Database Systems: Design, Implementation, and Management

Lesson 5

The Extended Entity Relationship Model

- Result of adding more semantic constructs to original entity relationship (ER) model
- Diagram using this model is called an EER diagram (EERD)

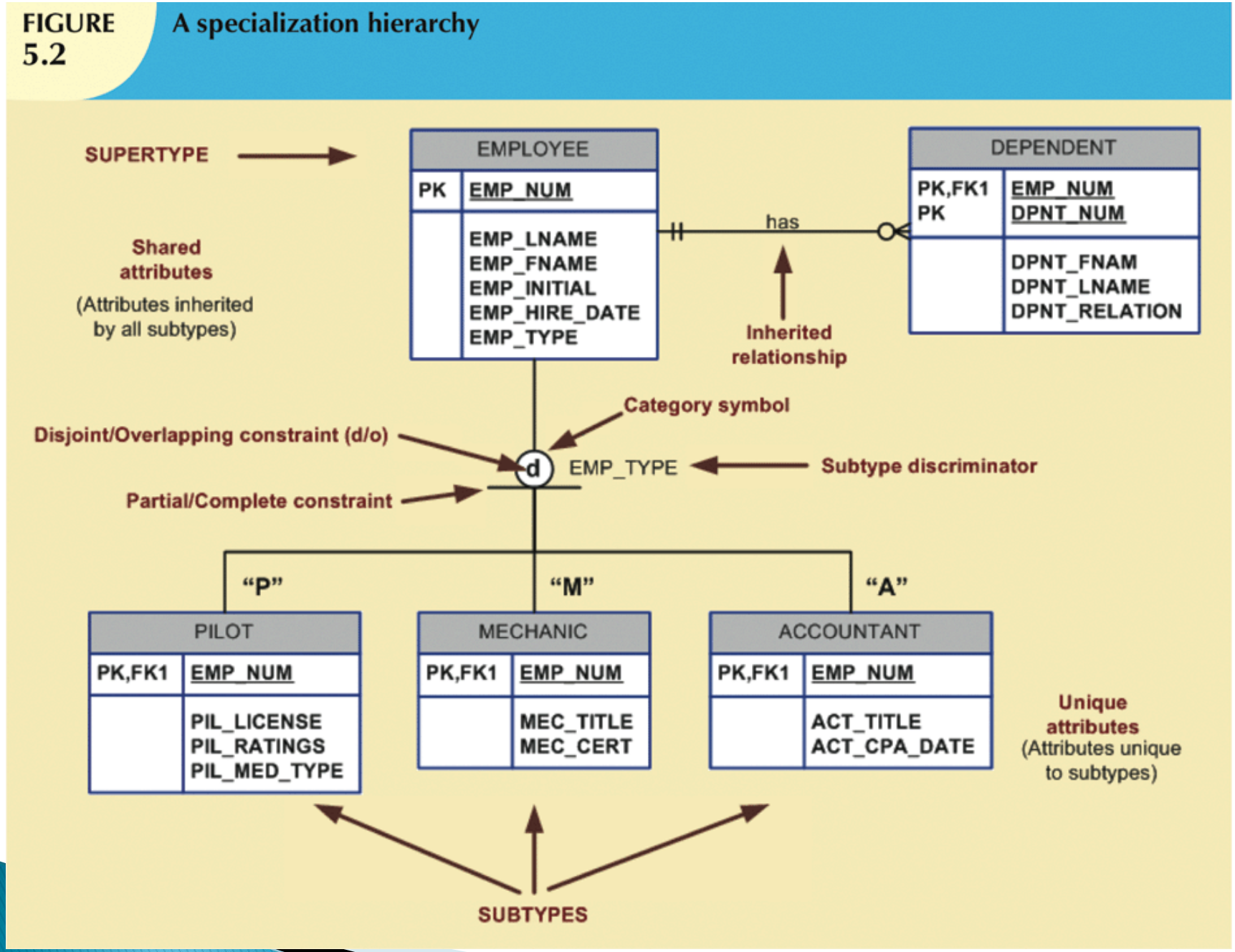
Entity Supertypes and Subtypes

- **Entity supertype**
  - Generic entity type related to one or more entity subtypes
  - Contains common characteristics
- **Entity subtype**
  - Contains unique characteristics of each entity subtype

Specialization Hierarchy

- Depicts arrangement of higher-level entity supertypes and lower-level entity subtypes
- Relationships described in terms of “IS-A” relationships
- Subtype exists only within context of supertype
- Every subtype has only one supertype to which it is directly related
- Can have many levels of supertype/subtype relationships

FIGURE 5.2 A specialization hierarchy



Inheritance

- Enables entity subtype to inherit attributes and relationships of supertype
- All entity subtypes inherit their primary key attribute from their supertype
- At implementation level, supertype and its subtype(s) maintain a 1:1 relationship
- Entity subtypes inherit all relationships in which supertype entity participates
- Lower-level subtypes inherit all attributes and relationships from all upper-level supertypes

FIGURE 5.3 The EMPLOYEE-PILOT supertype-subtype relationship

Table Name: EMPLOYEE

EMP_NUM	EMP_LNAME	EMP_FNAME	EMP_INITIAL	EMP_HIRE_DATE	EMP_TYPE
100	Kolmycz	Xavier	T	15-Mar-88	
101	Lewis	Marcos		25-Apr-89	P
102	Vandam	Jean		20-Dec-93	A
103	Jones	Victoria	R	28-Aug-03	
104	Lange	Edith		20-Oct-97	P
105	Williams	Gabriel	U	08-Nov-97	P
106	Duzak	Mario		05-Jan-04	P
107	Diante	Venite	L	02-Jul-97	M
108	Wiesenbach	Joni		18-Nov-95	M
109	Travis	Brett	T	14-Apr-01	P
110	Genkazi	Stan		01-Dec-03	A

Table Name: PILOT

EMP_NUM	PIL_LICENSE	PIL_RATINGS	PIL_MED_TYPE
101	ATP	SEL/MEL/Instr/CFII	1
104	ATP	SEL/MEL/Instr	1
105	COM	SEL/MEL/Instr/CFI	2
106	COM	SEL/MEL/Instr	2
109	COM	SEL/MEL/SES/Instr/CFII	1

Subtype Discriminator

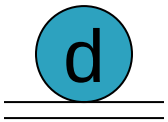
- Attribute in supertype entity
  - Determines to which entity subtype each supertype occurrence is related
- Default comparison condition for subtype discriminator attribute is equality comparison
- Subtype discriminator may be based on other comparison condition

Disjoint and Overlapping Constraints

- **Disjoint subtypes**
  - Also called **nonoverlapping subtypes**
  - Subtypes that contain unique subset of supertype entity set
- **Overlapping subtypes**
  - Subtypes that contain nonunique subsets of supertype entity set

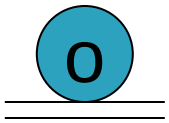
Disjoint and Overlapping Constraints

- Truth Table

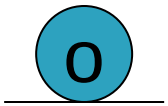


Y	N
T	F
F	T

Y	N
T	F
F	T
F	F

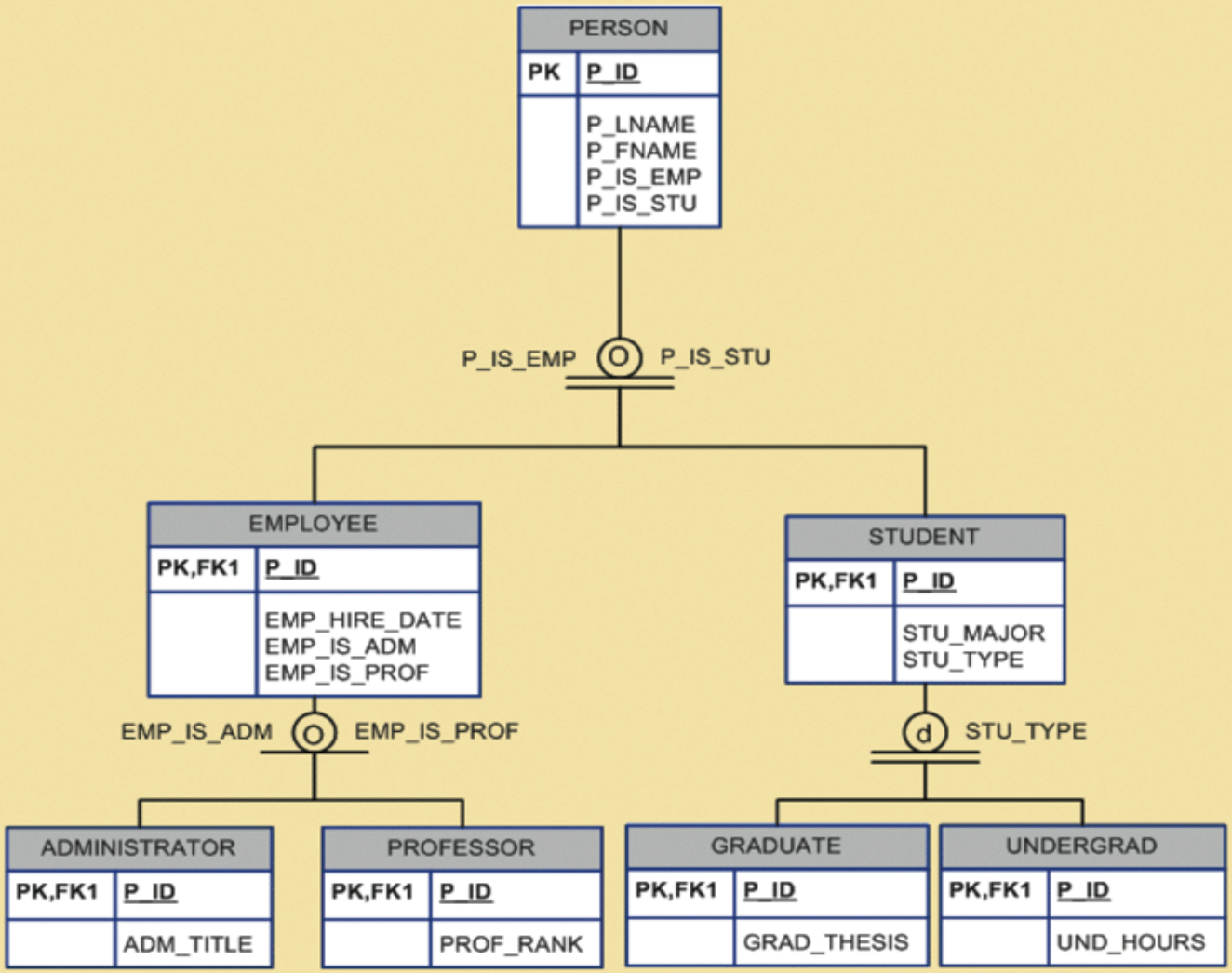


Y	N
T	F
F	T
T	T



Y	N
T	F
F	T
F	F
T	T

FIGURE 5.4 Specialization hierarchy with overlapping subtypes



Completeness Constraint

- Specifies whether entity supertype occurrence must be a member of at least one subtype
- **Partial completeness**
  - Symbolized by a circle over a single line
  - Some supertype occurrences are not members of any subtype
- **Total completeness**
  - Symbolized by a circle over a double line
  - Every supertype occurrence must be member of at least one subtype

Specialization and Generalization

- **Specialization**
  - Identifies more specific entity subtypes from higher-level entity supertype
  - Top-down process
  - Based on grouping unique characteristics and relationships of the subtypes

Specialization and Generalization (cont'd.)

- **Generalization**
  - Identifies more generic entity supertype from lower-level entity subtypes
  - Bottom-up process
  - Based on grouping common characteristics and relationships of the subtypes