

# ER Model-Part 3

## Reduction of ER Model to Relational Schema



# ER to Relational Mapping

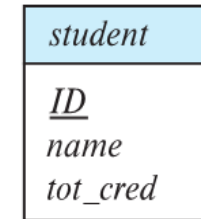
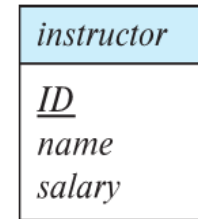
- A database which conforms to an E-R diagram can be represented by a collection of schemas.



# Representing Entity Sets

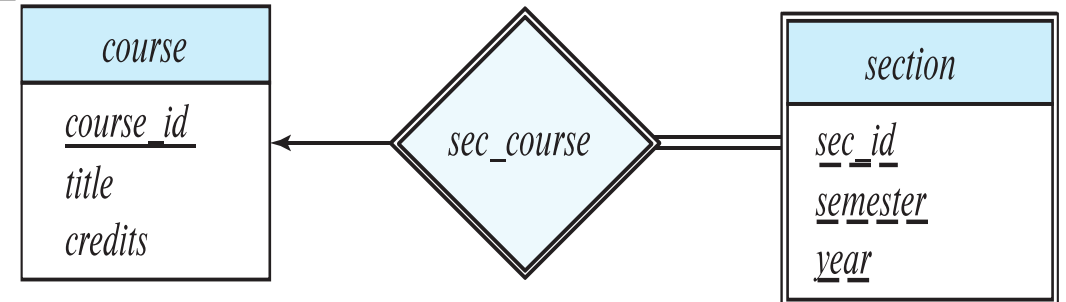
- A strong entity set reduces to a schema with the same attributes

*student(ID, name, tot\_cred)*  
*Instructor(ID, name, salary)*



- A weak entity set becomes a table that includes a column for the primary key of the identifying strong entity set

*section ( course id, sec id, sem, year )*



# Representation of Entity Sets with Composite Attributes

<i>instructor</i>
<u>ID</u>
name
<i>first_name</i>
<i>middle_initial</i>
<i>last_name</i>
address
street
<i>street_number</i>
<i>street_name</i>
<i>apt_number</i>
city
state
zip
{ <i>phone_number</i> }
<i>date_of_birth</i>
<i>age</i> ( )

- Composite attributes are flattened out by creating a separate attribute for each component attribute
  - Example: given entity set *instructor* with composite attribute *name* with component attributes *first\_name* and *last\_name* the schema corresponding to the entity set has two attributes *name\_first\_name* and *name\_last\_name*
    - Prefix omitted if there is no ambiguity (*name\_first\_name* could be *first\_name*)
- Ignoring multivalued attributes, extended instructor schema is
  - *instructor*(ID, *first\_name*, *middle\_initial*, *last\_name*, *street\_number*, *street\_name*, *apt\_number*, *city*, *state*, *zip\_code*, *date\_of\_birth*)

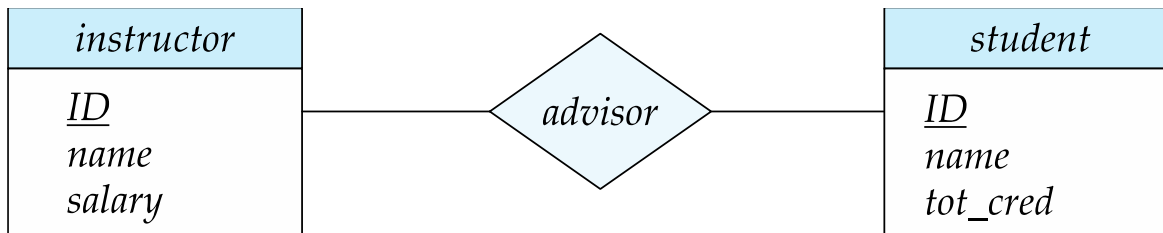
# Representation of Entity Sets with Multivalued Attributes

- A multivalued attribute  $M$  of an entity  $E$  is represented by a separate schema  $EM$
- Schema  $EM$  has attributes corresponding to the primary key of  $E$  and an attribute corresponding to multivalued attribute  $M$
- Example: Multivalued attribute *phone\_number* of *instructor* is represented by a schema:  
*inst\_phone* = ( ID, phone\_number )
- Each value of the multivalued attribute maps to a separate tuple of the relation on schema  $EM$ 
  - For example, an *instructor* entity with primary key 22222 and phone numbers 456-7890 and 123-4567 maps to two tuples:  
(22222, 456-7890) and (22222, 123-4567)

# Representing Relationship Sets

- A **many-to-many relationship set** is represented as a schema with attributes for the primary keys of the two participating entity sets, and any descriptive attributes of the relationship set.
- Example: schema for relationship set *advisor*

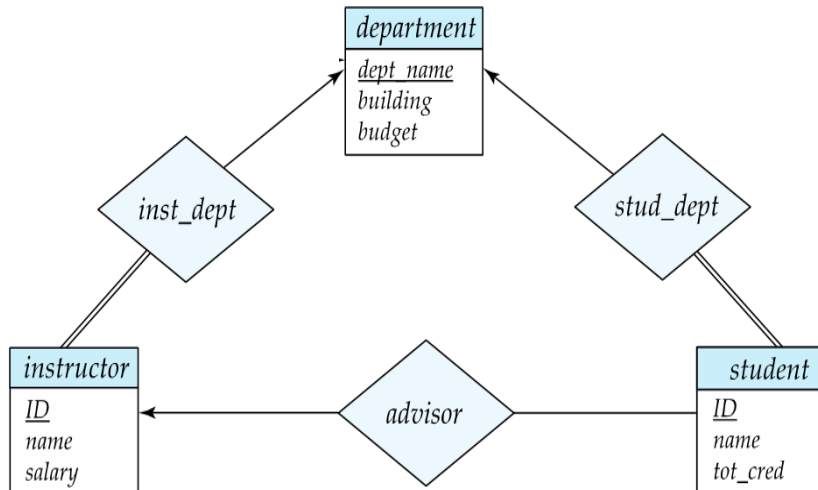
*advisor* = (*s\_id*, *i\_id*)



# Representing Relationship Sets

- **Many-to-one and one-to-many relationship** sets that are total on the many-side can be represented by adding an extra attribute to the “many” side, containing the primary key of the “one” side
- Example: Instead of creating a schema for relationship set *inst\_dept*, add an attribute *dept\_name* to the schema arising from entity set *instructor*

- Example



Instructor(id,name,salary,dname)

# Representing Relationship Sets

- For **one-to-one relationship** sets, either side can be chosen to act as the “many” side
  - That is, an extra attribute can be added to either of the tables corresponding to the two entity sets
  - It is better to add the primary key of entity set that is partially participating in the relationship set as a foreign key in the relation corresponding to entity at total participating side.




## Mapping of N-ary Relationship Types.

- For each n-ary relationship type R, where  $n > 2$ , create a new relation S to represent R.
  - Include as foreign key attributes in S the primary keys of the relations that represent the participating entity types.
  - Also include any simple attributes of the n-ary relationship type (or simple components of composite attributes) as attributes of S.

# Summary –Mapping ER to Relational Schema

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

ER MODEL	RELATIONAL MODEL
Entity type	<i>Entity</i> relation
1:1 or 1:N relationship type	Foreign key (or <i>relationship</i> relation)
M:N relationship type	 <i>Relationship</i> relation and <i>two</i> foreign keys
<i>n</i> -ary relationship type	<i>Relationship</i> relation and <i>n</i> 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