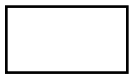
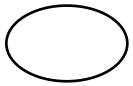
ER Diagrams

E-R Diagram



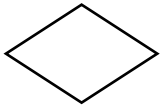
- Rectangle – entity set



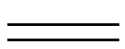
- Ellipse – attribute

- Double ellipse – multivalued attribute

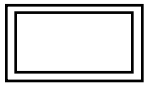
- Dashed ellipse – derived attribute



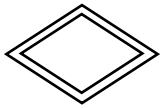
- Diamond – relationship set



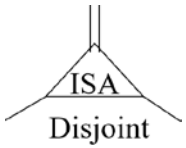
- Double line – total participation



- Double rectangle – weak entity set



- Double diamond – relationship set for weak entity set



- Class Hierarchy - disjoint/overlapping constraint

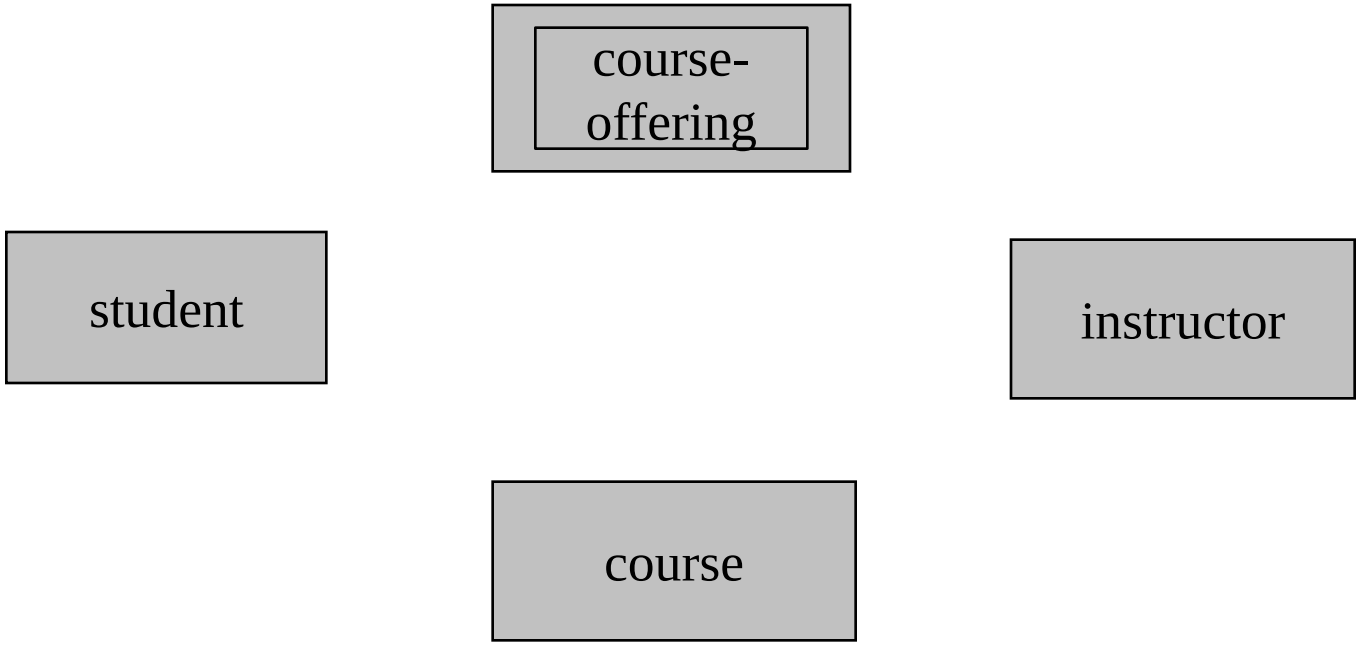
Exercise 1

- 大学教务系统 maintains data about the following entities:
  - a) **course**, including number, title, credits, syllabus大纲, and prerequisites先修课; 。
  - b) **course offering课程排期**, including course number, year, semester, instructor(s)讲师, timings, and classroom;
  - c) **student**, including student-id, name, and program专业;
  - d) **instructor**, including identification number, name, department, and title.
  - Further, the enrollment of students in courses学生的选课, and grades awarded to students in each course they are enrolled for学生每门课的成绩 must be appropriately modeled.
- Construct an E-R diagram for the registrar's office. Document all assumptions that you make about the cardinality constraints and participation constraints（如果题目没有明确表述的方面，如需可列出你关于cardinality, participation 的假设）.

Entity sets

“A university registrar’s office maintains data about the following entity sets:”

(a) course (b) course offering (c) student (d) instructor



Course

- "**course** including number, title, credits, syllabus, and prerequisites"

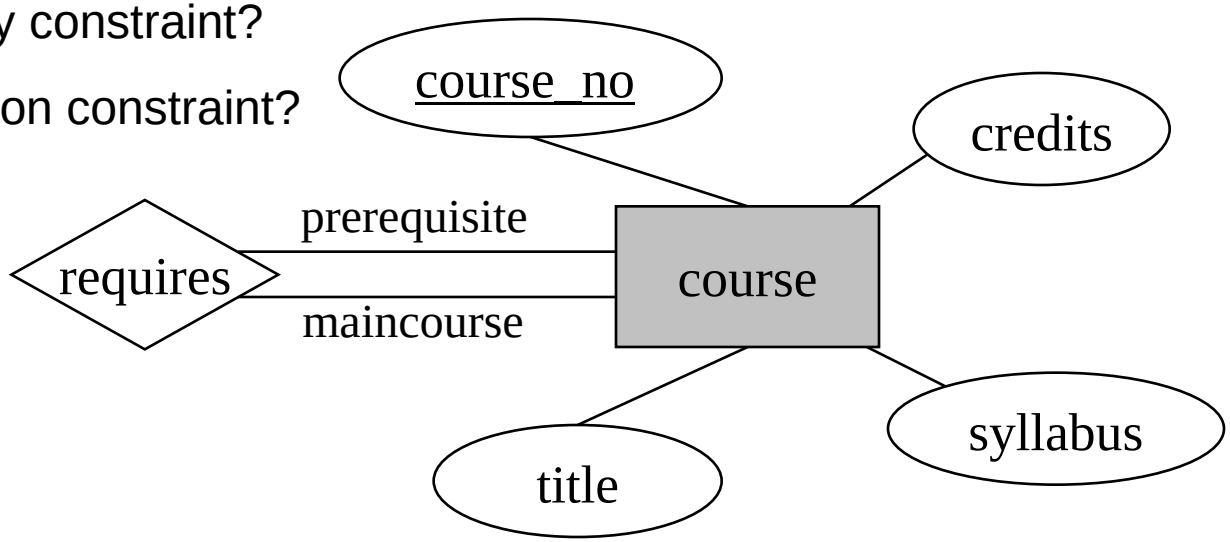
  Entity set?

  Attribute?

  Relationship set? Roles?

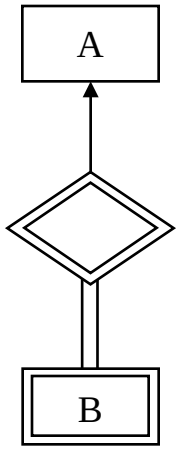
  Cardinality constraint?

  Participation constraint?



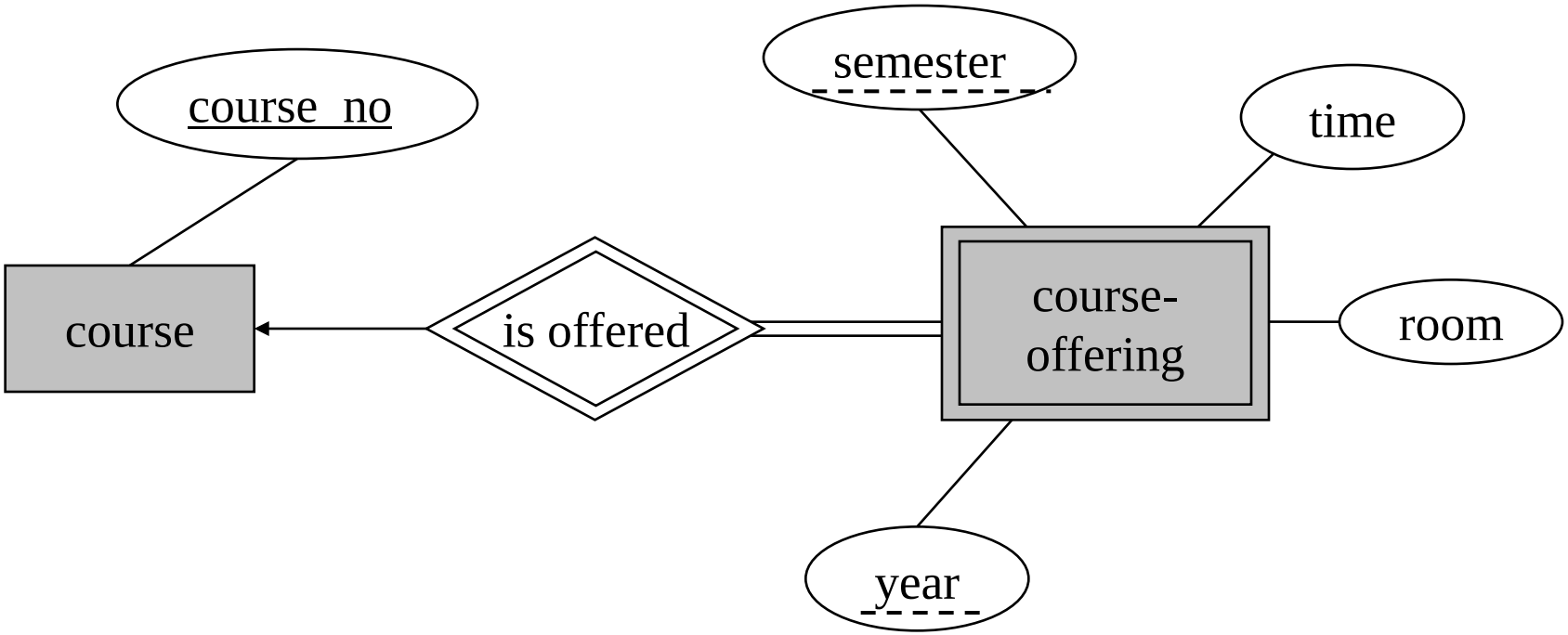
Weak Entity Set

- A **weak entity set** can be identified uniquely only by considering the primary key of another (owner) entity set
  - Owner entity set and weak entity set must participate in **one-to-many** relationship set (one owner, many weak entities).
  - Weak entity set must have **total participation** in this identifying relationship set.



Course Offering

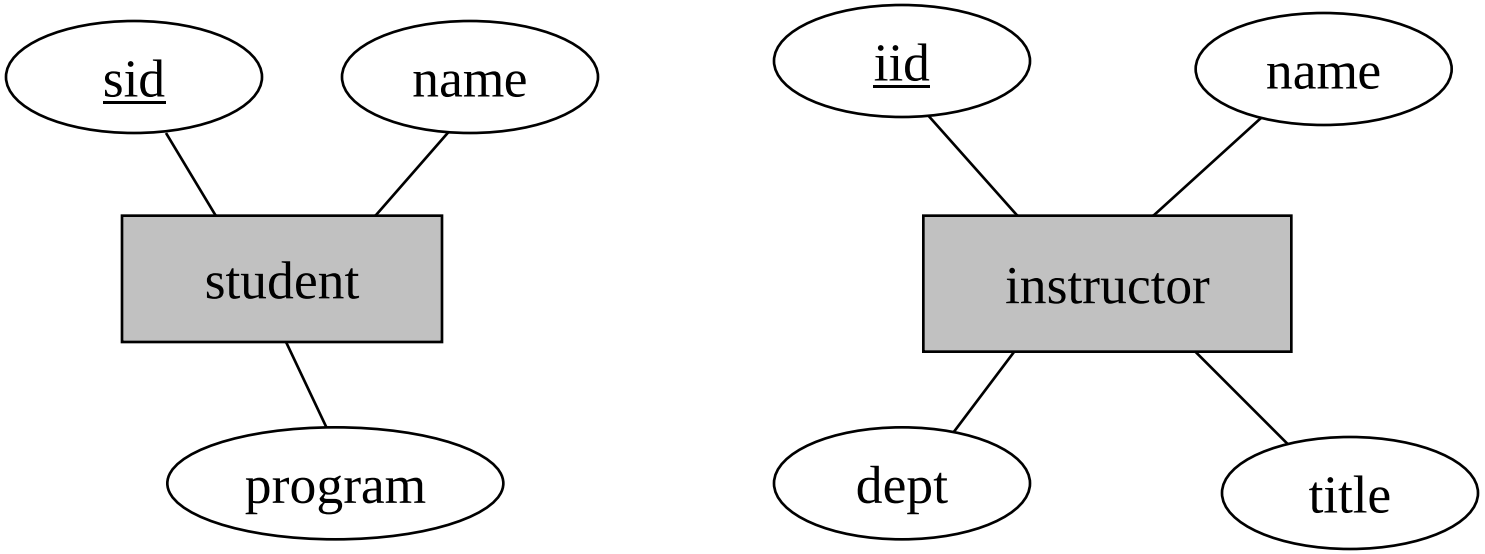
- "**course offering**, including course number, year, semester, instructor(s), timings, and classroom"



semester, year are the partial key of course-offering

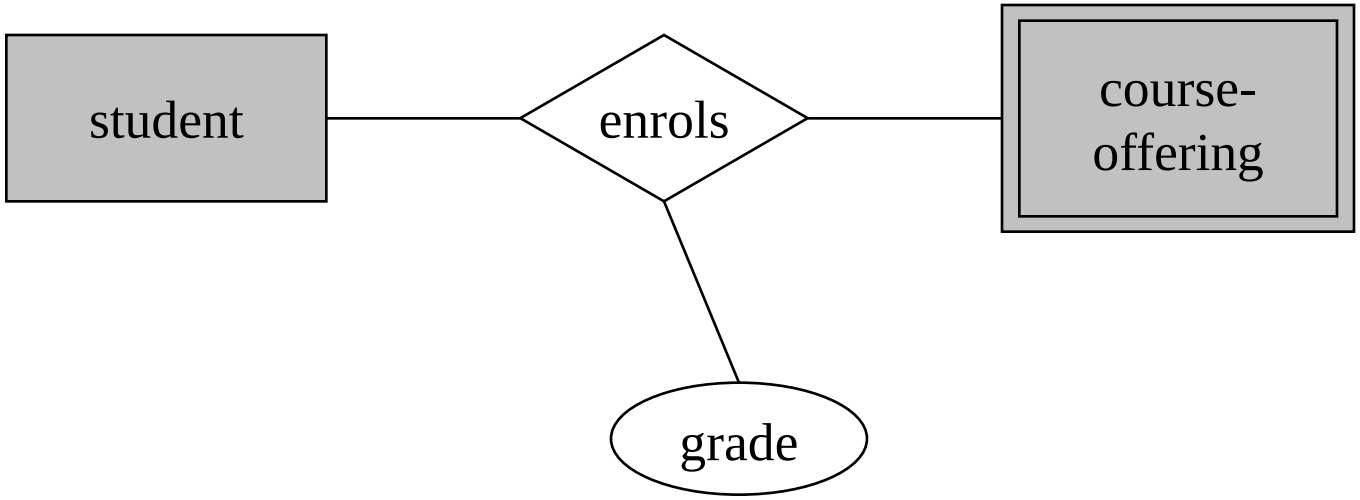
Student, Instructor

- “**student**, including student-id, name, and program”
- **“instructor**, including identification number, name, department, and title”



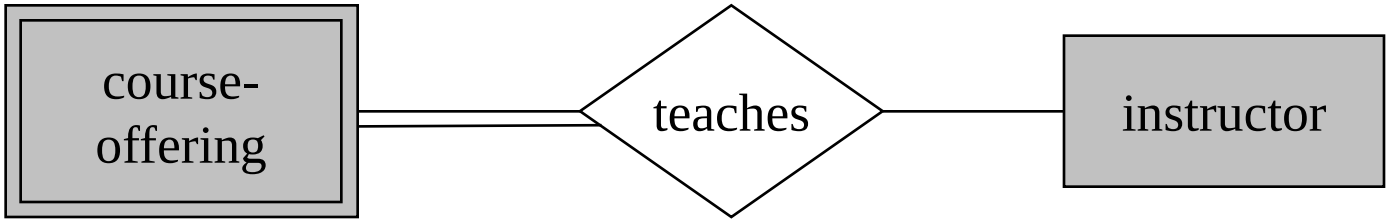
Enrollment

- “Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled.”此外，学生注册的课程以及学生注册的每门课程的成绩必须进行适当的建模。



Anymore ?

- Instructor teaches course…..



A course-offering has to have an instructor.

Total participation

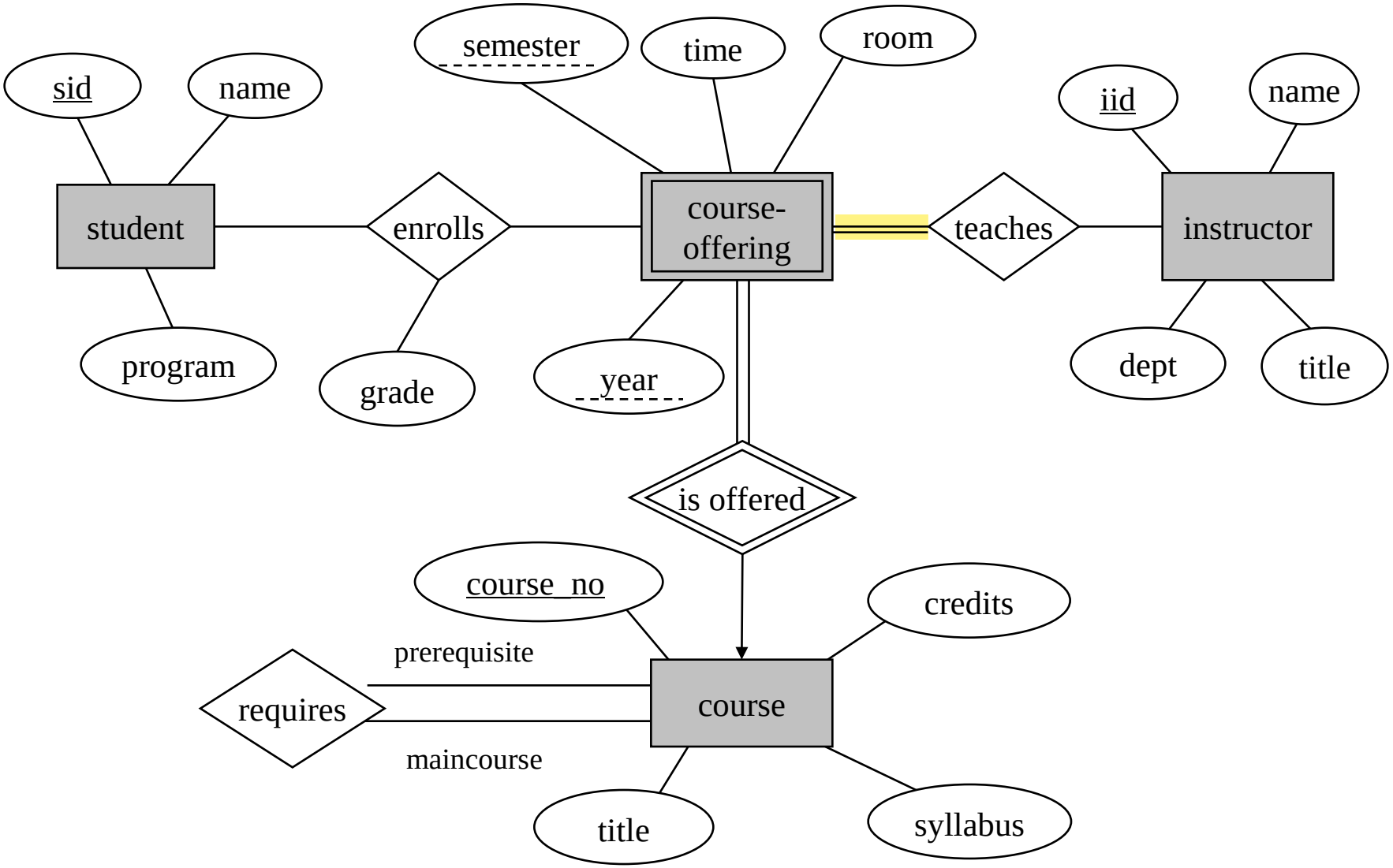


Figure 1 E-R diagram for a university registrar office.

More ...

Based on **Figure 1** , modify the E-R Diagram so as to present the following information.

Each department includes dept-id, name, telephone number.

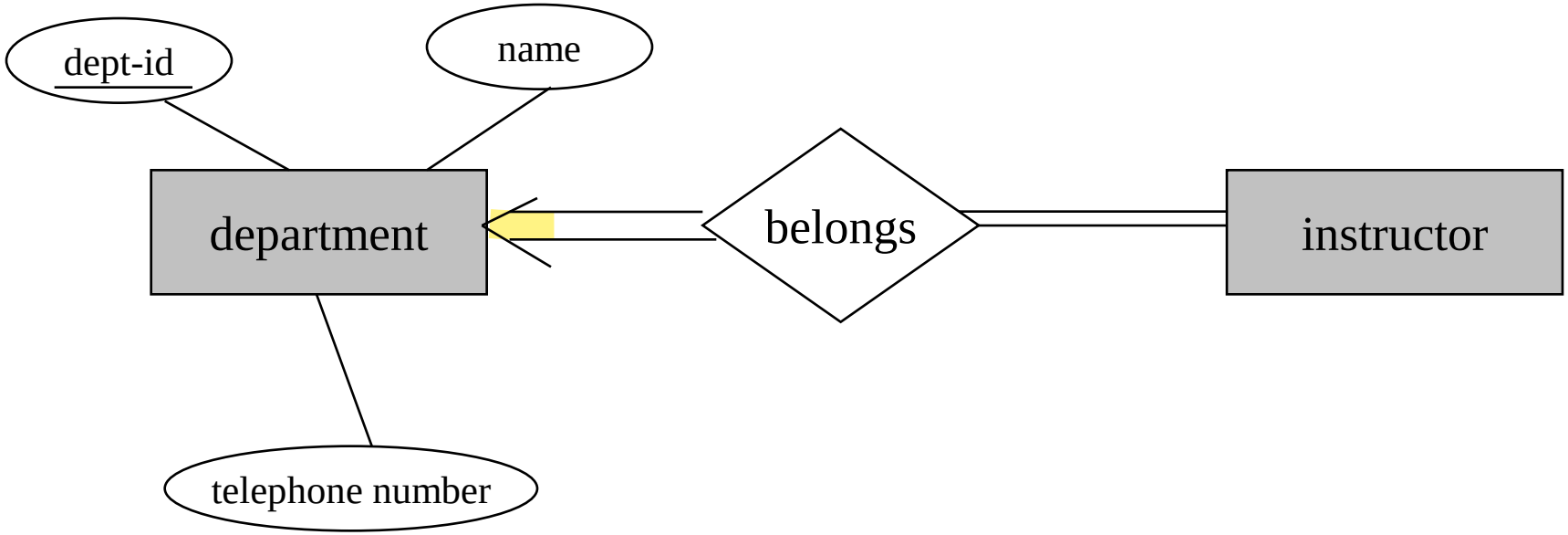
totally participated in

- Each instructor must belong to exactly one department.
- Each department must have at least one instructor.

totally participated

Department

- Each instructor must belong to exactly one department
- Each department must have a least one instructor.



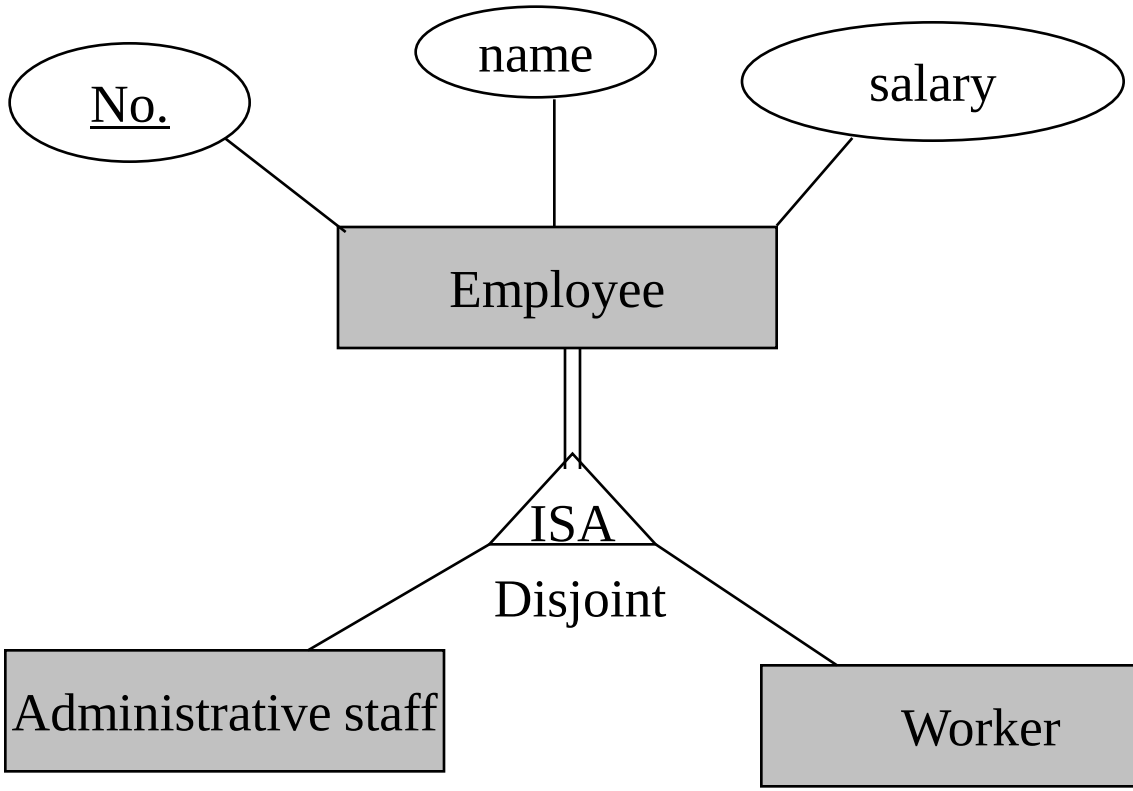
Exercise 2

- Design a database to organize the information about a factory工厂 and the products that are manufactured生产 there. The relevant information is as follows:
  a) The factory has a number of **employees**. For each employee you need to store the name, employee number, and salary.
  b) Each employee must be an **administrative管理 staff** or a **worker**, but not both.
  c) Administrative employees must take **seminars研讨课**. For each seminar we keep its id, name and date. For the administrative staff, you must store the grade received, for each seminar taken.
  d) The factory manufactures a number of **products** and each product is identified by a product id and has a name.
  e) A worker is assigned to work on exactly one product; a product has multiple (one or more) workers assigned to it.
  f) A large number of **items部件** are manufactured for each product. Each item has a serial number序列号 and a color. Different items of the same product have different serial numbers. However, two items that belong to different products may have the same serial number.

Employee, Administrative staff, Worker

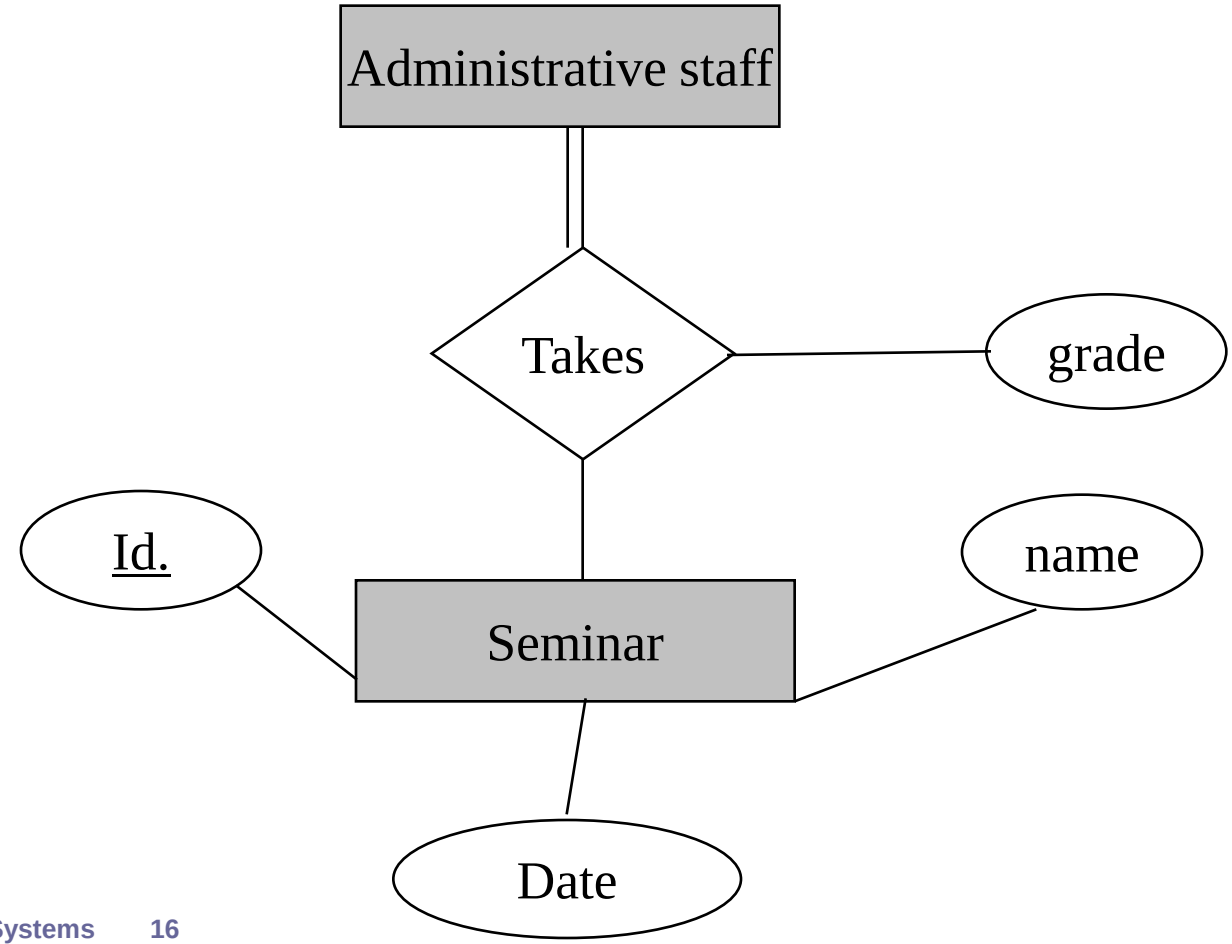
a) The factory has a number of **employees**. For each employee you need to store the name, employee number, and salary.

b) Each employee must be an **administrative staff** or a **worker**, but not both.



Seminar

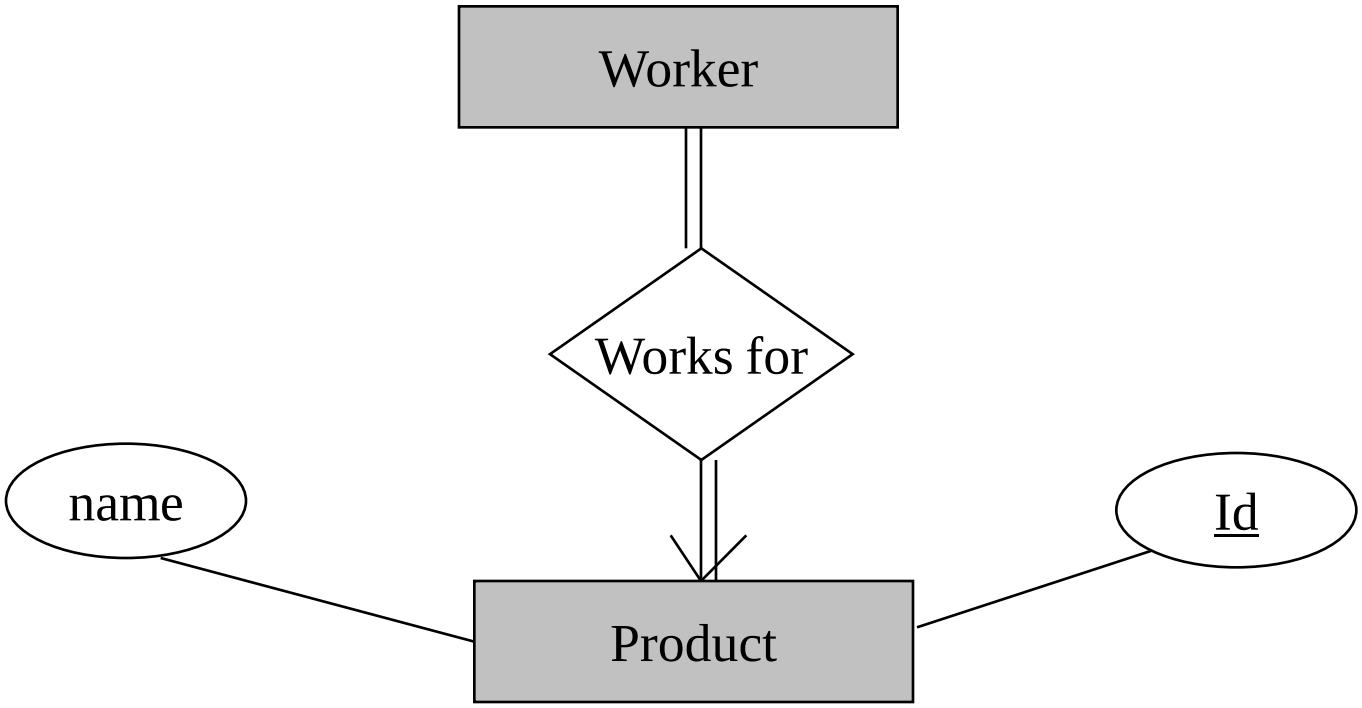
a) Administrative employees must take **seminars**研讨课. For each seminar we keep its id, name and date. For the administrative staff, you must store the grade received, for each seminar taken.



Product

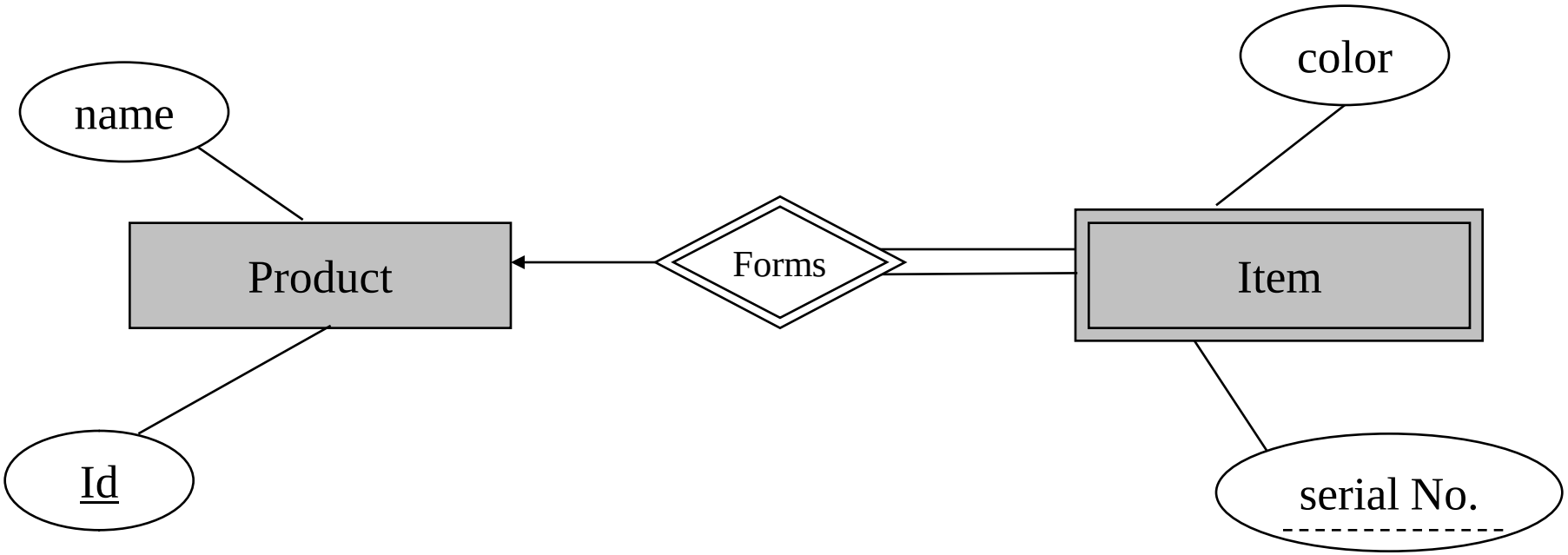
a) The factory manufactures a number of **products** and each product is identified by a product id and has a name.

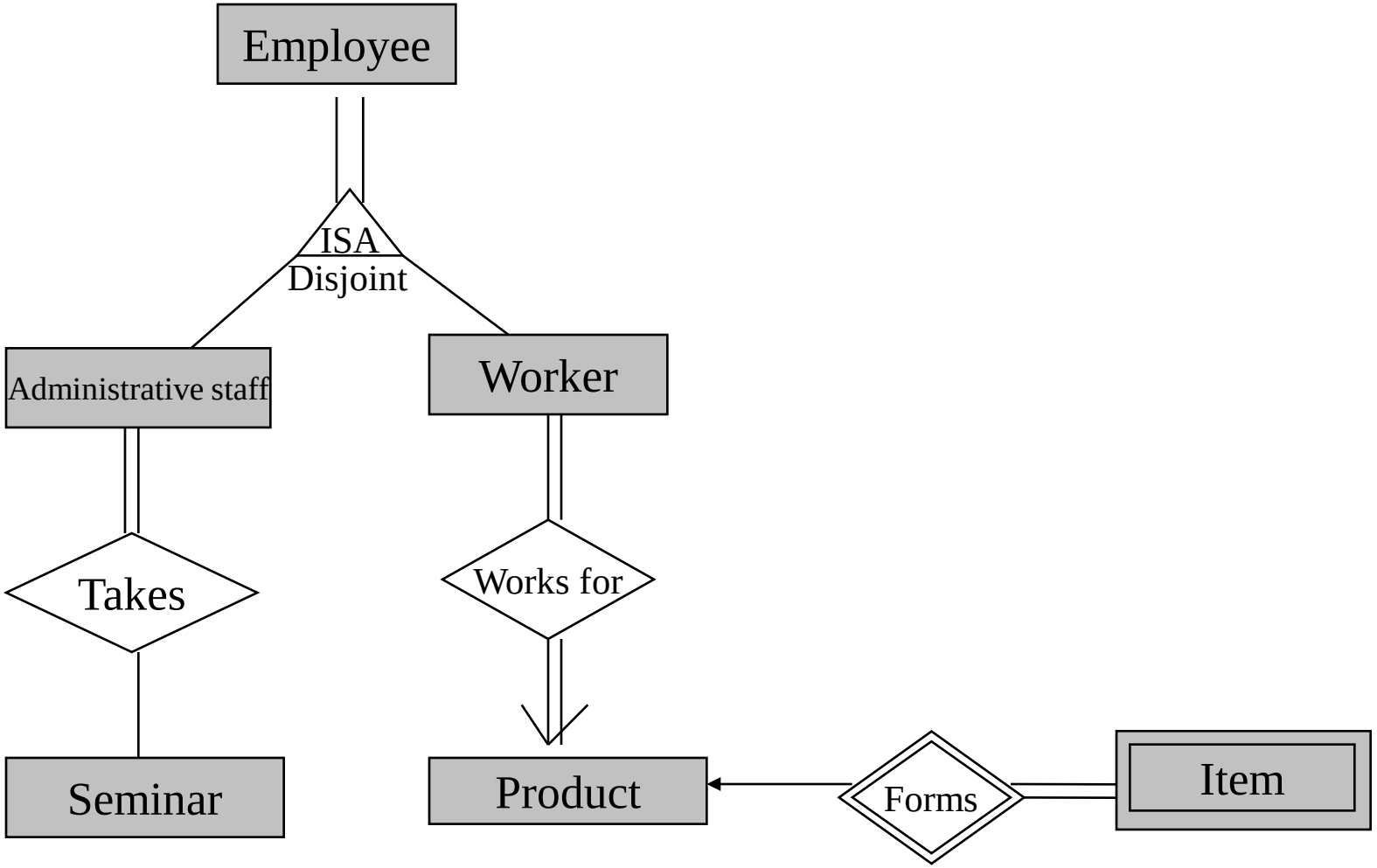
b) A worker is assigned to work on exactly one product; a product has multiple (one or more) workers assigned to it.



Item

a) A large number of **items** are manufactured for each product. Each item has a serial number and a color. Different items of the same product have different serial numbers. However, two items that belong to different products may have the same serial number.





根据前述添加上属性即为完整答案。

Conclusion

- Notations of E-R Diagram
- Generally, we construct an E-R diagram, by identifying:
  - Entity sets
    - What should be entities?
    - Strong or weak entity set?
  - Relationship sets
    - Need to label roles?
  - Attributes
    - Can be inherited? (generalization or specification)
  - Participation constraints:
    - Total participation or partial participation? — or ═══
  - Cardinality constraints
    - One to one, one to many or many to many? — or ⟶