

The Entity-Relationship (ER) Model

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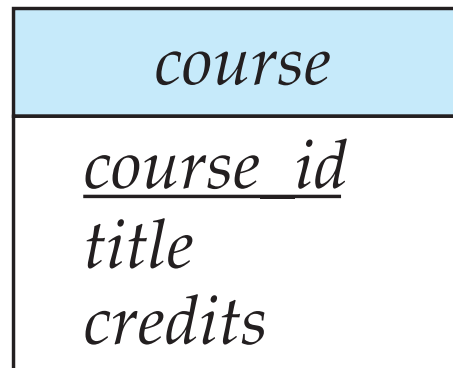


Question on HW1?

- You must show your work to receive full credit on homework and exams.

Weak Entity Sets

- Recall the course entity sets...



- Suppose we want to allow multiple sections per course.

Weak Entity Sets

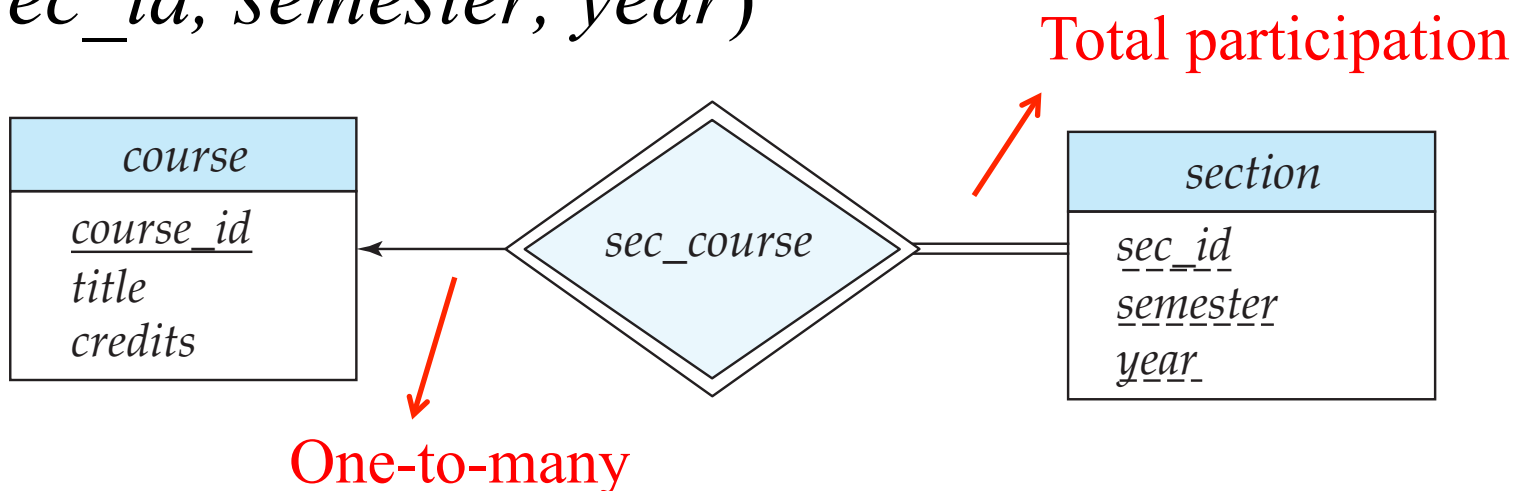
- An entity set that does not have a primary key is referred to as a **weak entity set**.
- The existence of a weak entity set depends on the existence of a **identifying entity set**
 - It must relate to the identifying entity set via a **total, one-to-many** relationship set from the identifying to the weak entity set
 - **Identifying relationship** depicted using a double diamond

Weak Entity Sets (Cont.)

- The **discriminator** (*or partial key*) of a weak entity set is the set of attributes that distinguishes among all the entities of a weak entity set.
- The primary key of a weak entity set is formed by the primary key of the strong entity set on which the weak entity set is existence dependent, plus the weak entity set's discriminator.

Weak Entity Sets (Cont.)

- We underline the discriminator of a weak entity set with a dashed line.
- We put the identifying relationship of a weak entity in a double diamond.
- Primary key for *section* – (*course_id*, *sec_id*, *semester*, *year*)



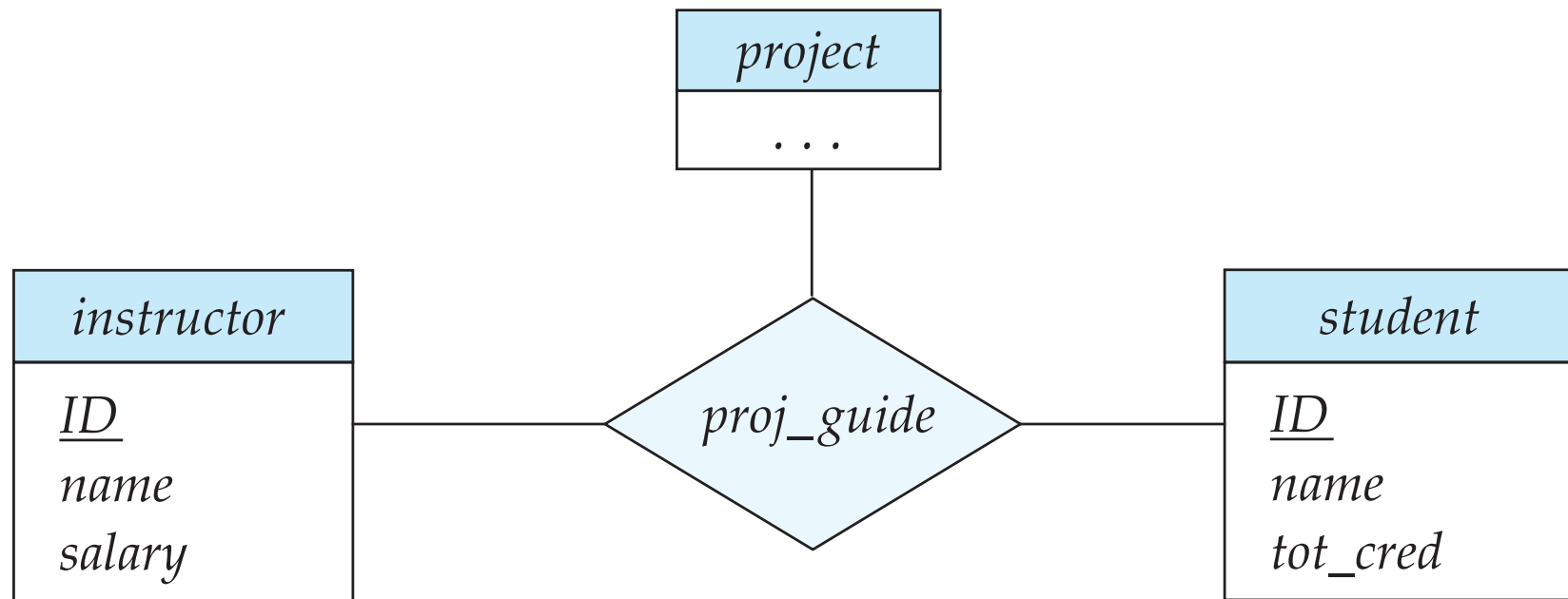
Weak Entity Sets (Cont.)

- Note: the primary key of the strong entity set is NOT explicitly stored with the weak entity set, since it is implicit in the identifying relationship.
- If *course_id* were explicitly stored, *section* could be made a strong entity, but then the relationship between *section* and *course* would be duplicated by an implicit relationship defined by the attribute *course_id* common to *course* and *section*

Weak Entity Sets Example

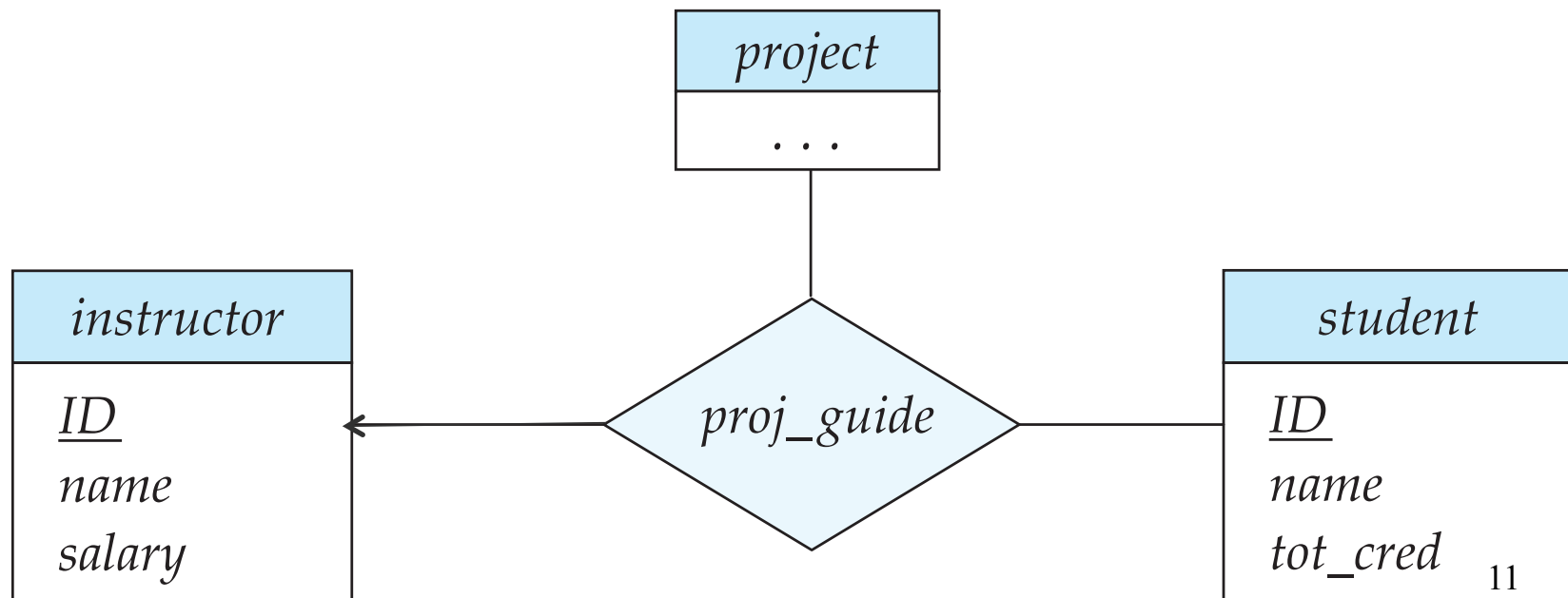
- Entity sets Teams, and Players.
 - No team has two players with the same number.
 - However, there can be players with the same number on different teams

Ternary Relationship



Ternary Relationship and Mapping Cardinality

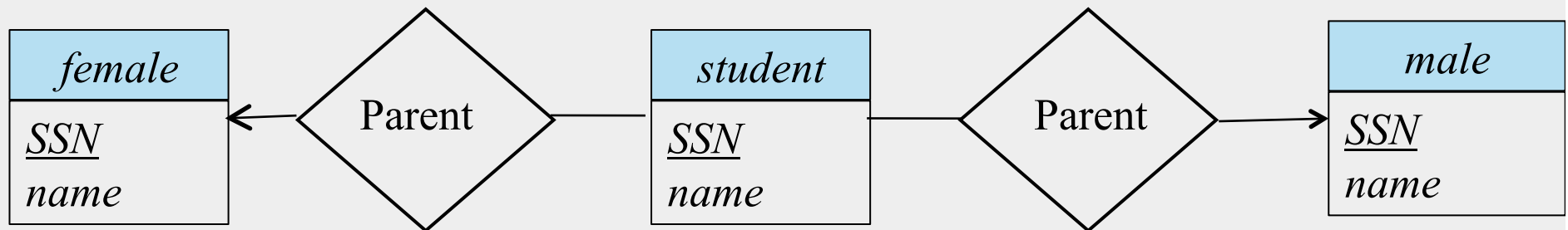
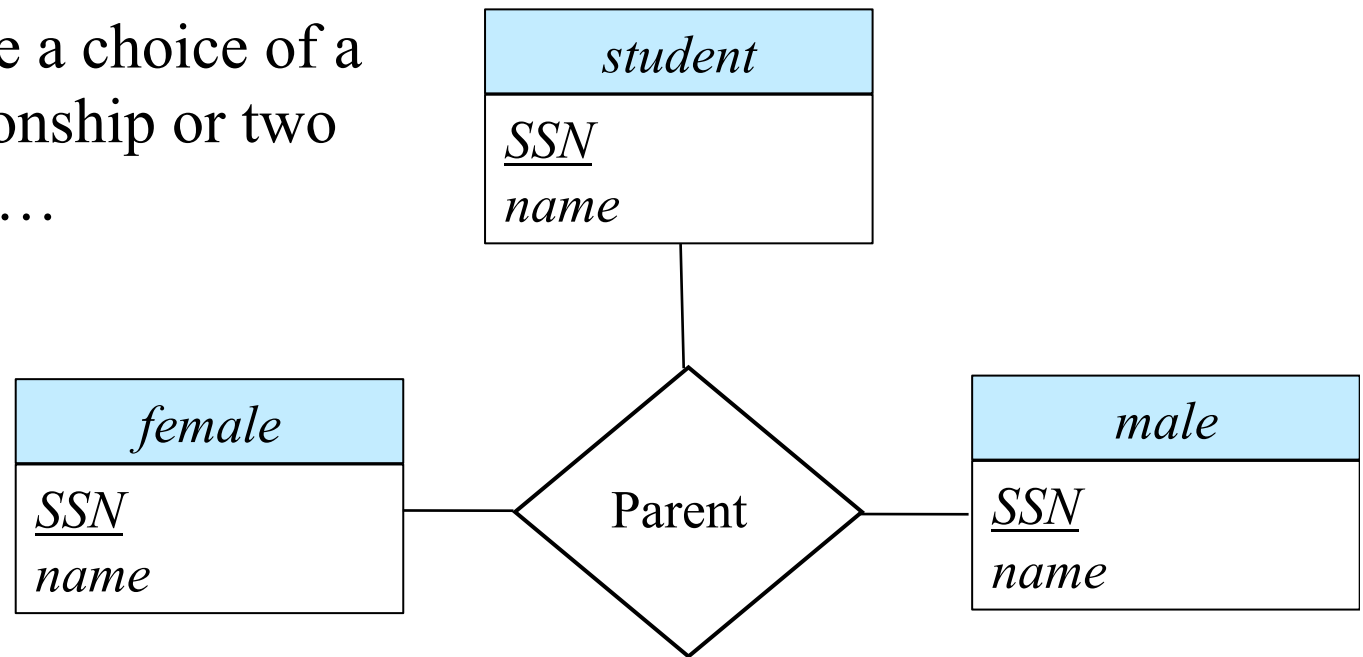
- At most one arrow out of a relationship set is allowed. (Why?)



Ternary Relationships

Sometimes you have a choice of a single ternary relationship or two binary relationships...

In general, unless you really need a ternary relationship, use binary relationships.



Exercise – University Database

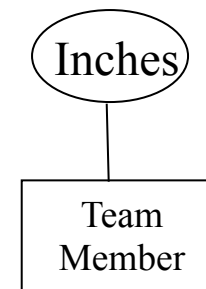
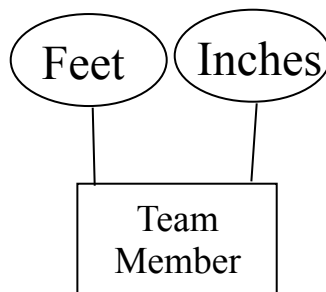
- University has departments, instructors, students, and courses.
- Departments offer courses; instructors teach courses; students take courses.
- A course can have multiple sections; each section has a time slot and location.
- A course has a set of pre-requisites.
- Students are advised by instructors; a student has *at most* one advisor.
- An instructor is associated with *exactly one* department.
- A student is associated with *exactly one* department.
- A student receives grade from a course he/she takes.

Entity Attributes Revisited

- What is the correct choice of attributes to represent height?

Using two fields, one for *feet* the other for *inches* is probably the best solution if we are never going to do arithmetic on the height, and you need to report the height in a human intuitive way (dating agency).

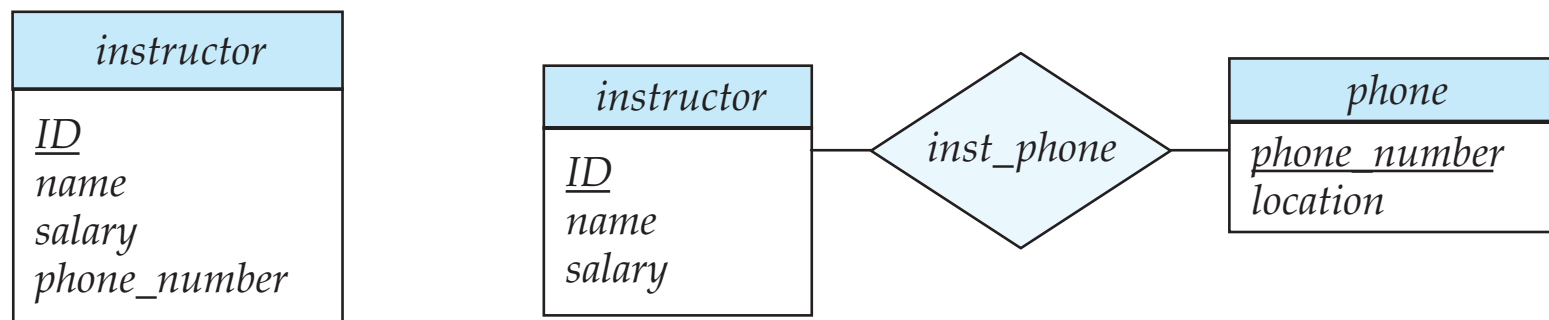
If we are going to do calculations on the data (i.e calculate the BMI) we would be much better off with just the height in inches. (medical records)



Entity versus Attribute

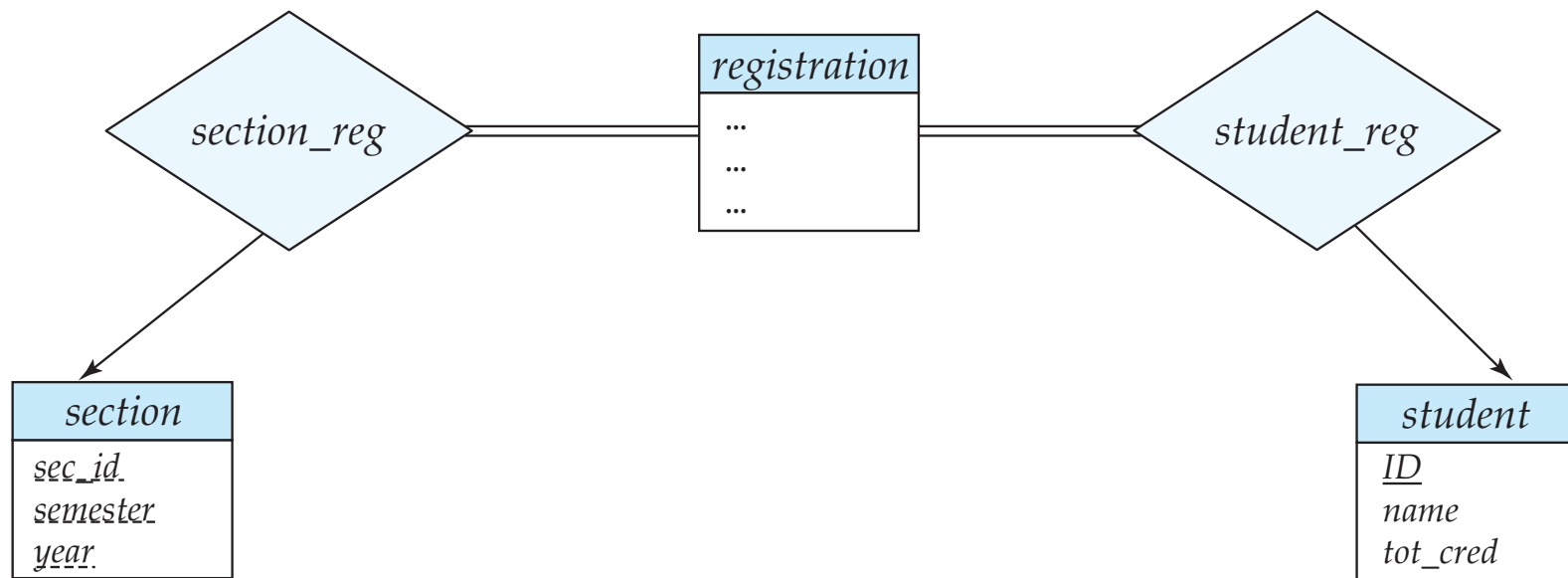
Sometimes we have to decide whether a property of the world we want to model should be an **attribute of an entity**, or an **entity set which is related to the attribute by a relationship set**.

A major advantage of the latter approach is that we can easily model the fact that a person can have multiple phones, or that a phone might be shared by several students.



Entity Sets vs. Relationship Sets

- It's not always clear whether an object should be an entity set or a relationship set.
- Possible guideline is to designate a relationship set to describe an action that occurs between entities



Domains Revisited

We already said...

The **domain** of the attribute is the set of permitted values (e.g. the telephone number must be ten positive integers).

Defining the correct **domain** for an attribute is an important skill. Making a mistake at this stage can cause huge problems later on.

What is the **domain** for GENDER?

is it MALE, FEMALE, MIXED?

(Olympics)

is it MALE, FEMALE, UNKNOWN?

(Fossils)

is it MALE, FEMALE, DECLINE TO STATE?

(Politically Correct)

Domains Revisited Cont.

What is the correct domain for GPA?

What is the correct domain for street address?

What is the correct domain for Phone Number? (What about foreign ...)

What is the correct domain for Bank Account Balance?