- **One-to-many**. We draw a directed line from the relationship set to the "one" side of the relationship. Thus, in Figure 6.11b, there is a directed line from relationship set *advisor* to the entity set *instructor*, and an undirected line to the entity set *student*. This indicates that an instructor may advise many students, but a student may have at most one advisor.
- **Many-to-one**. We draw a directed line from the relationship set to the "one" side of the relationship. Thus, in Figure 6.11c, there is an undirected line from the relationship set *advisor* to the entity set *instructor* and a directed line to the entity set *student*. This indicates that an instructor may advise at most one student, but a student may have many advisors.
- **Many-to-many**. We draw an undirected line from the relationship set to both entity sets. Thus, in Figure 6.11d, there are undirected lines from the relationship set *advisor* to both entity sets *instructor* and *student*. This indicates that an instructor may advise many students, and a student may have many advisors.

The participation of an entity set E in a relationship set R is said to be **total** if every entity in E must participate in at least one relationship in R. If it is possible that some entities in E do not participate in relationships in R, the participation of entity set E in relationship R is said to be **partial**.

For example, a university may require every *student* to have at least one advisor; in the E-R model, this corresponds to requiring each entity to be related to at least one instructor through the *advisor* relationship. Therefore, the participation of *student* in the relationship set *advisor* is total. In contrast, an *instructor* need not advise any students. Hence, it is possible that only some of the *instructor* entities are related to the *student* entity set through the *advisor* relationship, and the participation of *instructor* in the *advisor* relationship set is therefore partial.

We indicate total participation of an entity in a relationship set using double lines. Figure 6.12 shows an example of the *advisor* relationship set where the double line indicates that a student must have an advisor.

E-R diagrams also provide a way to indicate more complex constraints on the number of times each entity participates in relationships in a relationship set. A line may have an associated minimum and maximum cardinality, shown in the form $l..h$, where l

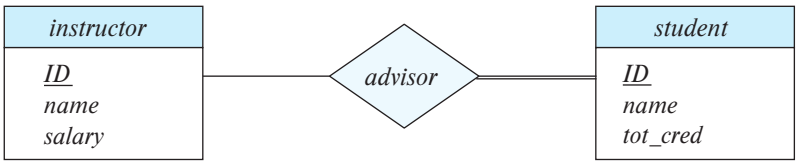

Figure 6.12 E-R diagram showing total participation.