

RDBMS AND SQL ER MODEL

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Slide contents are borrowed from the official website of the course text. For the authors' original version of slides, visit: <https://www.db-book.com/db6/slide-dir/index.html>.

Database Design Using The Entity-Relationship Model

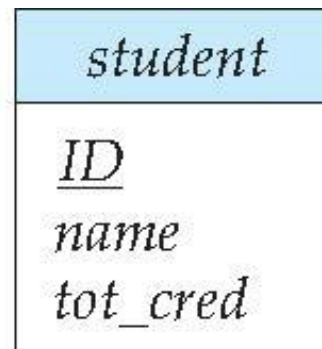
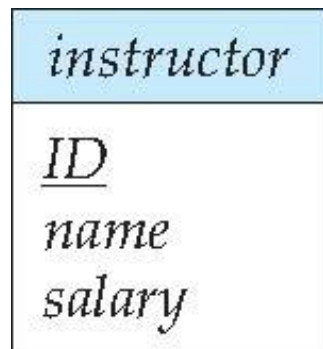
A Data Model

ER Model

- Models an enterprise as a collection of *entities* and *relationships*
 - Entity: a “thing” or “object” in the enterprise that is distinguishable from other objects
 - Described by a set of *attributes*
 - Relationship: an association among several entities
- Represented diagrammatically by an *entity-relationship diagram*.
- The ER data model employs three basic concepts:
 - entity sets,
 - relationship sets,
 - attributes.

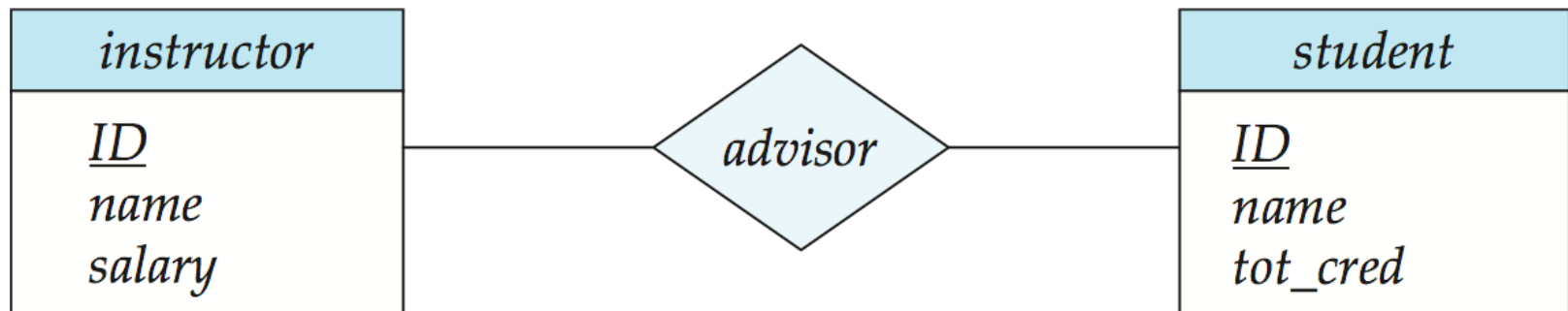
Entity Sets

- Entities can be represented graphically as follows:
 - Rectangles represent entity sets.
 - Attributes listed inside entity rectangle
 - Underline indicates primary key attributes



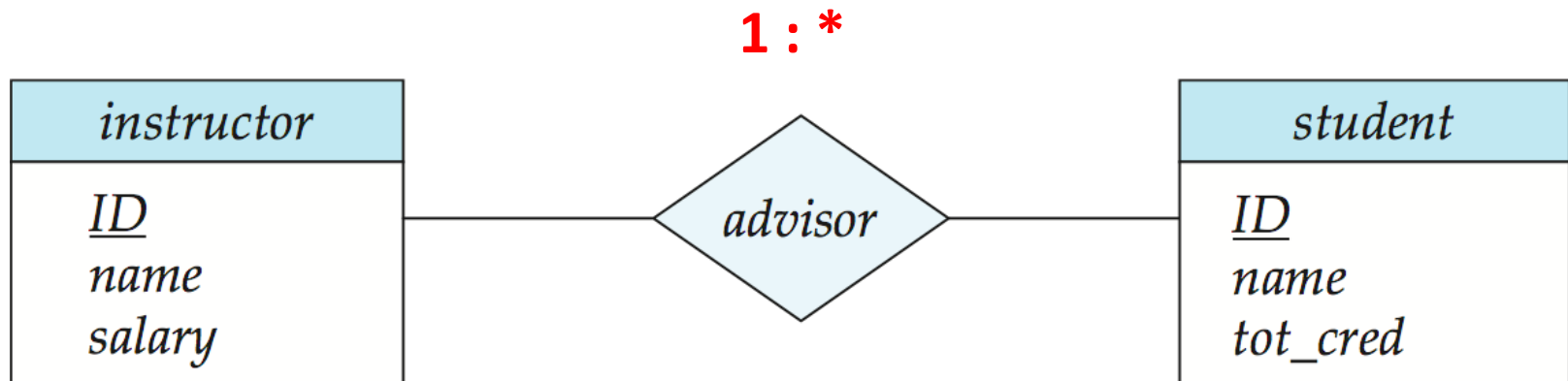
Relationship Sets

- Diamonds represent relationship sets.

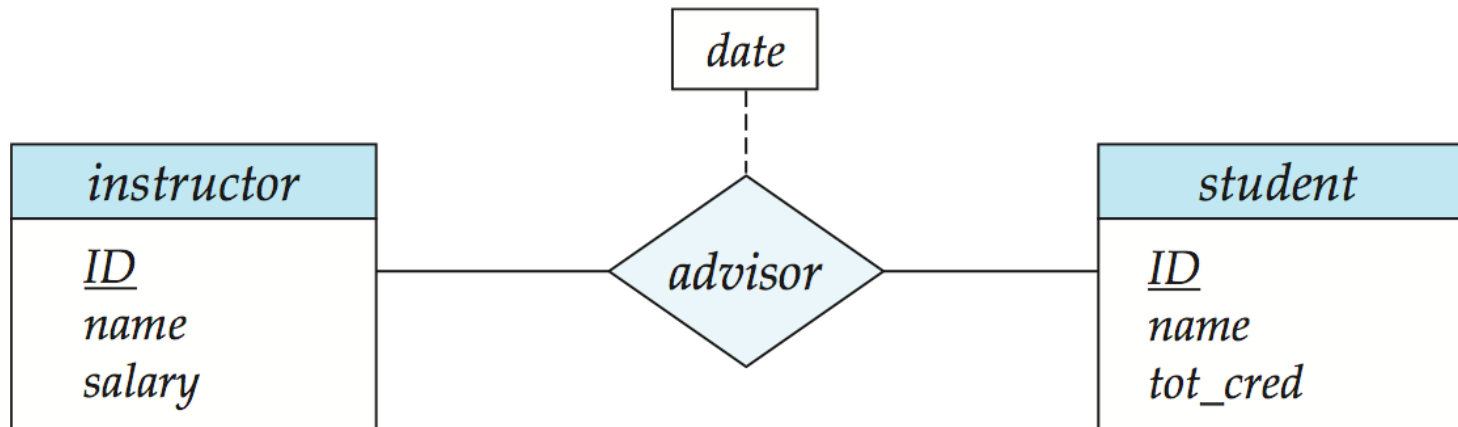


Mapping Cardinalities

- Specifies constraints on entity-entity association.

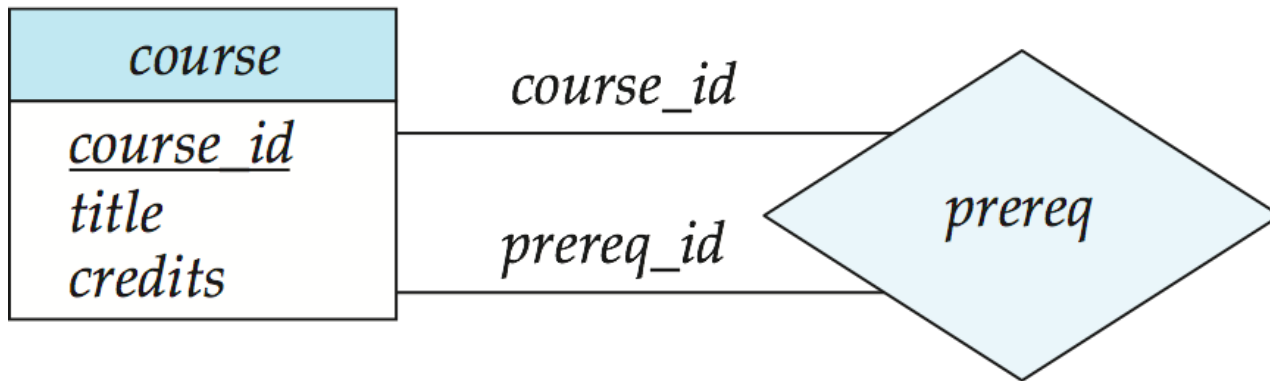


Relationship Sets with Attributes

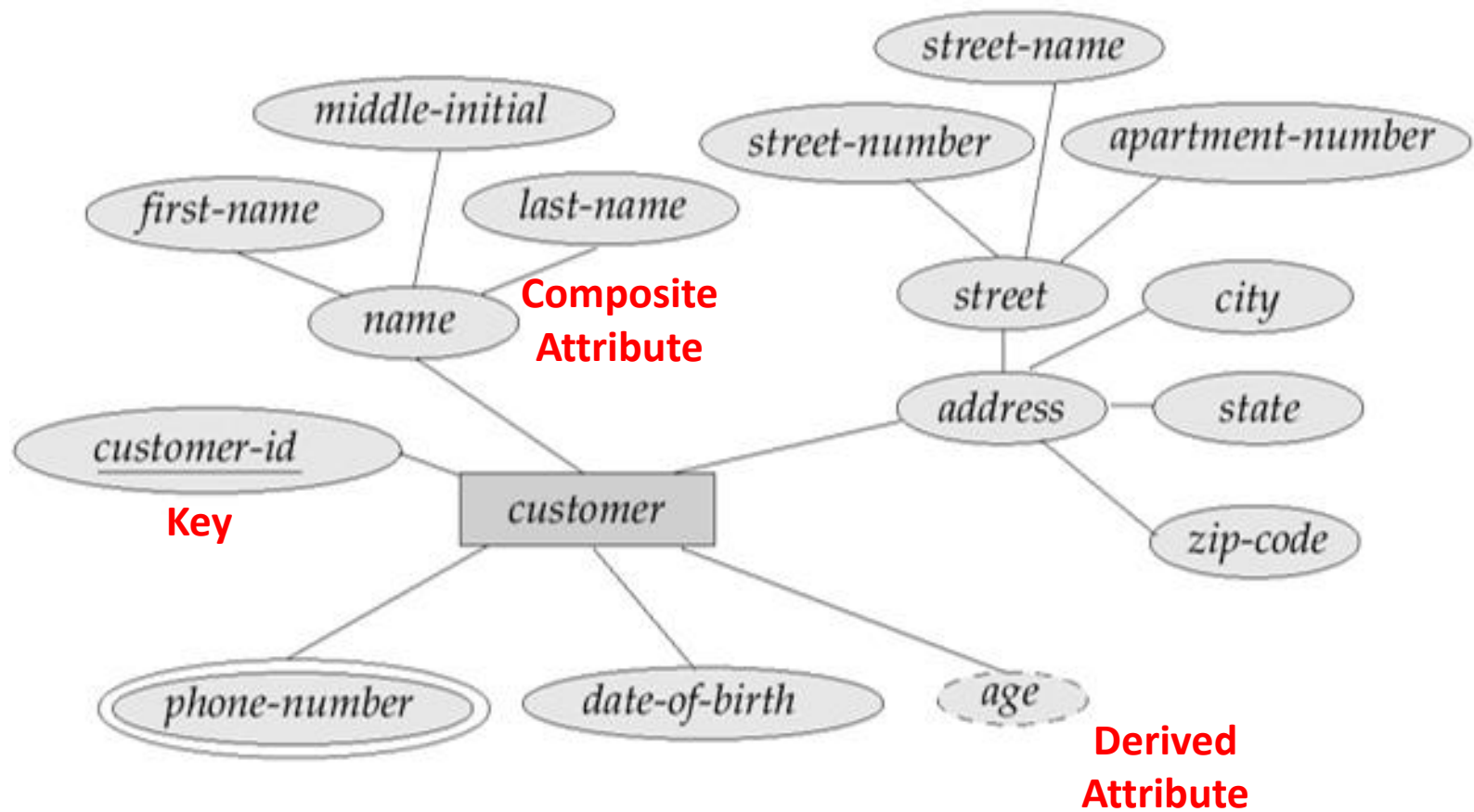


Roles

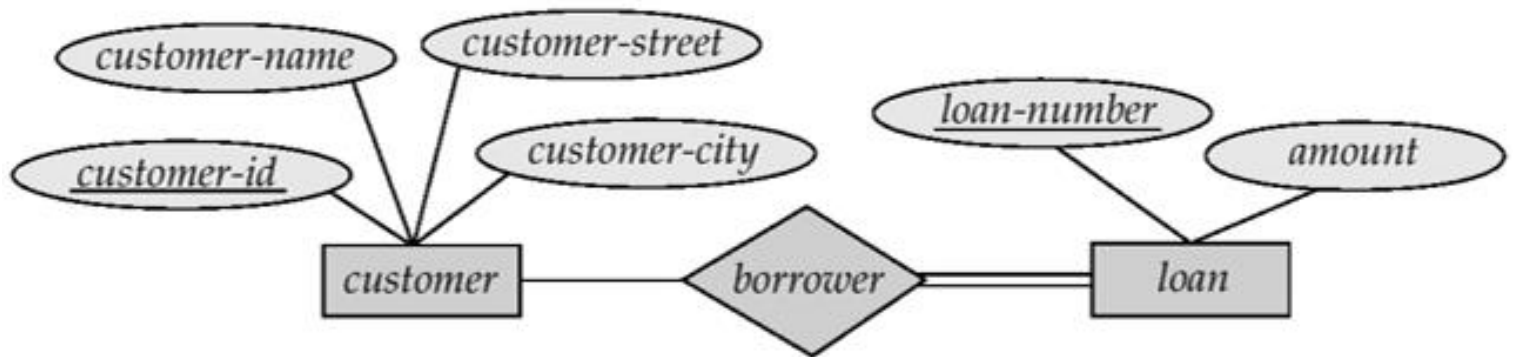
- Entity sets of a relationship need not be distinct
 - Each occurrence of an entity set plays a “role” in the relationship
- The labels “*course_id*” and “*prereq_id*” are called **roles**.



Attribute Types

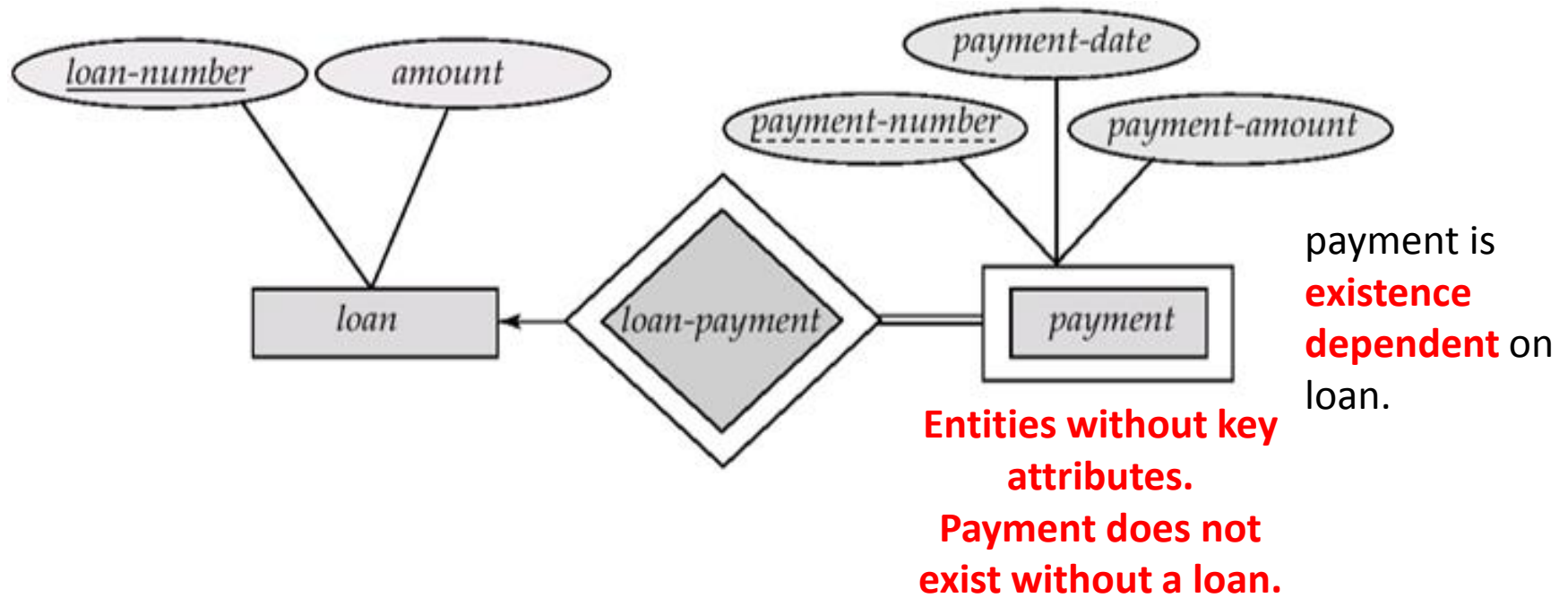


Total Vs. Partial Participation



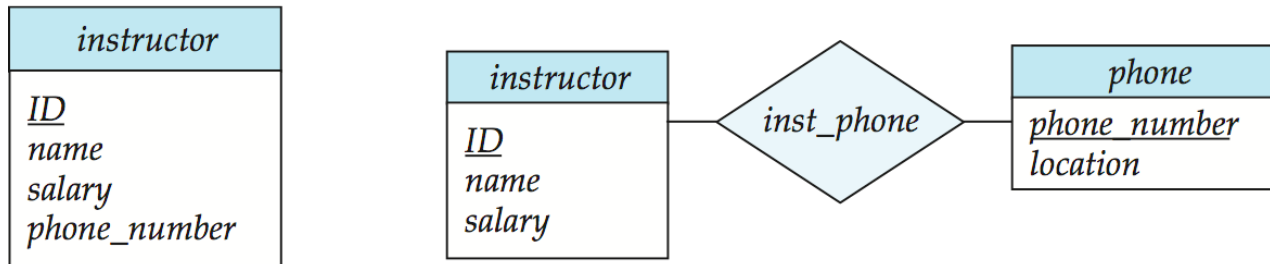
Every customer need not borrow loan!

Weak Entities



Entities vs. Attributes

- Use of entity sets vs. attributes



- Use of phone as an entity allows extra information about phone numbers (plus multiple phone numbers)

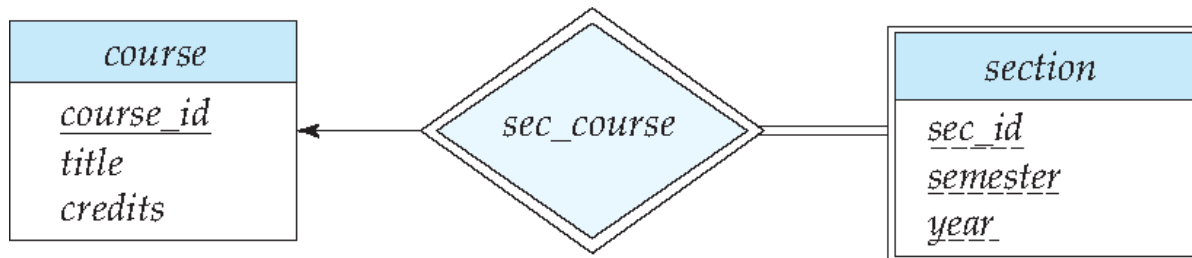
Reduction to Relation Schemas

- Entity sets and relationship sets can be expressed uniformly as *relation schemas*.
- A database which conforms to an E-R diagram can be represented by a collection of schemas.
- For each entity set and relationship set there is a unique schema that is assigned the name of the corresponding entity set or relationship set.

Representing Entity Sets

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

student(ID, name, tot_cred)



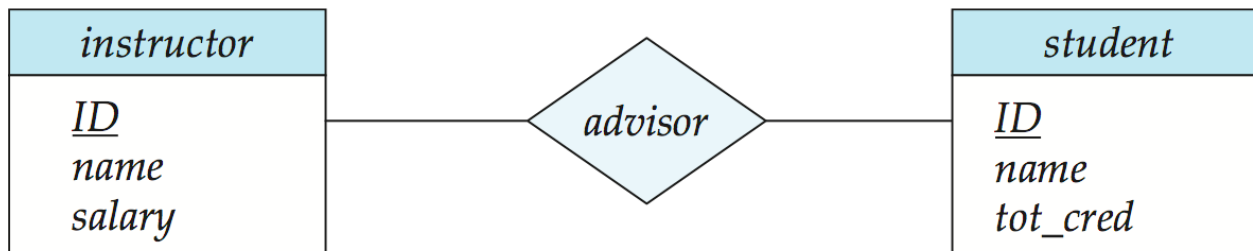
- A weak entity set becomes a table that includes a column for the primary key of the identifying strong entity set

section (course_id, sec_id, sem, year)

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*)



Representation of Entity Sets with Composite Attributes

<i>instructor</i>
<u><i>ID</i></u>
<i>name</i>
<i>first_name</i>
<i>middle_initial</i>
<i>last_name</i>
<i>address</i>
<i>street</i>
<i>street_number</i>
<i>street_name</i>
<i>apt_number</i>
<i>city</i>
<i>state</i>
<i>zip</i>

- Composite attributes are flattened out by creating a separate attribute for each component attribute
 - *instructor*(*ID*,
 first_name, *middle_initial*,
 last_name, *street_number*,
 street_name, *apt_number*, *city*, *state*,
 zip_code)

Summary

- ER Model is made of
 - entity sets,
 - relationship sets and
 - attribute sets.
- We have a standard UML-kind notation to draw ER diagrams.
- Although it looks natural, designing a good ER model requires creativity.