CSCI3170 Introduction to Database Systems

Tutorial 4 – ER Model

About TAs

Mr. Chen Xiong (Barry)

- Email: 1155209956@link.cuhk.edu.hk

ER-diagram and mapping constraints

ENTITY-RELATIONSHIP MODEL

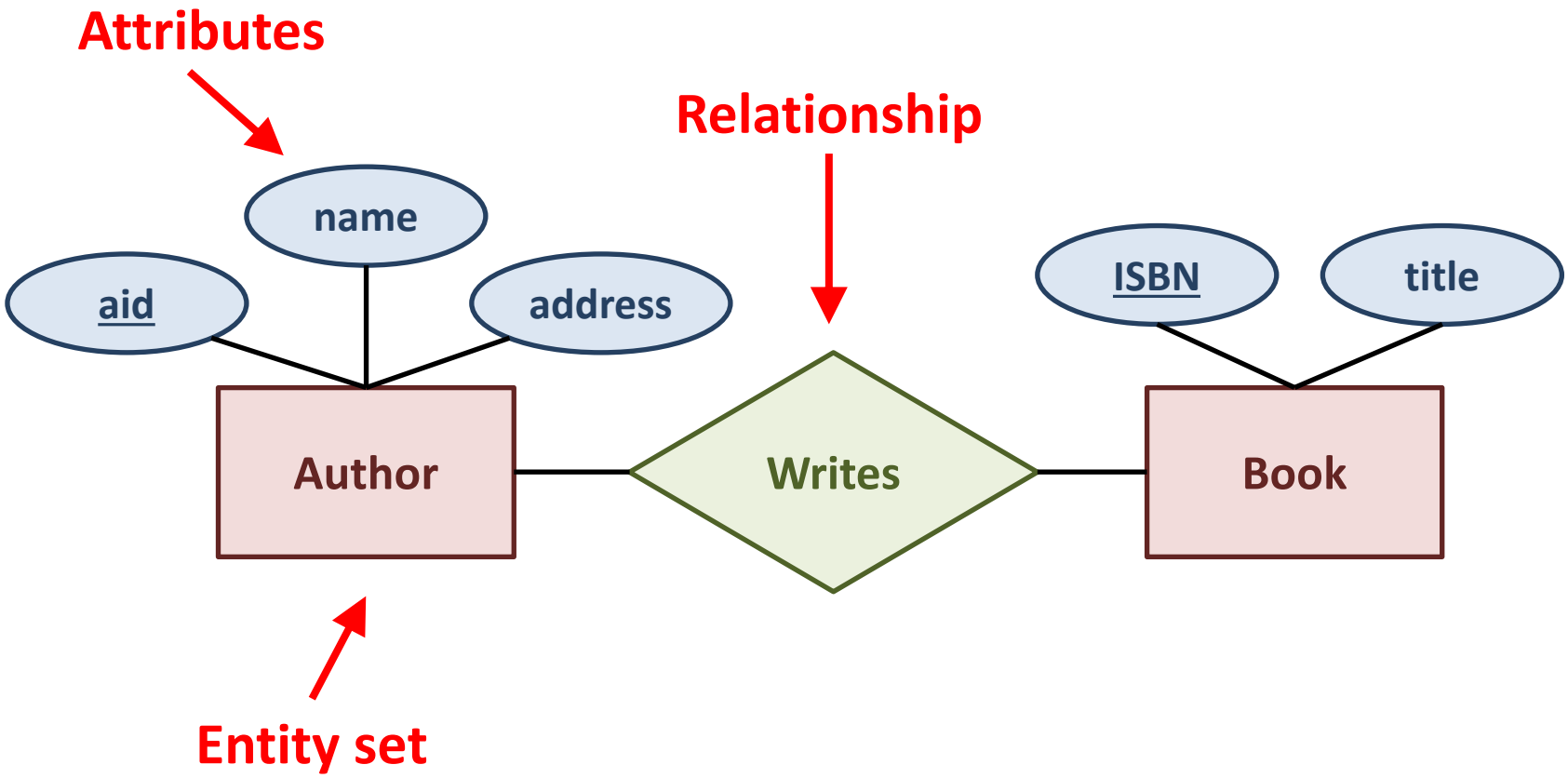
ER-model

- A conceptual data model
- Real world objects are mapped to **entities** and described by **relationships** among the entities

- There are different sets of notations for drawing an ER-diagram
- For our course, you are required to use the notations mentioned in the lecture notes
- **Marks will be deduced if notations other than the one specified in lecture notes are used in assignments, projects and examinations**

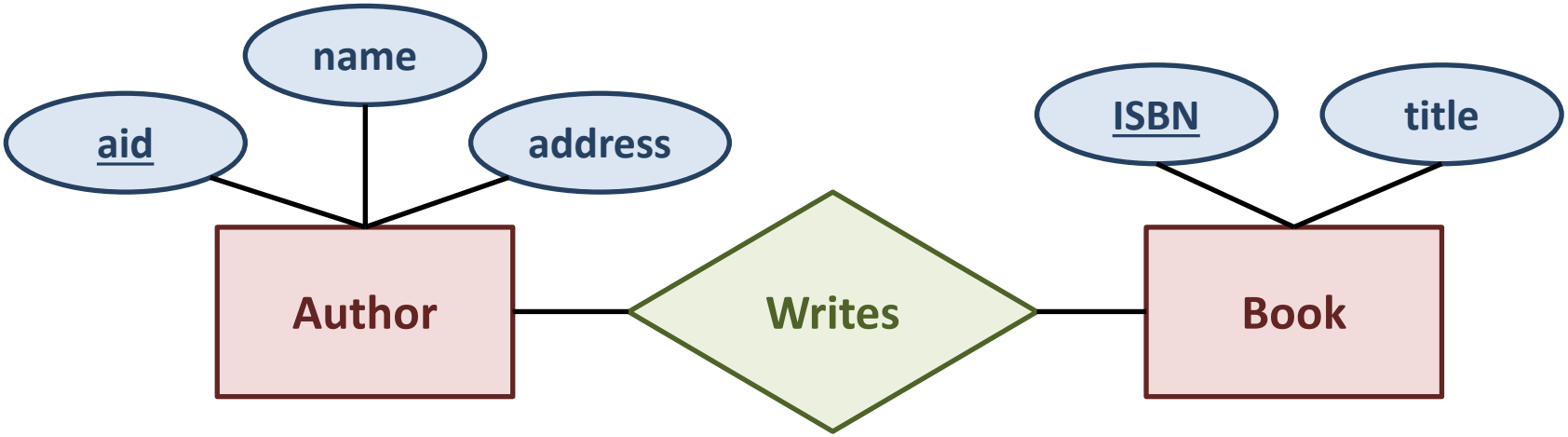
ER-diagram

- Graphical representation of an ER-model



Many-to-many relationships

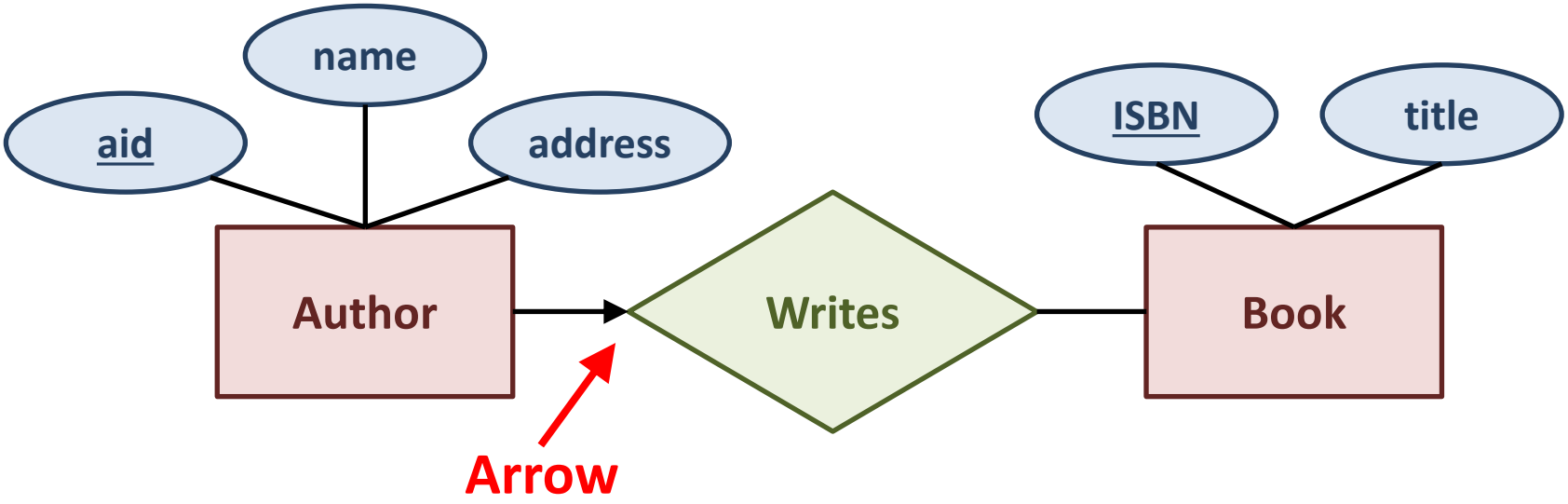
- No mapping constraint is required



- An author can write **any number of** books
- A book can be written by **any number of** authors

Many-to-one relationships

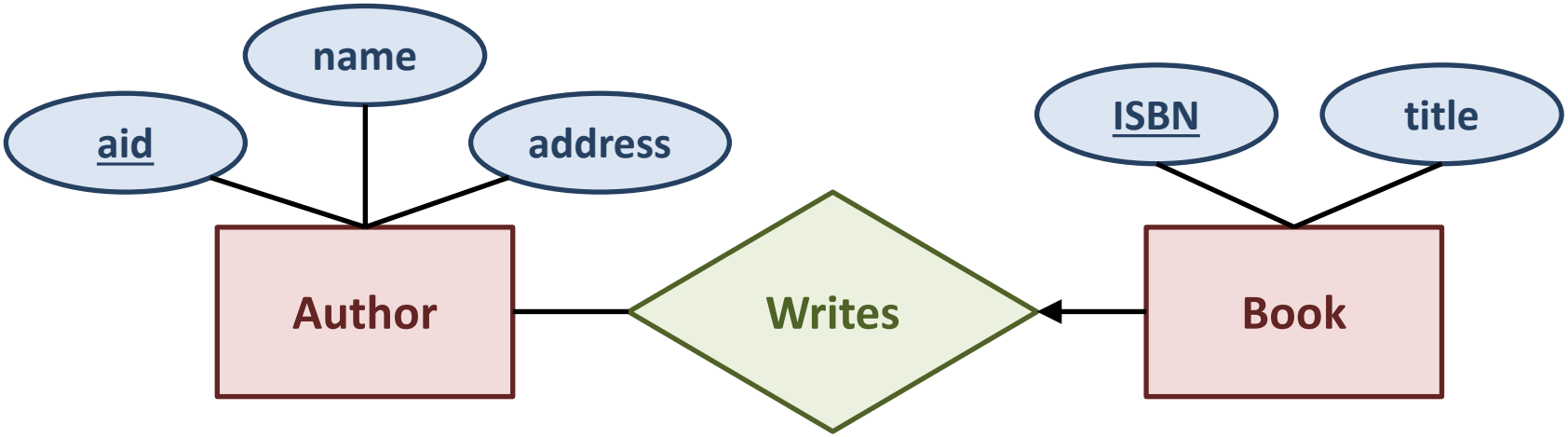
- Use an arrow to indicate the restriction



- An author can write **at most one** book
- A book can be written by **any number of** authors

One-to-many relationships

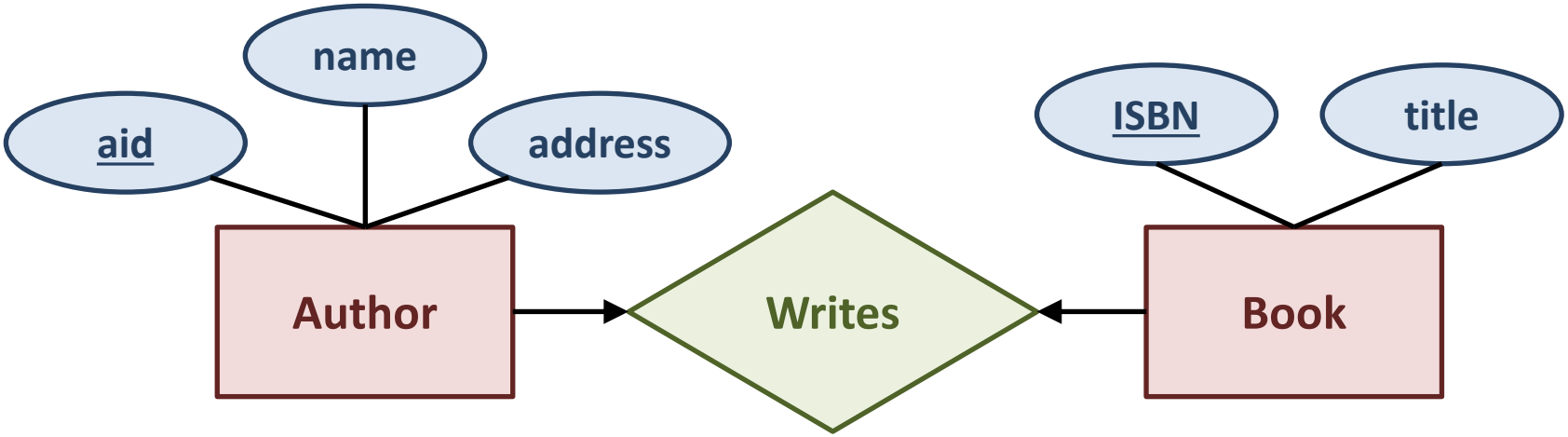
- Similar to many-to-one relationship



- An author can write **any number of** books
- A book can be written by **at most one** author

One-to-one relationships

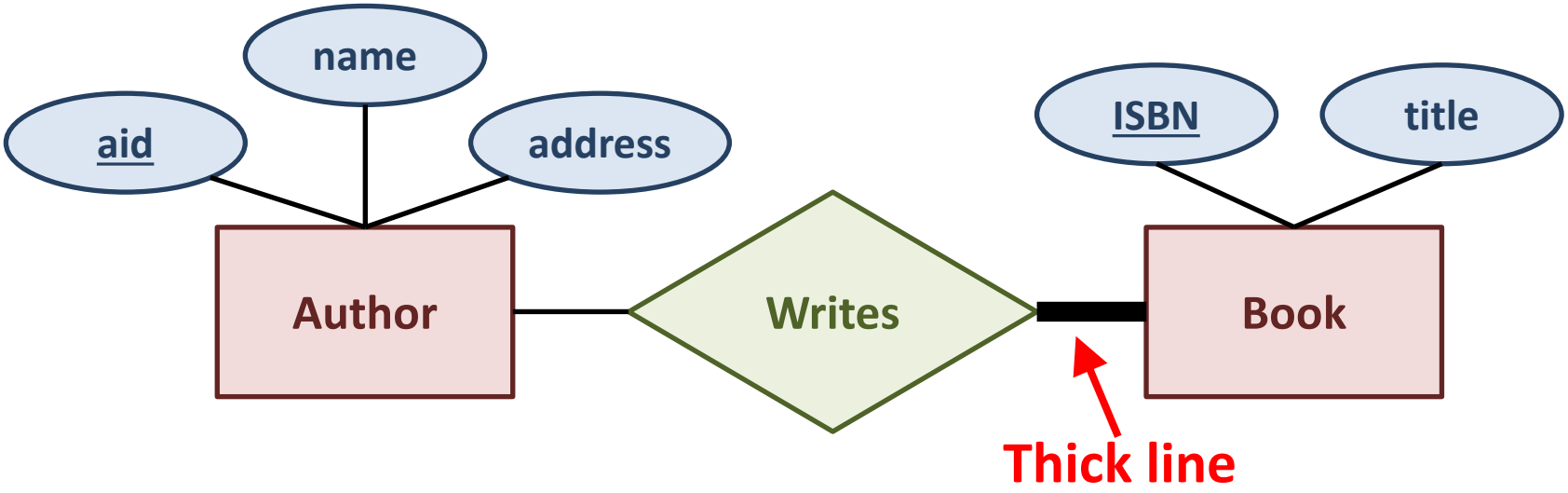
- Arrows appear on both sides



- An author can write **at most one** book
- A book can be written by **at most one** author

Total participation

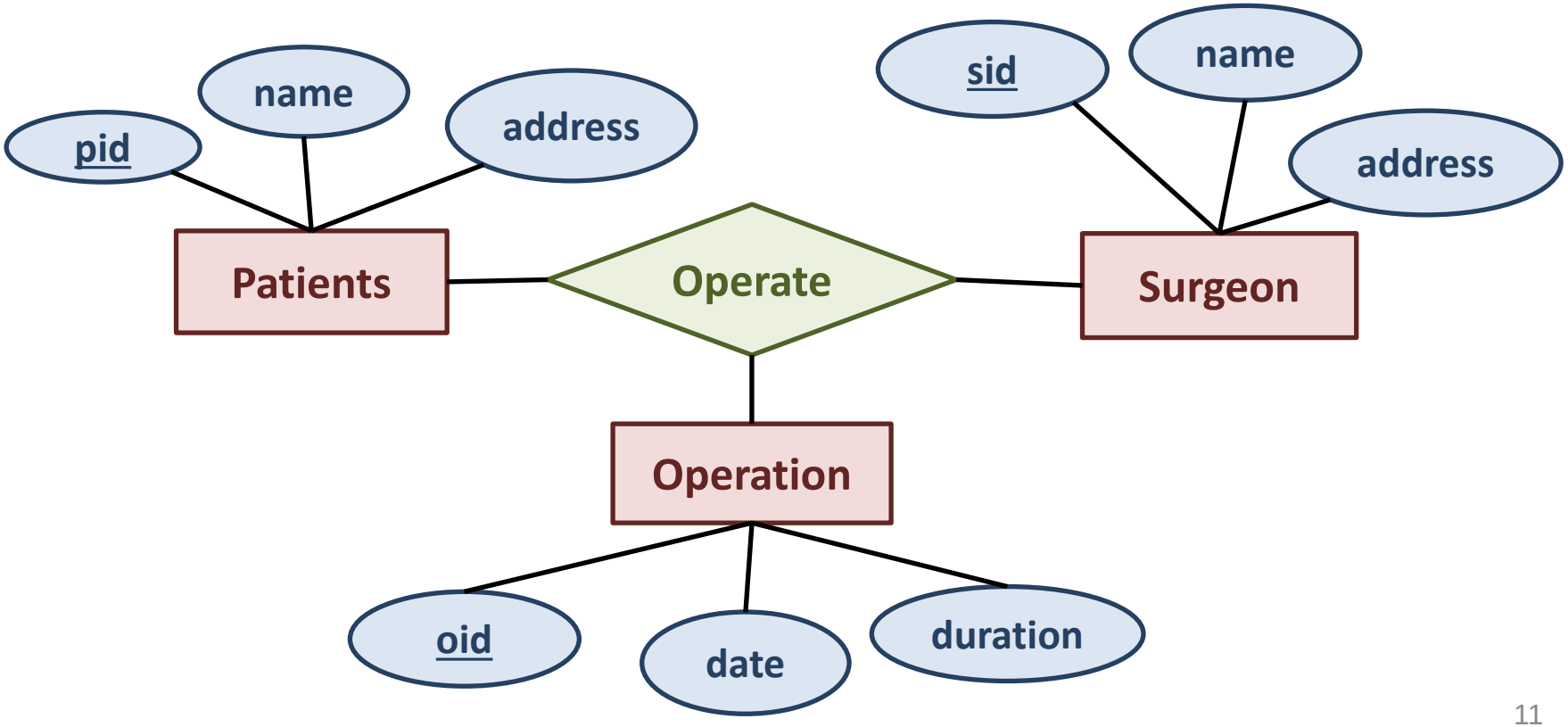
- Use a thick line to indicate the restriction



- An author can write **any number of** books
- A book must be written by **at least one** author

Ternary relationships

- Sometimes, the relationship is among three entity sets.

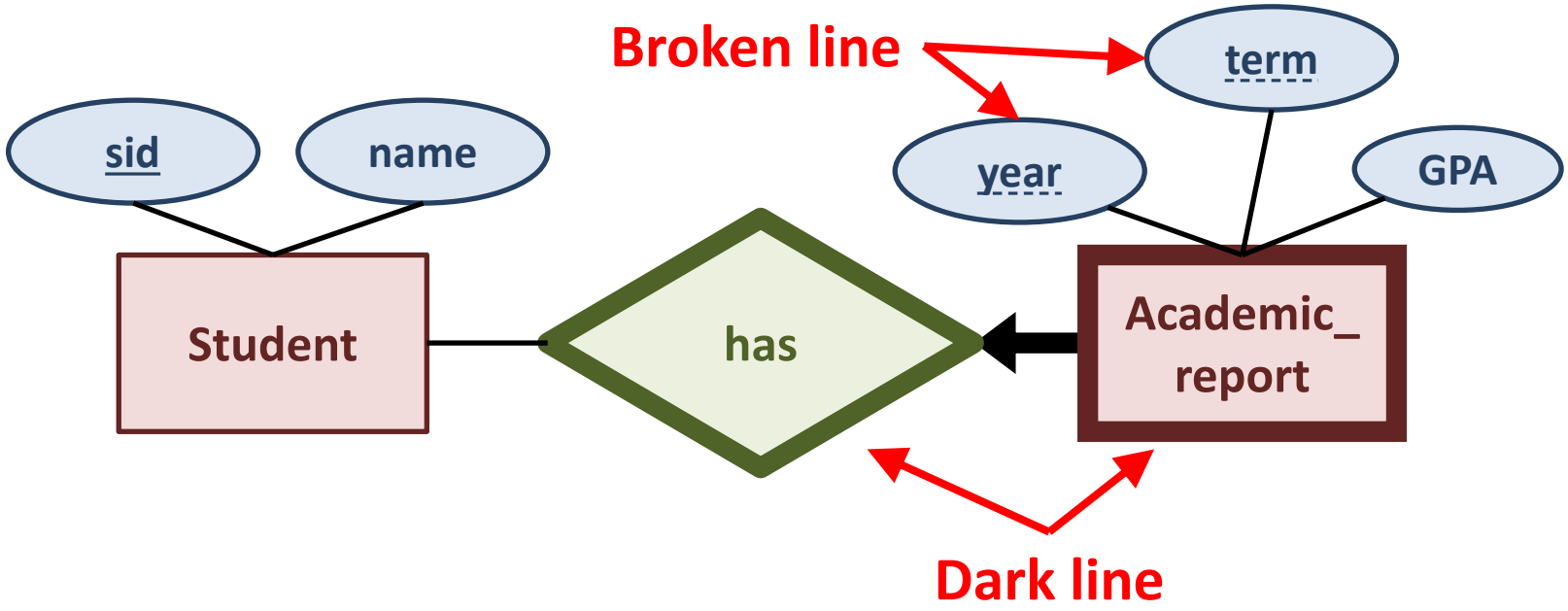


Keys

- Superkey: **any** set of **attributes** which can uniquely identify an entity in the entity set.
- (Candidate) key: a **minimal** set of **attributes** whose values uniquely identify an entity.
- Primary key: a candidate key chosen to serve as the key for the entity set.
- Remark: an entity set can have more than one superkey and candidate key.

Weak entity set

- Instances of the entity set cannot be uniquely identified by its set of attributes

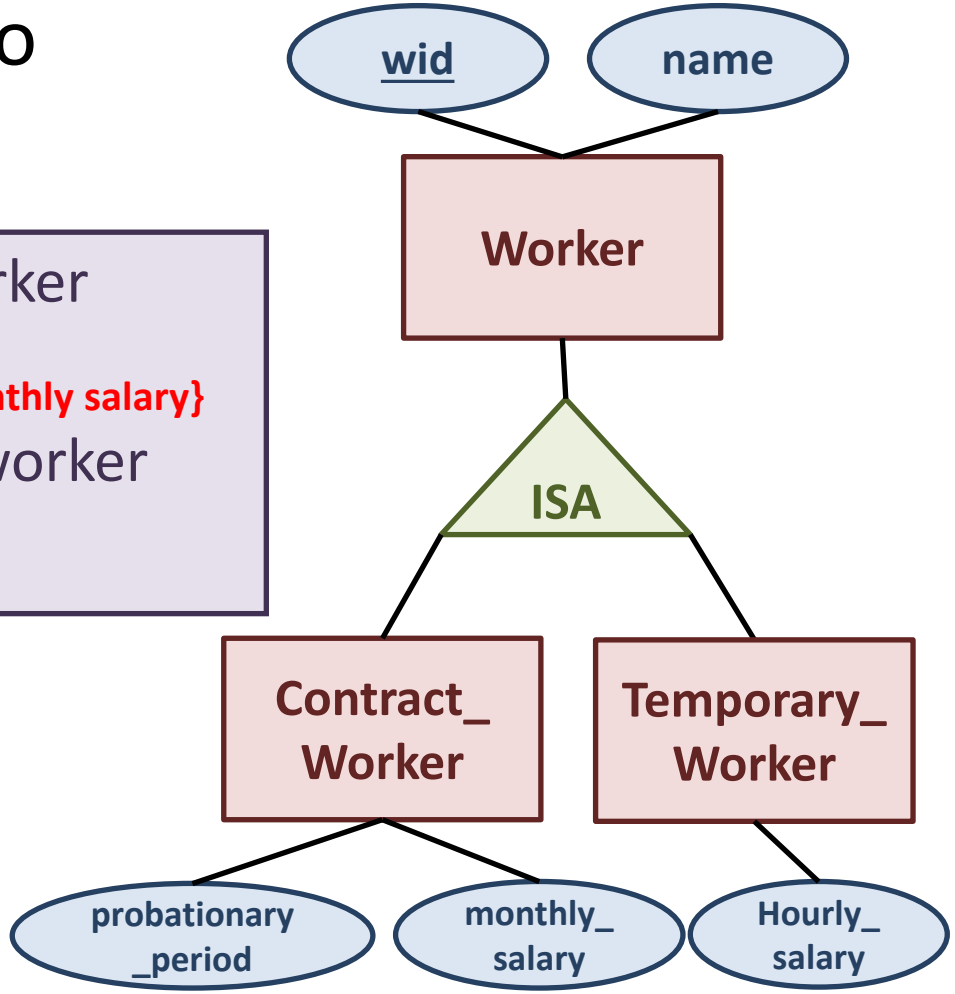


- An academic report is uniquely identified by the three attributes: **sid**, **year** and **term**.

Class hierarchies

- Classify an entity into a subclass

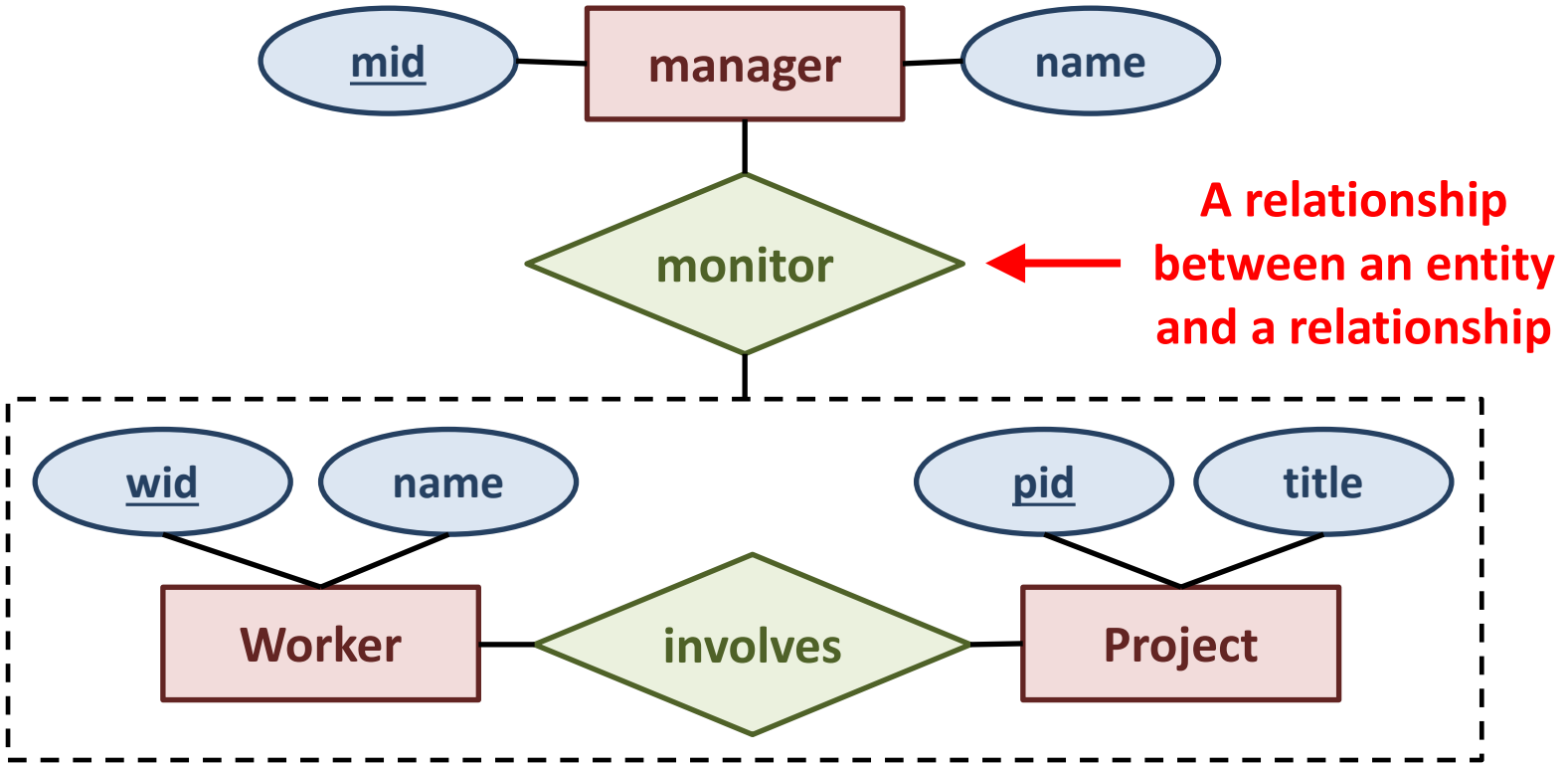
- A contract worker **IS A** worker
  attribute set:
  {wid, name, probationary_period, monthly salary}
- A temporary worker **IS A** worker
  attribute set:
  {wid, name, hourly_salary}



- Overlap constraints
- Covering constraints

Aggregation

- A relationship between a collection of entities and relationships



Construct an ER-diagram from user description

AN EXAMPLE OF ER MODEL

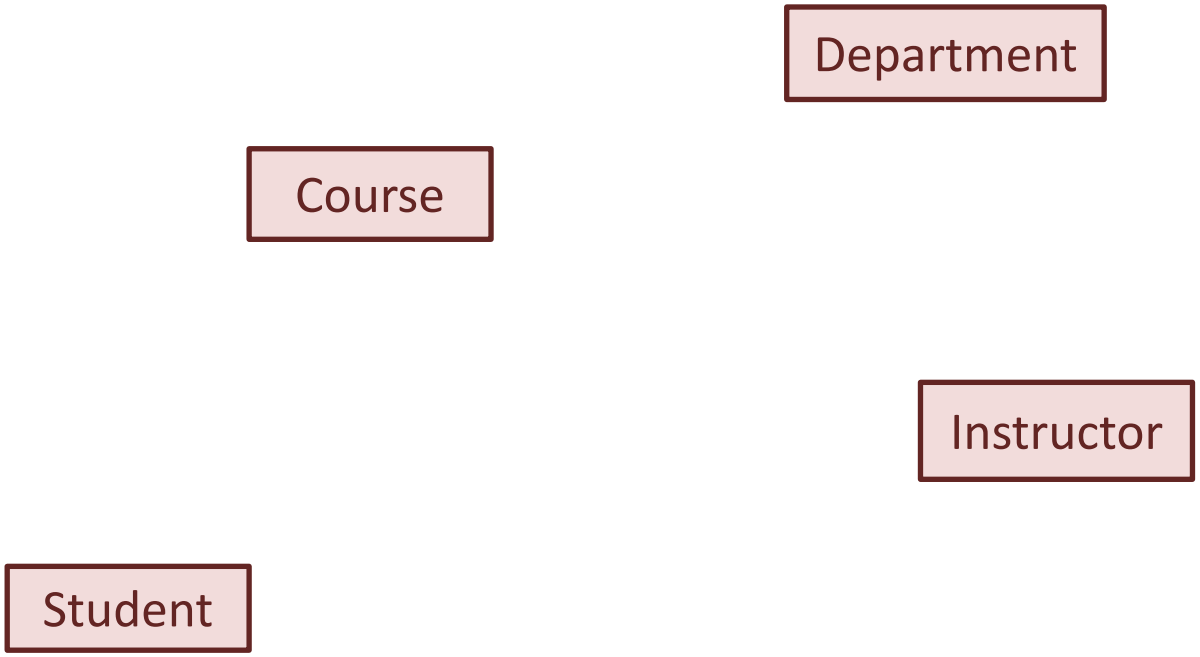
Example: university database

- The university contains many **departments**
- Each department has a name and location
- Many **instructors** work in a department, and an instructor can work in at most one department
- (many-to-one relationship, total participation for department in “work” relationship)
- Each instructor has an ID, a name and an email address
- For each department there is a Head, and an instructor can be Head of at most one department
- (one-to-one relationship, total participation for department in “head” relationship)

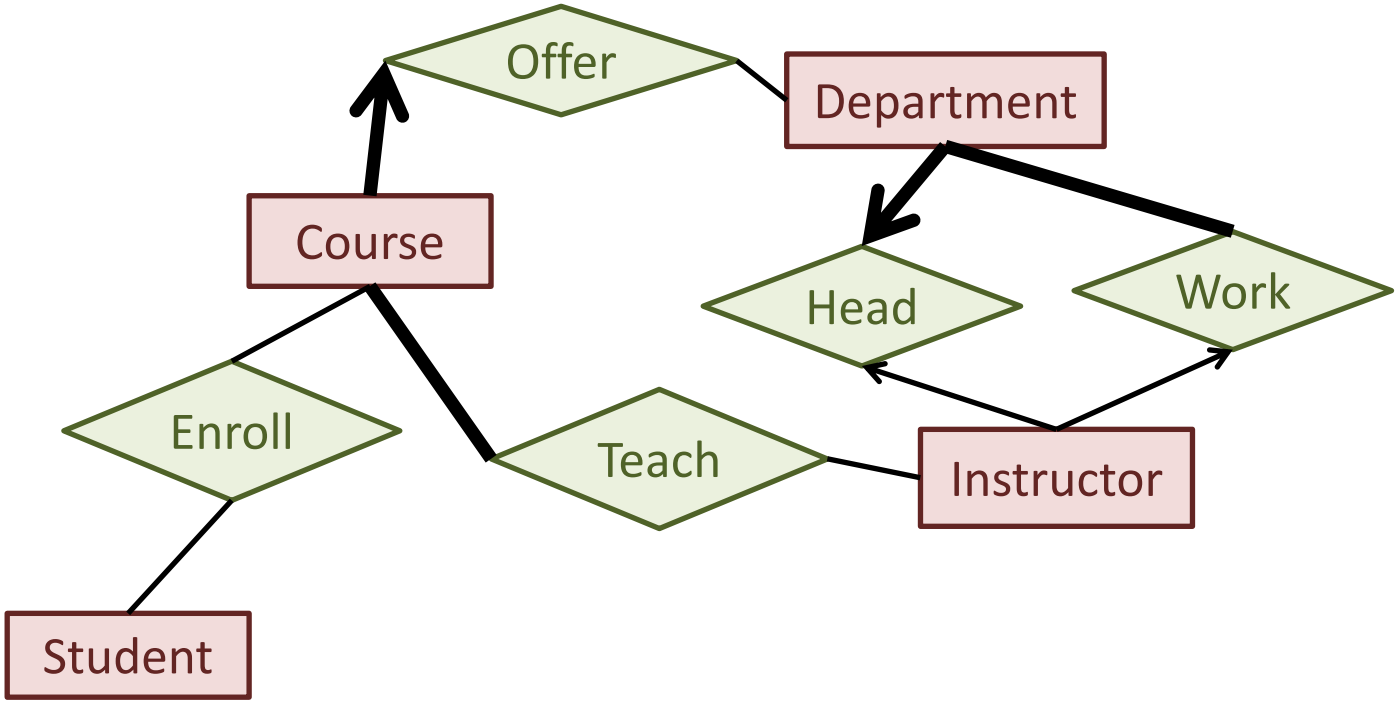
Example: university database

- Each department can offer any number of **courses,** and a course is offered by only one department
- (one-to-many relationship, total participation for course in “offer” relationship)
- Each instructor can teach any number of courses and a course is taught by one or several instructors
- (many-to-many relationship, total participation for course in “teach” relationship)
- Each course has a course code and a course title
- Each **student** has a student ID and a name
- A student can enroll in any number of courses and each course can have any number of students
- (many-to-many relationship)

Step 1: identify entity sets



Step 2: add relationships



Step 3: add (key) attributes