DATABASE SYSTEMS

WEEK 6 LECTURE 1

Topics to Cover

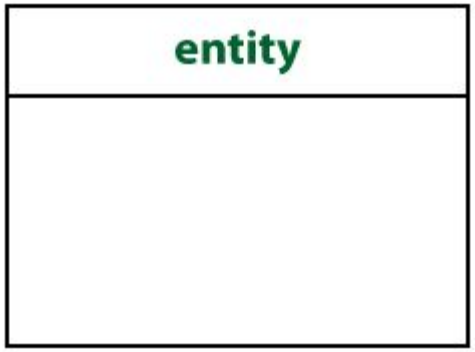
- Crow's Foot Notation
- Symbols in Crow's Foot Notation
- Complete ERD with crow's foot notation

History

- The most recognizable characteristic of crow's foot notation (also known as IE notation) is that it uses graphical symbols to indicate the 'many' side of the relationship.
- The three-pronged 'many' symbol is also how this widely-used notation style got its name. Let's see where crow's foot is placed in the history of data modeling and take a look at its symbols.
- The beginning of crow's foot notation dates back to an article by Gordon Everest (1976, Fifth Computing Conference, IEEE).

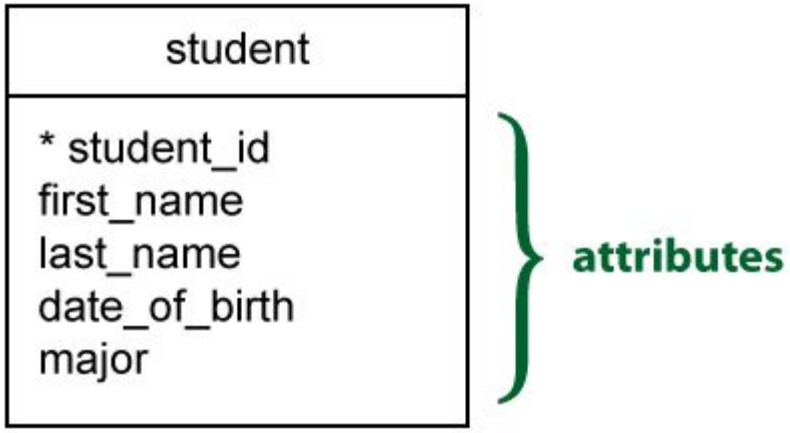
Symbols in Crow's Foot Notation

- **Entities**
- In crow's foot notation, an entity is represented by a rectangle, with its name on the top. The name is singular (entity) rather than plural (entities).



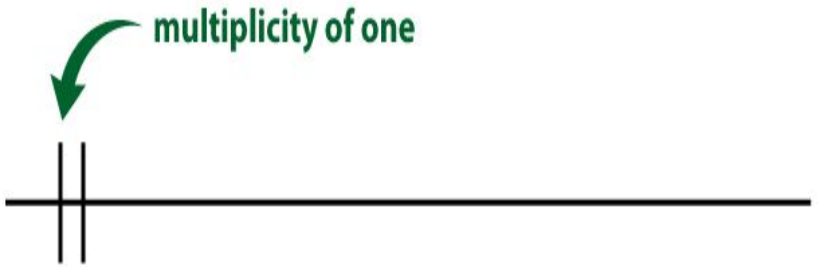
Symbols in Crow's Foot Notation

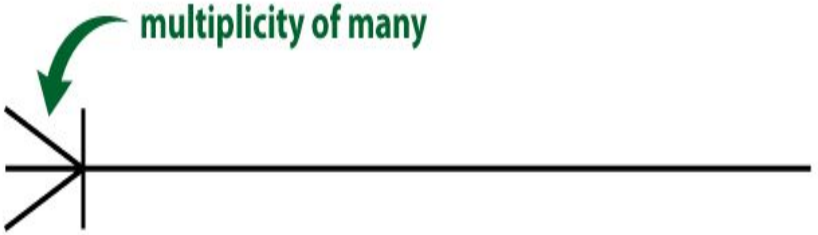
- **Attributes**
- The attribute(s) that uniquely distinguishes an instance of the entity is the identifier. Usually, this type of attribute is marked with an asterisk.



Symbols in Crow's Foot Notation

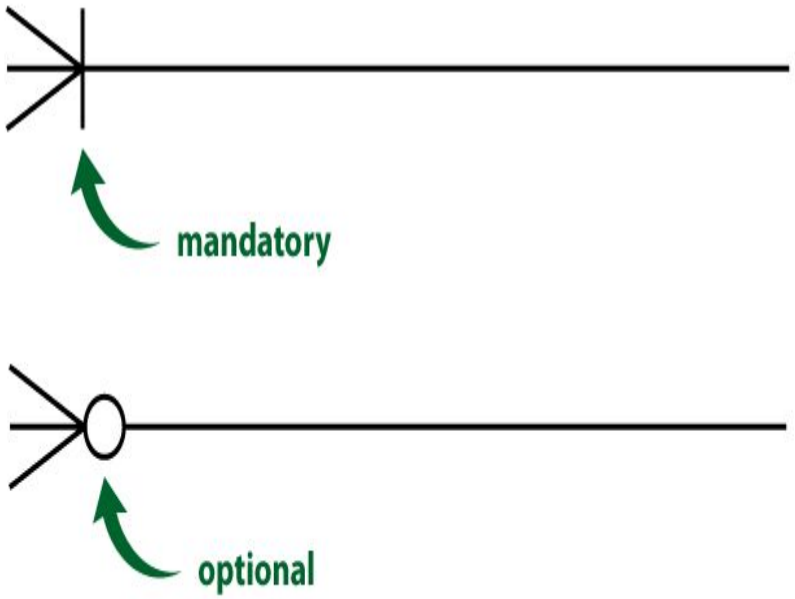
- **Cardinality**
- Relationships have two indicators. These are shown on both sides of the line.
- The first one (often called multiplicity) refers to the maximum number of times that an instance of one entity can be associated with instances in the related entity. It can be one or many.





Symbols in Crow's Foot Notation

- The second describes the minimum number of times one instance can be related to others. It can be zero or one, and accordingly describes the relationship as optional or mandatory.



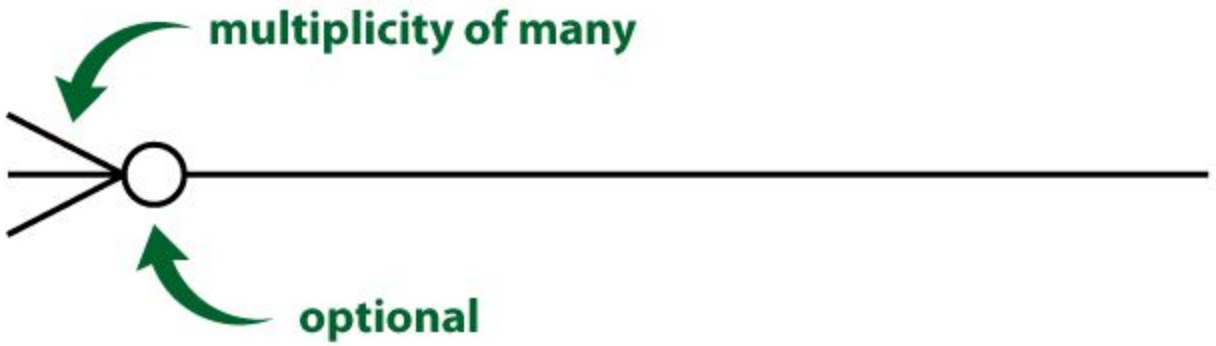
Symbols in Crow's Foot Notation

- The combination of these two indicators is always in a specific order. Placed on the outside edge of the relationship, the symbol of multiplicity comes first.
- The symbol indicating whether the relationship is mandatory or optional is shown after the symbol of multiplicity.

Symbols in Crow's Foot Notation

Finally, there are four possible edges to the relationship, illustrated :

- zero or many



Symbols in Crow's Foot Notation

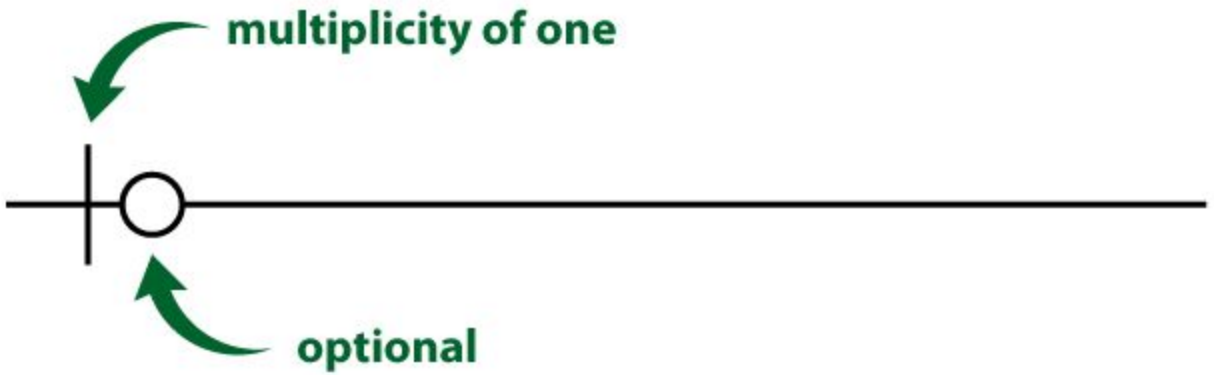
- one or many

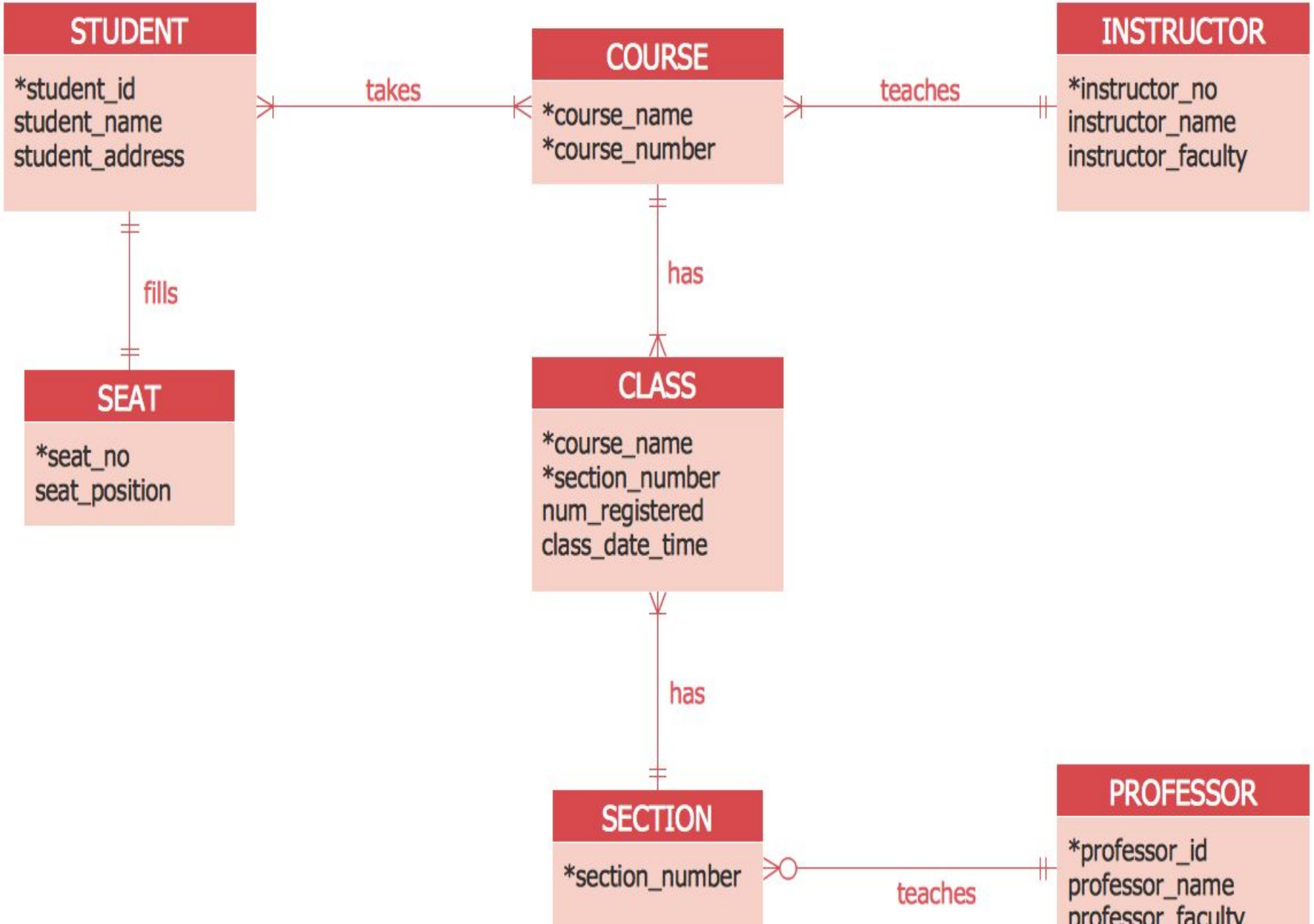
Symbols in Crow's Foot Notation

- One and only one

Symbols in Crow's Foot Notation

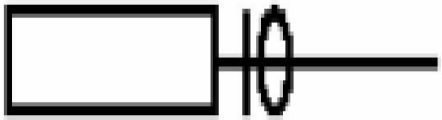
- zero or one



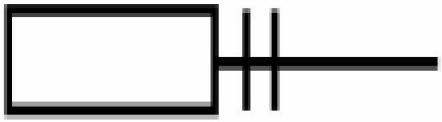

STUDENT
*student_id
student_name
student_address
takes
COURSE
*course_name
*course_number
teaches
INSTRUCTOR
*instructor_no
instructor_name
instructor_faculty
fills
has
SEAT
*seat_no
seat_position
CLASS
*course_name
*section_number
num_registered
class_date_time
has
SECTION
*section_number
teaches
PROFESSOR
*professor_id
professor_name

Summary

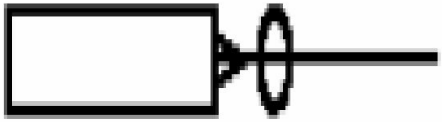
- Optional one



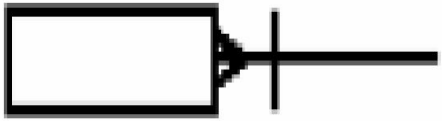
- Mandatory one



- Optional many



- Mandatory many



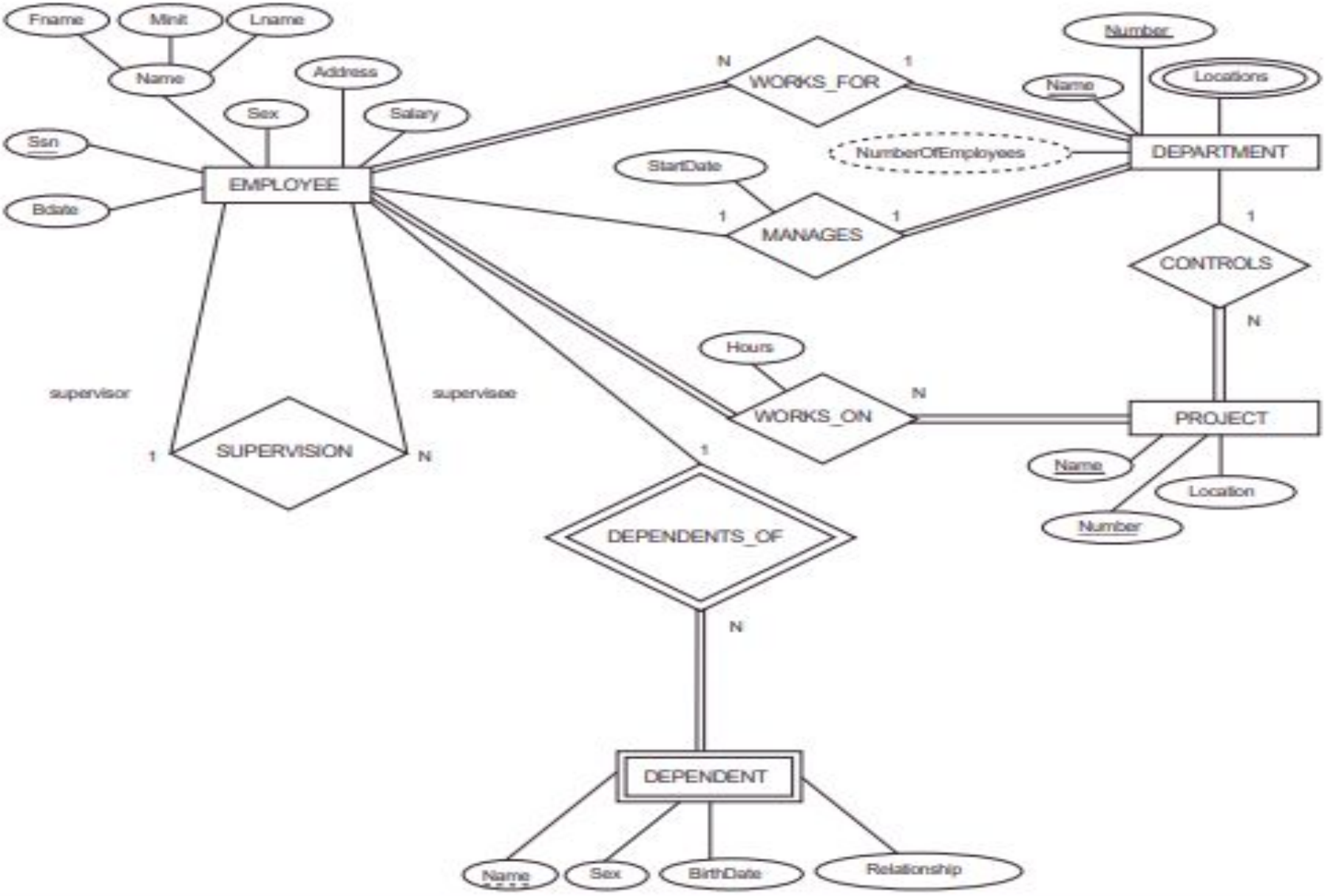
Example

Database Application (Company Database)
Company organized into DEPARTMENTs. Each department has unique name and a particular employee who manages the department. Start date for the manager is recorded.

Department may have several locations. A department controls a number of PROJECTs. Projects have a unique name, number and a single location. Company's EMPLOYEE s name, ssno, address, salary, sex and birth date are recorded.

An employee is assigned to one department, but may work for several project s (not necessarily controlled by her dept). Number of hours/week an employee works on each project i s recorded;

The immediate supervisor for the employee. Employee's DEPENDENT s are tracked for health insurance purposes (dependent name, birthdate, relationship to employee).


Fname
Minit
Lname
Name
Address
Sex
Salary
Ssn
Bdate
EMPLOYEE
N
WORKS_FOR
1
Number
Name
Locations
DEPARTMENT
NumberOfEmployees
StartDate
1
MANAGES
1
1
CONTROLS
N
Hours
WORKS_ON
N
PROJECT
Name
Location
Number
supervisor
supervisee
1
SUPERVISION
N
1
DEPENDENTS_OF
N
DEPENDENT
Name
Sex
BirthDate
Relationship

ERD case study 1

A professor teaches zero, one or many classes and a class is taught by exactly one professor. A course may generate zero, one or many classes and a class comes from exactly one course. A class is held in one room but a room has at least one or many classes.

ERD CASE study 2

An invoice is written by one salesrep but a salesrep may or may not write many invoices. A vendor sells zero, one or many products but a product is bought from only one vendor. An invoice has one or many products and a product is found on zero, one or many invoices.

ERD CASE study 3

The following information is stored in the database:

1. Customer: name, address, gender, and preferred sport.
2. Supplier: supplier identification number, name of the company, and address.
3. Product: product identification number, price per unit, amount in the inventory.

A customer may order one or more products, and a product may be ordered by one or more customers. Additionally, products may be provided by one or more suppliers, and a supplier may provide more than one product.