- It specifies that there might exist some courses for which no enrollments are made.

Participation Constraints

- **Partial Participation:**
- Employee “manages” department.
- Partial Participation from employee side (how?)
- Assume that the company has 3 employees.
- Should all employees manage departments ?
- If the answer is yes: (Total Participation) (represented by two lines)
- If the answer is No: (Partial Participation) (represented by one line)
- In our example, the answer is “No” because some employees are not managers.

Symbol for Relationships

- Shown as a Diamond
- Diamond is doubled if one of the participant is dependent on the other
- Participants are connected by continuous lines, labeled to indicate cardinality.
- In partial relationships roles are written on the line connecting the partially participating entity rectangle to the relationship diamond.
- Total participation is indicated by double lines.