Enhanced Entity-Relationship (EER) Modeling

Lecture 4

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Outline

- Enhanced ER or Extended ER
- Superclass/subclass Relations
- Generalization vs. Specialization
- Constraints on Specialization and Generalization

Enhanced ER or Extended ER (EER)

- Enhanced entity-relationship diagrams are advanced database diagrams very similar to regular ER diagrams which represent the Sub Class and Super Class; Specialization and Generalization.

Superclass/subclass Relations

- The EER Model has the power of expressing database entities in a conceptual hierarchical manner.

- Similar to superclass/subclass relations.

  1. **Generalization:** the process of generalizing entities, where the generalized entities contain the properties of all the generalized entities. In generalization, a number of entities are brought together into one generalized entity based on their similar characteristics.

  2. **Specialization:** is the opposite of generalization, a group of entities is divided into sub-groups based on their characteristics.

  3. **Inheritance:** is an important feature of Generalization and Specialization. It allows lower-level entities to inherit the attributes of higher-level entities.
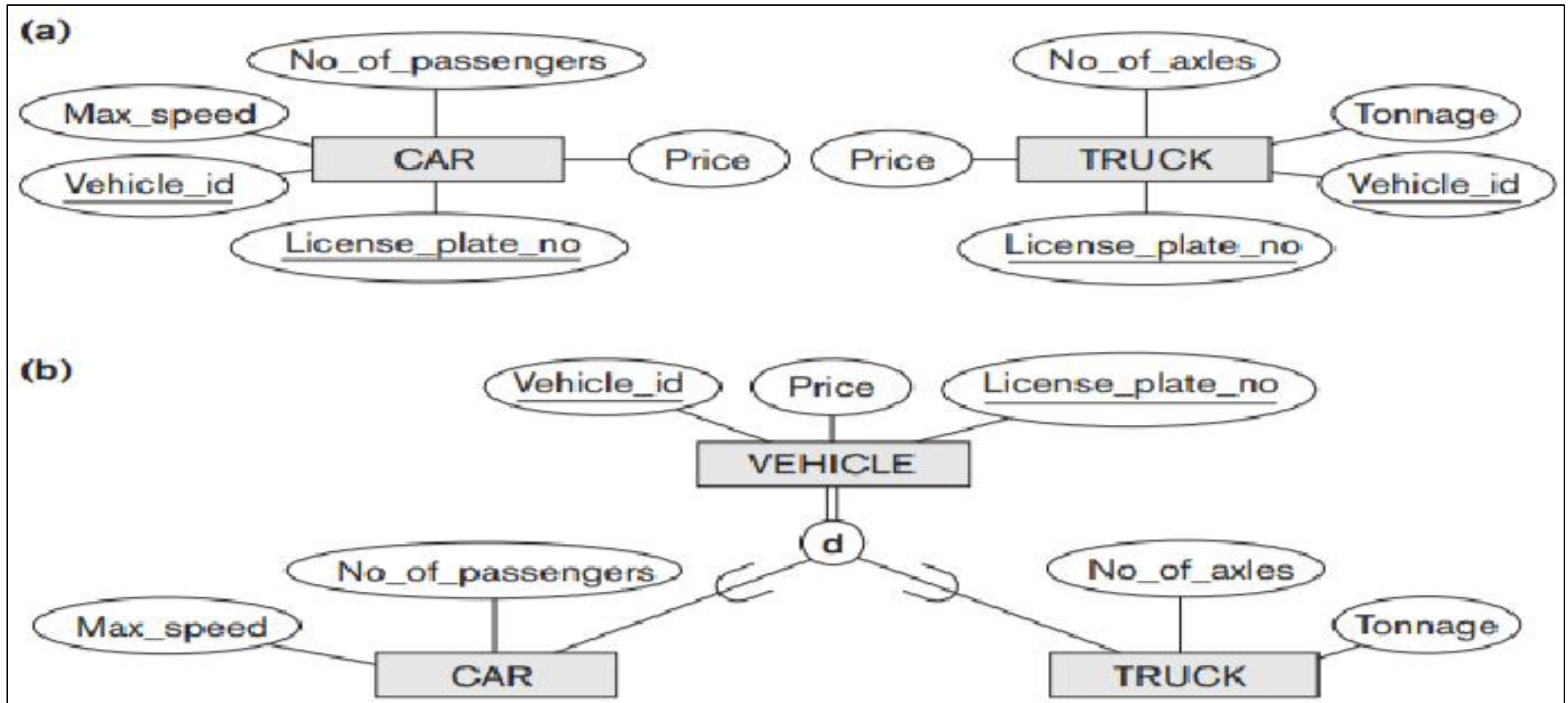
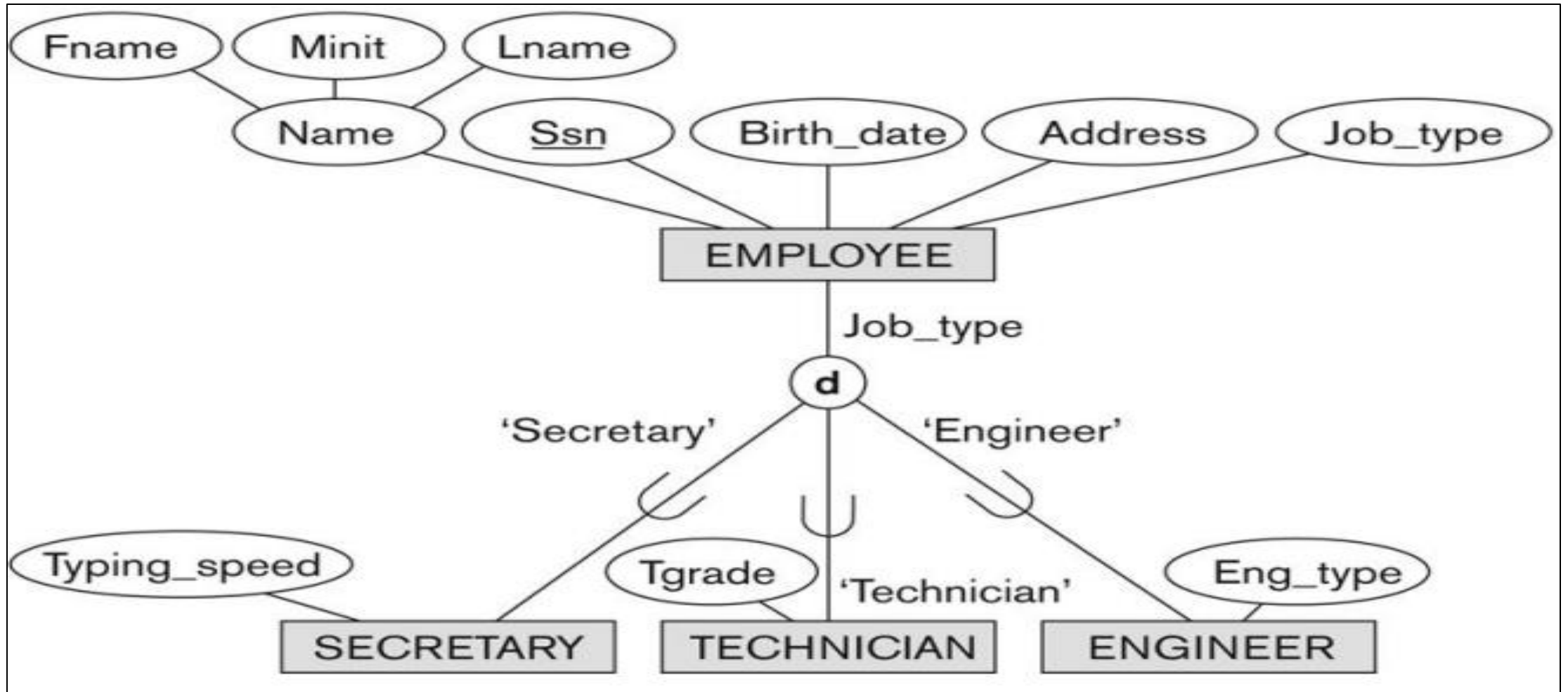# Generalization vs. Specialization

Generalization
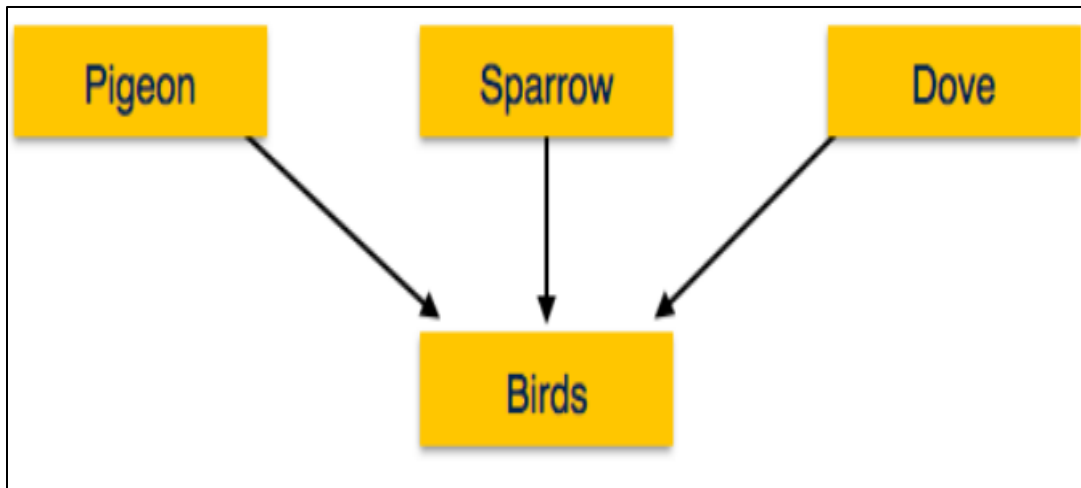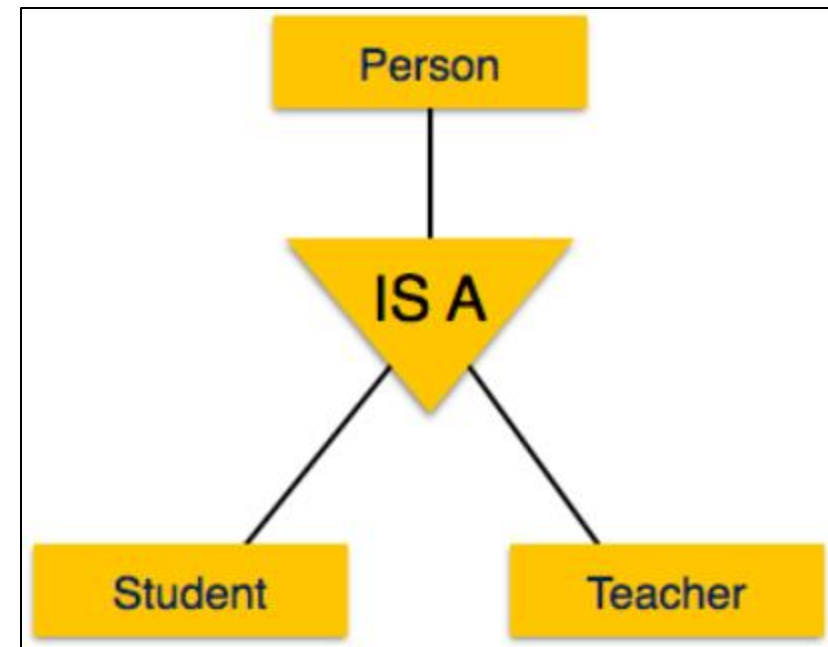
Specialization

Generalization

Specialization

Generalization and Specialization

- To distinguish between generalization and specialization, we represent them in the ER-model as:
  - Arrow pointing to the generalized superclass represents a generalization

Constraints on Specialization and Generalization

- Two basic constraints can apply to a specialization/generalization:
  - Disjointness Constraint
  - Completeness Constraints

Constraints on Specialization and Generalization

- Disjointness Constraint:
  - **Disjoint specialization:** Specifies that an entity (subclass) can be a member of at most one of the subclasses of the specialization.
    - Specified by <u>d</u> in EER diagram.
  - **Overlapping specialization:** that is the same entity may be a member of more than one subclass of the specialization
   - Specified by <u>o</u> in EER diagram

Constraints on Specialization and Generalization

- Completeness (Exhaustiveness) Constraint:
  - **Total:** specifies that every entity in the superclass must be a member of some subclass in the specialization/ generalization
    - Shown in EER diagrams by a double line.
  - **Partial:** allows an entity not to belong to any of the subclasses
    - Shown in EER diagrams by a single line.

Constraints on Specialization and Generalization

- Hence, we have four types of specialization/generalization:
    - Disjoint, total
    - Disjoint, partial
    - Overlapping, total
    - Overlapping, partial
- Note: Generalization usually is total because the superclass is derived from the subclasses.

Example of disjoint partial Specialization
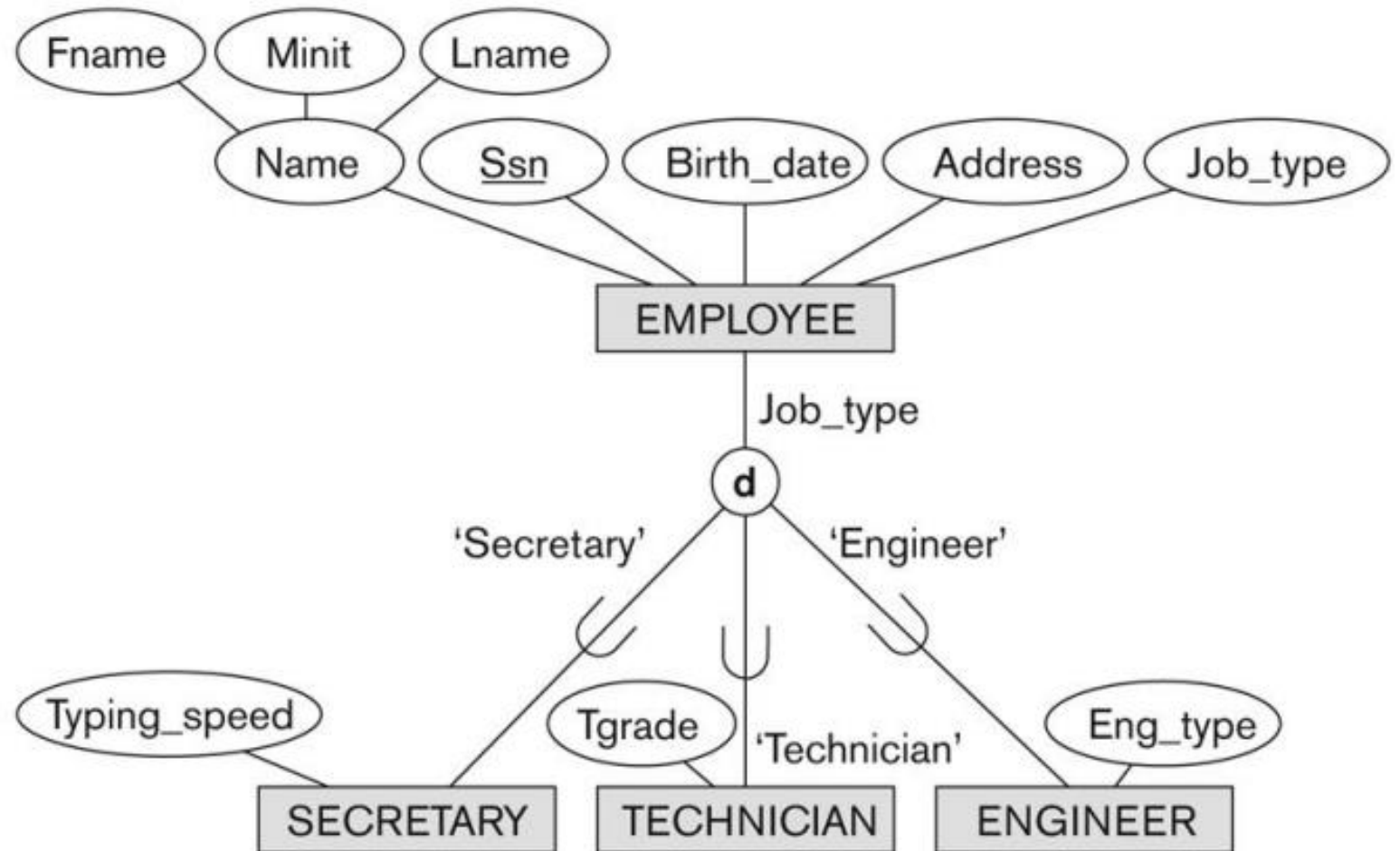
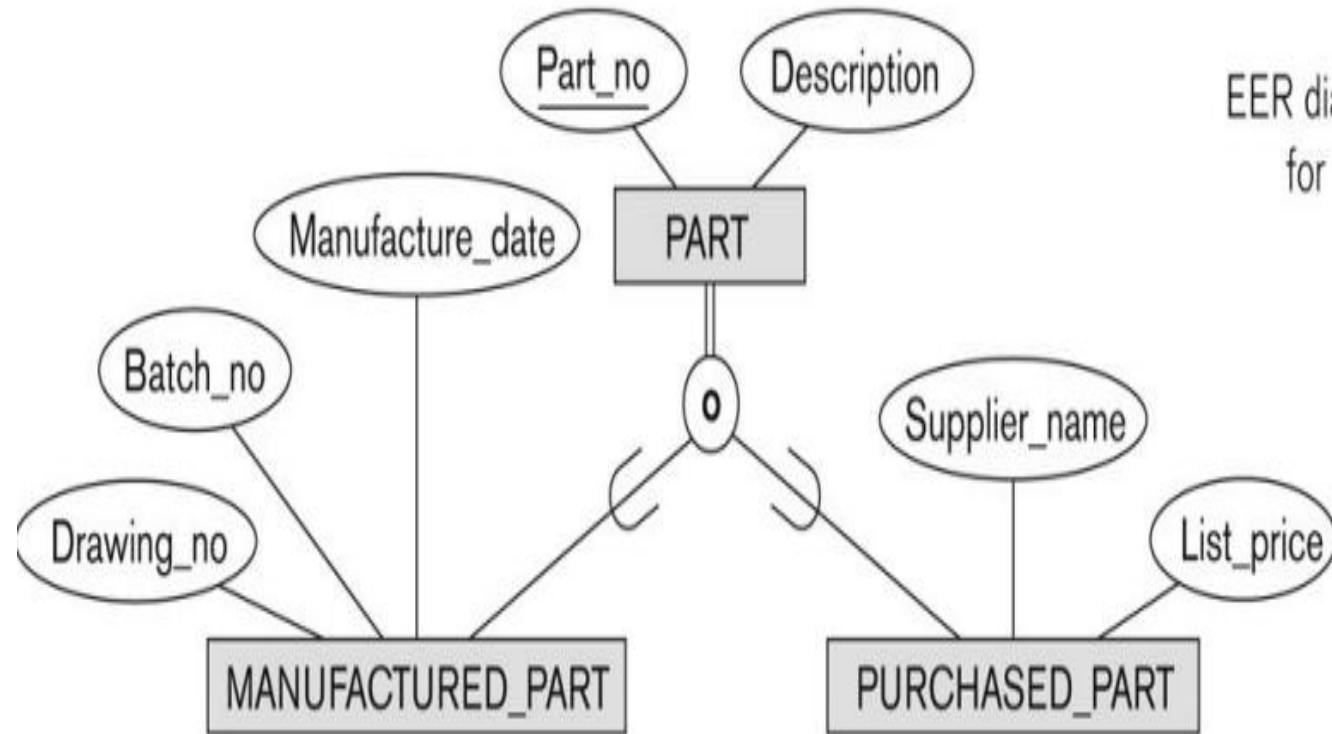# Example of overlapping total Specialization

Figure 4.5
EER diagram notation for an overlapping (nondisjoint) specialization.

Problem 1

- At the sports competition, the entity PERSON has three subclasses: SWIMMER, BIKER, or RUNNER. Draw a separate EERD to represent this situation.

a) At a given time, a person must be exactly one of these subtypes.

b) A person may or may not be one of these subtypes. However, a person who is one of these subtypes cannot at the same time be one of the other subtypes.

c) A person may or may not be one of these subtypes. However, a person may be any two or three of theses subtypes at the same time.

d) At a given time, a person must be at least one of these subtypes.

Problem 2

- A bank has 3 types of accounts: checking, saving, and loan. Following are the attributes of each type:
  - CHECKING: Acc_no, Date_opened, Balance, Service_charge.
  - SAVING: Acc_no, Date_opened, Balance, Interest_rate.
  - LOAN: Acc_no, Date_opened, Balance, Service_charge, Payment.
- Assume that each bank account must be a member of exactly one type of accounts. Using generalization, draw an EERD to represent this situation.

Problem 3

Design and draw an EER diagram that captures the information about a Hollywood Enterprise that requires modeling information about the different type of people involved in the movie production.

- Each person should have person ID, name, phone, gender, and address.

- There are two main groups of persons: Movie professionals and celebrity. Each movie professionals work on some company.

- A movie professional can be either a director or a agent. Each director has her or his popularity and can direct a number of movies. Each agent has the agent fee.

- A celebrity can be a movie star, a model, or both. Each movie star has her or his movie style and play in some movies. Each model has her or his preferences.

- Each movie has the information about the title, released date, and language.