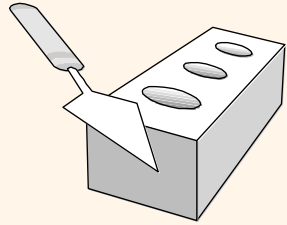
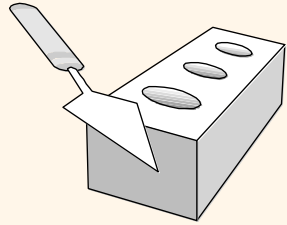


# Convert Entity-Relationship Diagrams to Relational Schemas

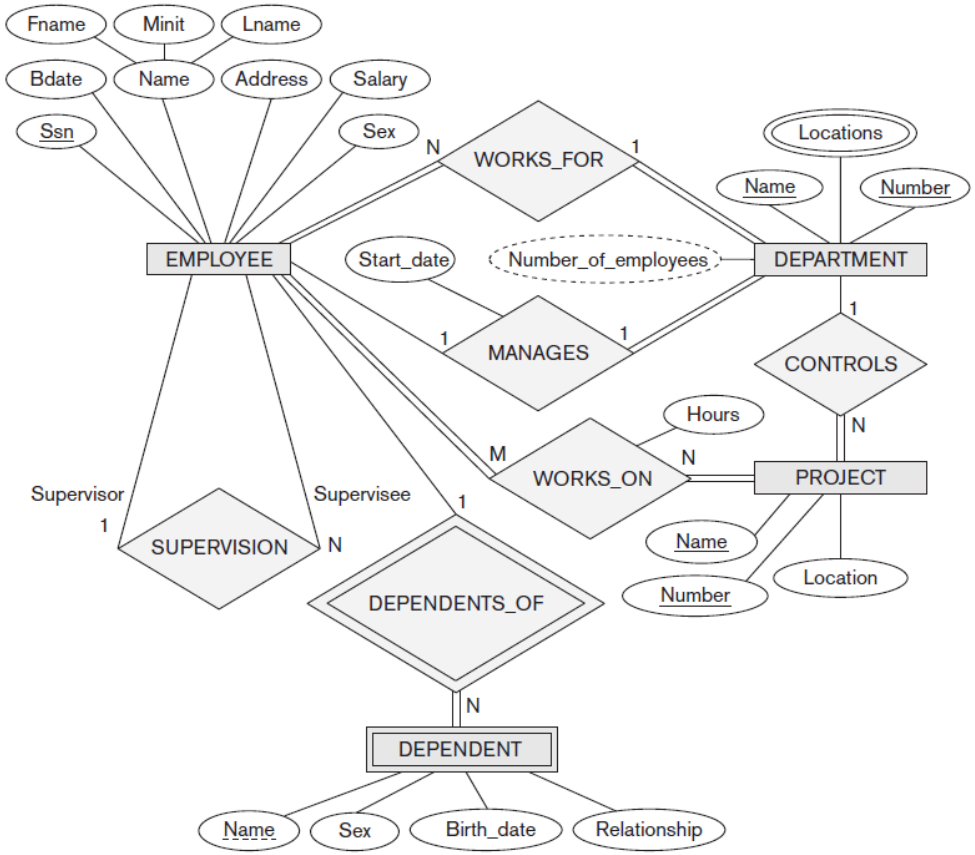
DataBase Modelling



- **Design a relational database schema**
  - Based on a conceptual schema design
- Seven-step algorithm to convert the basic ER model constructs into relations

# Relational Database Design Using ER-to-Relational Mapping

**Figure 9.1**
The ER conceptual schema diagram for the COMPANY database.



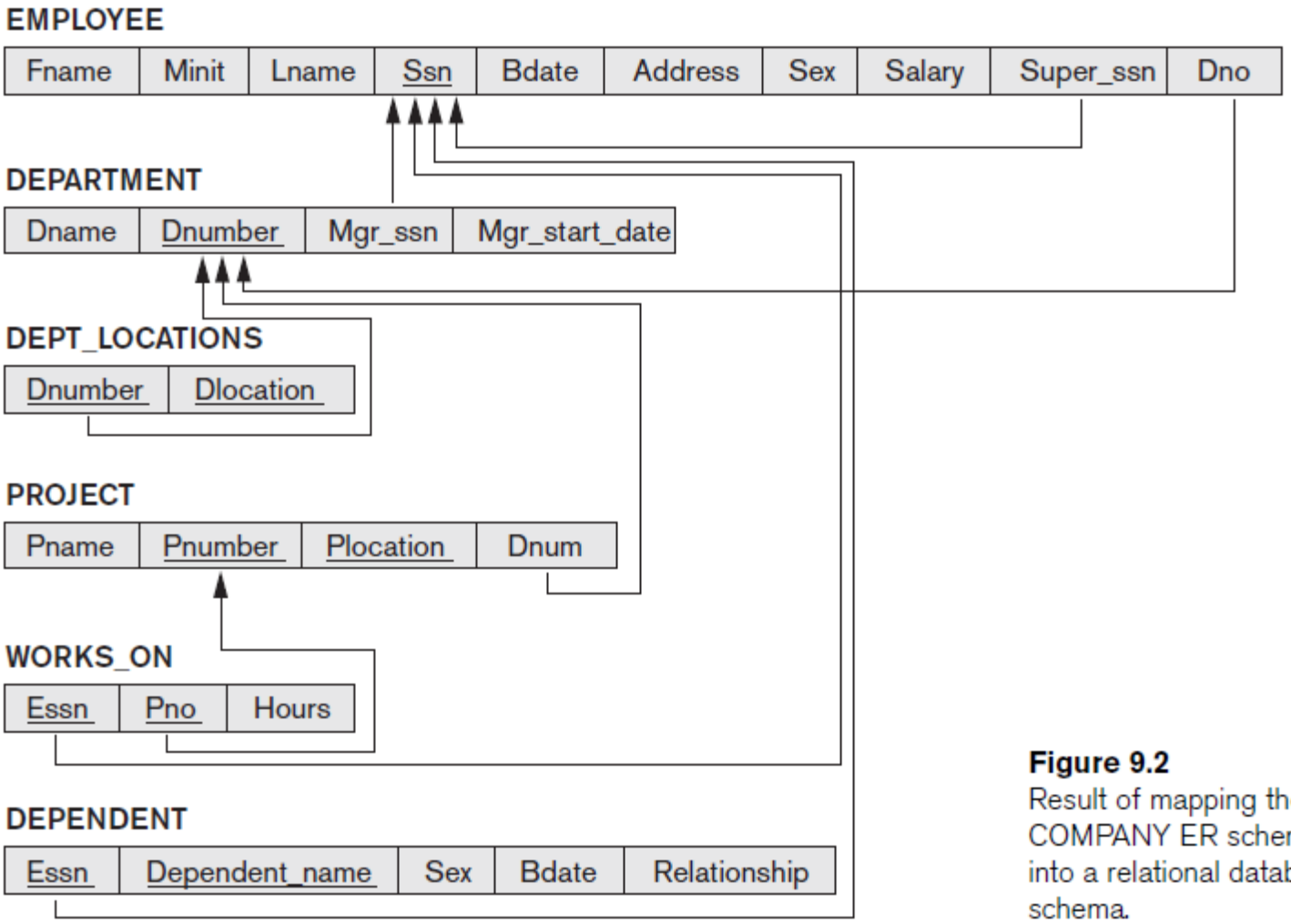
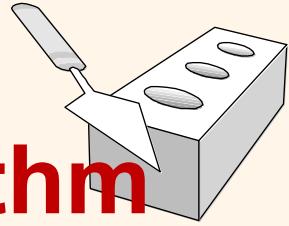


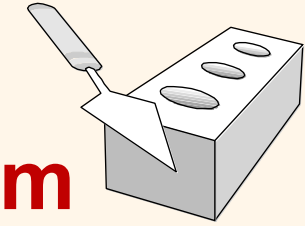

**Figure 9.2**
Result of mapping the COMPANY ER schema into a relational database schema.

# ER-to-Relational Mapping Algorithm



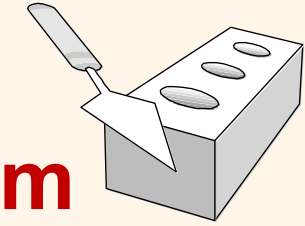
- Step 1: Mapping of Regular Entity Types
  - For each regular entity type, create a relation *R* that includes all the simple attributes of *E*
- Step 2: Mapping of Weak Entity Types
  - For each weak entity type, create a relation *R* and include all simple attributes of the entity type as attributes of *R*
  - Include primary key attribute of owner as foreign key attributes of *R*

# ER-to-Relational Mapping Algorithm



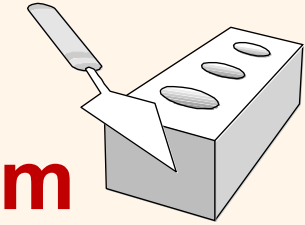
- Step 3: Mapping of Binary 1:1 Relationship Types
  - For each binary 1:1 relationship type
    - •Include primary key of one side as foreign key of the other side.
    - •Include other attributes of the relationship as attributes to the relation.
    - •Be aware of total/partial dependency.

# ER-to-Relational Mapping Algorithm



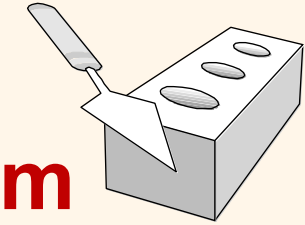
- Step 4: Mapping of Binary 1:*N* Relationship Types
  - For each regular binary 1:*N* relationship type
    - •Identify relation that represents participating entity type at *N*-side of relationship type
    - •Include primary key of other entity type as foreign key in *S*
    - •Include simple attributes of 1:*N* relationship type as attributes of *S*
    - •*Sometimes 1:N relationship produces a table*

# ER-to-Relational Mapping Algorithm

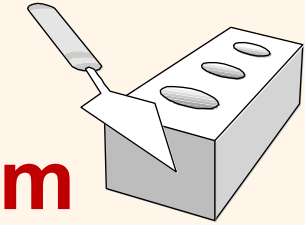


- Step 5: Mapping of Binary *M*:*N* Relationship Types
  - For each binary *M*:*N* relationship type
    - •Create a new relation *S*
    - •Include primary key of participating entity types as foreign key attributes in *S*
    - •Include any simple attributes of *M*:*N* relationship type

# ER-to-Relational Mapping Algorithm



- Step 6: Mapping of Multivalued Attributes
  - For each multivalued attribute
    - •Create a new relation
    - •Primary key of *R* is the combination of *A* and *K*
    - •If the multivalued attribute is composite, include its simple components



# ER-to-Relational Mapping Algorithm

- Step 7: Mapping of *N*-ary Relationship Types
  - For each *n*-ary relationship type *R*
    - •Create a new relation *S* to represent *R*
    - •Include primary keys of participating entity types as foreign keys
    - •Include any simple attributes as attributes

# Discussion and Summary of Mapping for ER Model Constructs

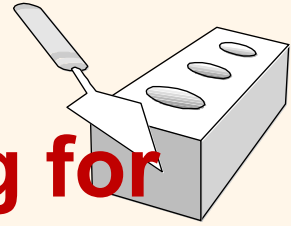
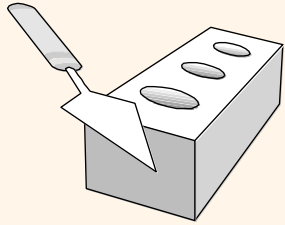


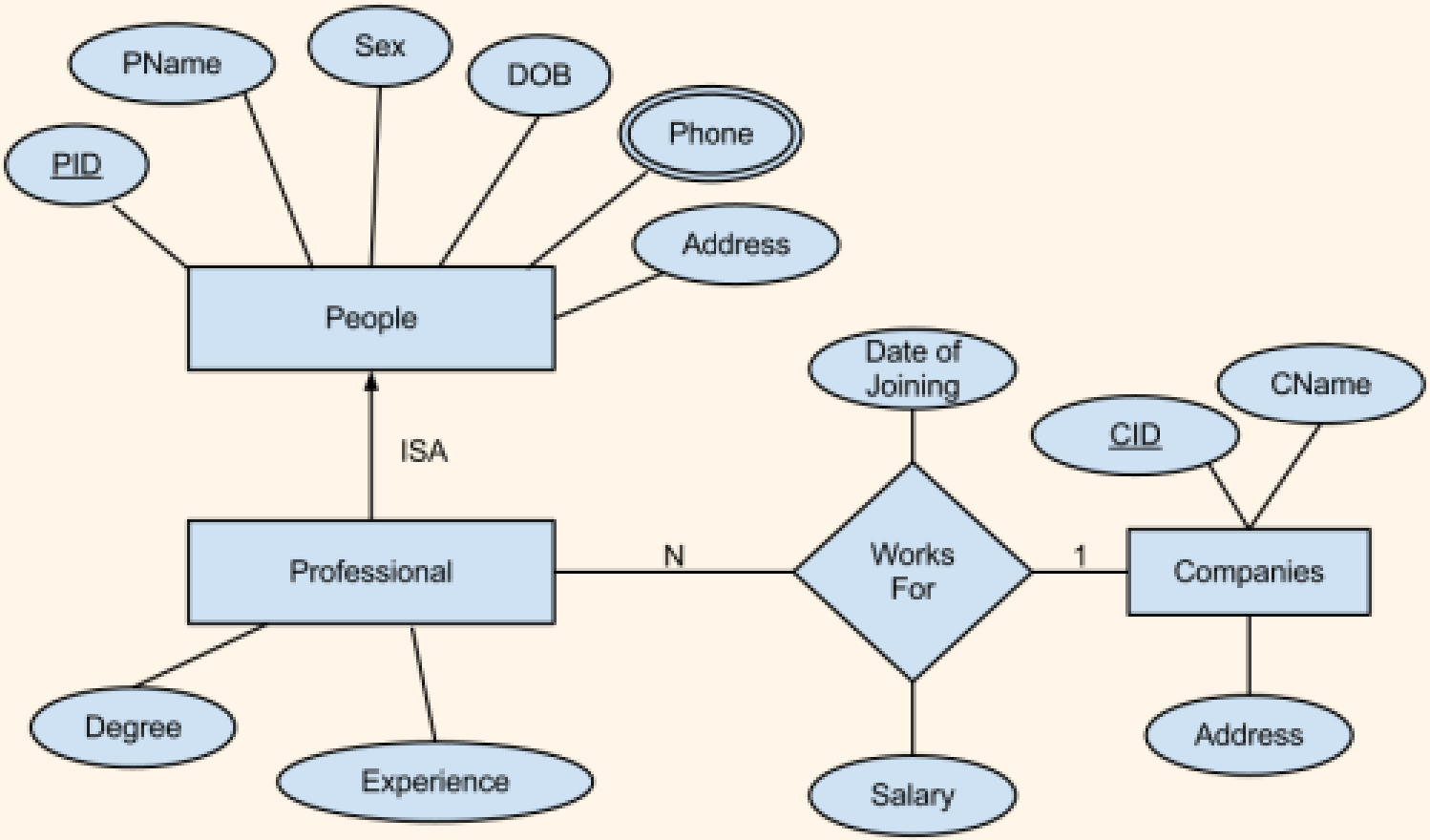
**Table 9.1** Correspondence between ER and Relational Models

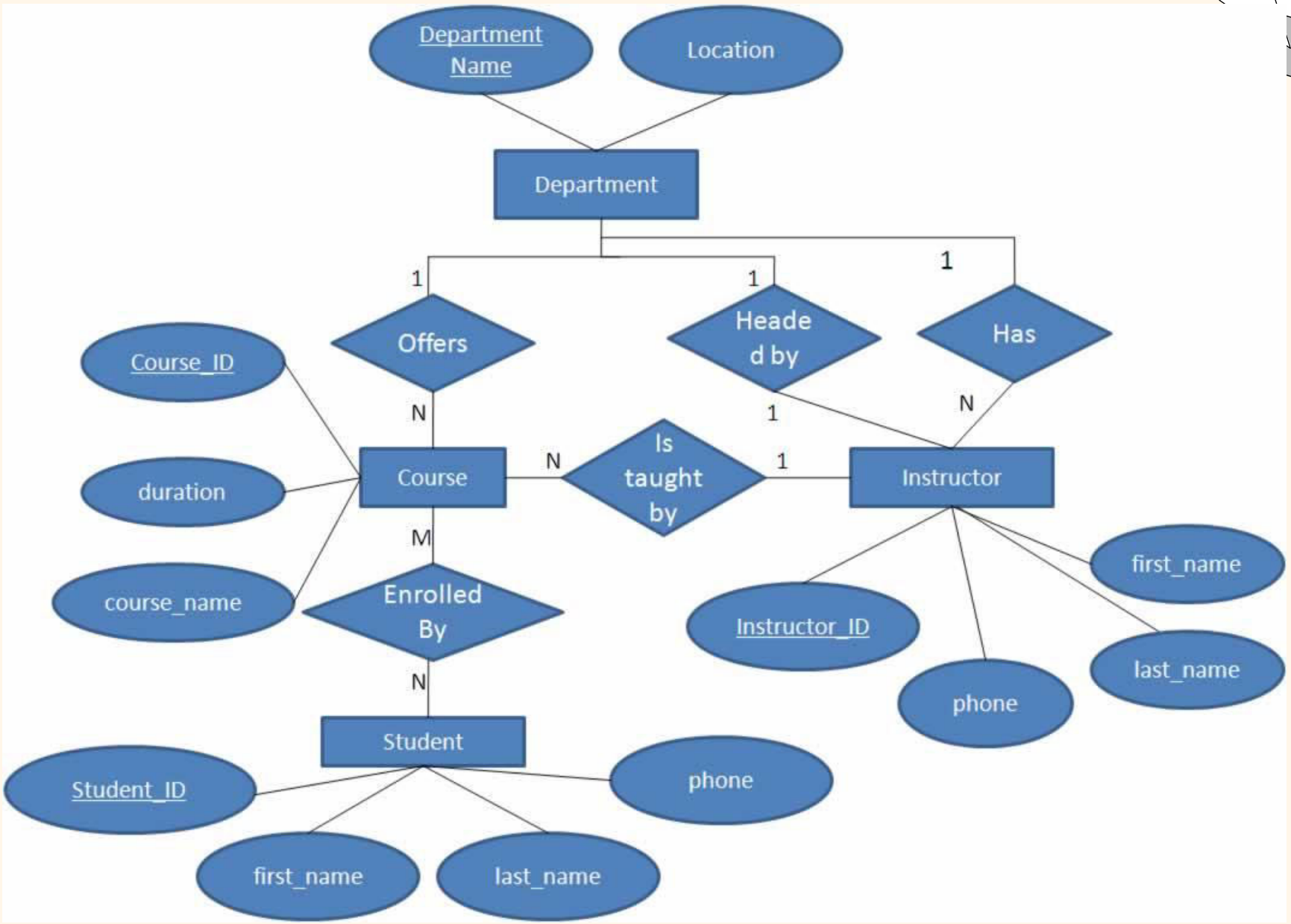
| ER MODEL | RELATIONAL MODEL |
|---|---|
| Entity type | *Entity* relation |
| 1:1 or 1:N relationship type | Foreign key (or *relationship* relation) |
| M:N relationship type | *Relationship* relation and *two* foreign keys |
| *n*-ary relationship type | *Relationship* relation and *n* foreign keys |
| Simple attribute | Attribute |
| Composite attribute | Set of simple component attributes |
| Multivalued attribute | Relation and foreign key |
| Value set | Domain |
| Key attribute | Primary (or secondary) key |

# Mapping of Specialization or Generalization



- Step 8: ISA
  - **Option 8A: Impremented (INHERIT)**
  - **Option 8B: 1:N relationship**


PName
Sex
DOB
Phone
PID
Address
People
ISA
Professional
Degree
Experience
N
Works For
Date of Joining
Salary
1
Companies
CID
CName
Address


Department Name
Location
Department
1
1
1
Offers
Heade d by
Has
Course_ID
N
1
N
duration
Course
N
Is taught by
1
Instructor
M
course_name
Enrolled By
first_name
Instructor_ID
last_name
phone
N
Student
Student_ID
phone
first_name
last_name