

# INTRODUCTION TO DATA MODELS

Presentation by

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# Data Models

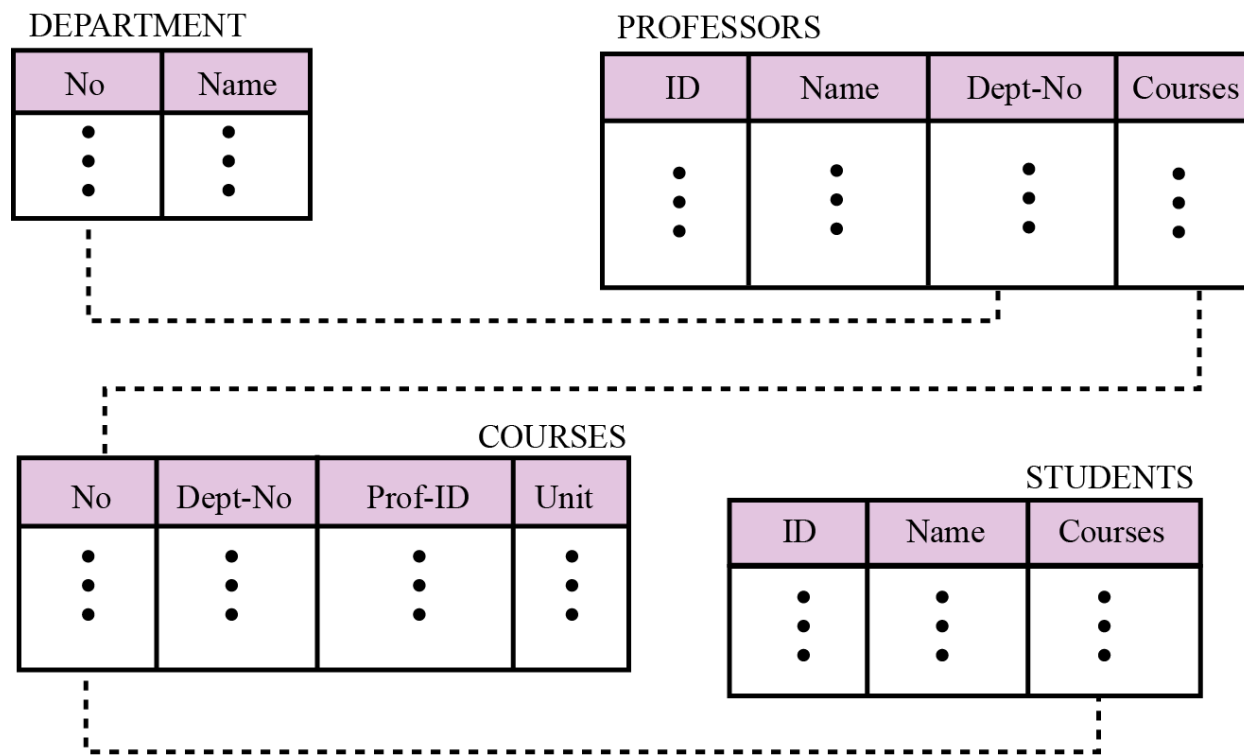
- A collection of tools for describing
  - Data
  - Data relationships
  - Data semantics
  - Data constraints

# Data Models - Types

- Relational model
- Entity-Relationship data model (mainly for database design)
- Network model
- Hierarchical model
- Object-based data models (Object-oriented and Object-relational)
- Distributed model

# Relational Model

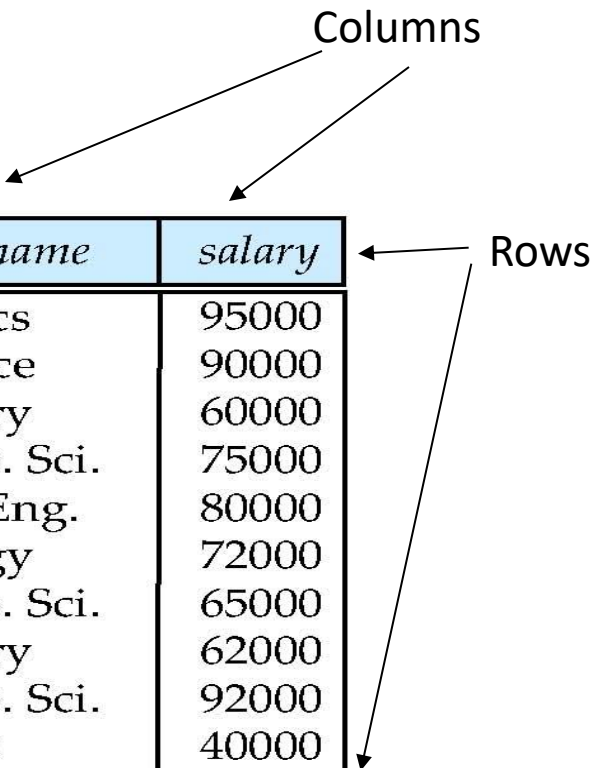
In the relational model, data is organized in two-dimensional tables called relations. The tables or relations are, however, related to each other, as we will see shortly.



An example of the relational model representing a university

# Relational Model

- Example of tabular data in the relational model



The diagram shows a table with four columns and 13 rows. Two arrows labeled 'Columns' point to the top row's cells, and two arrows labeled 'Rows' point to the first and last rows of the table.

<i>ID</i>	<i>name</i>	<i>dept_name</i>	<i>salary</i>
22222	Einstein	Physics	95000
12121	Wu	Finance	90000
32343	El Said	History	60000
45565	Katz	Comp. Sci.	75000
98345	Kim	Elec. Eng.	80000
76766	Crick	Biology	72000
10101	Srinivasan	Comp. Sci.	65000
58583	Califieri	History	62000
83821	Brandt	Comp. Sci.	92000
15151	Mozart	Music	40000
33456	Gold	Physics	87000
76543	Singh	Finance	80000

(a) The *instructor* table

# A Sample Relational Database

<i>ID</i>	<i>name</i>	<i>dept_name</i>	<i>salary</i>
22222	Einstein	Physics	95000
12121	Wu	Finance	90000
32343	El Said	History	60000
45565	Katz	Comp. Sci.	75000
98345	Kim	Elec. Eng.	80000
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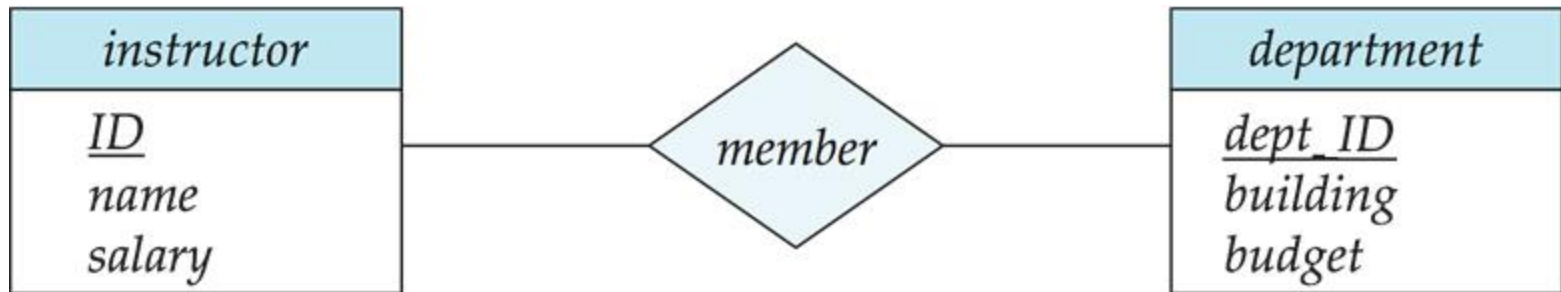
(a) The *instructor* table

<i>dept_name</i>	<i>building</i>	<i>budget</i>
Comp. Sci.	Taylor	100000
Biology	Watson	90000
Elec. Eng.	Taylor	85000
Music	Packard	80000
Finance	Painter	120000
History	Painter	50000
Physics	Watson	70000

(b) The *department* table

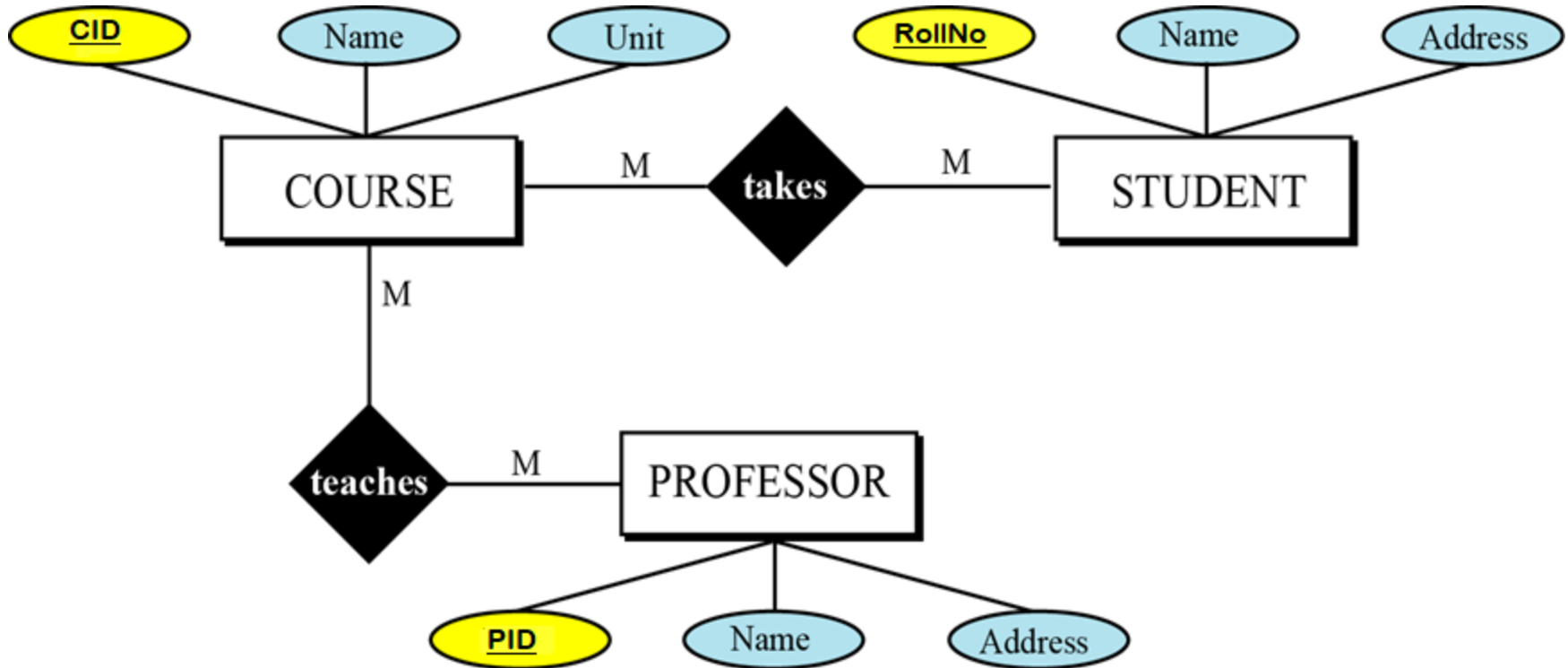
# The Entity-Relationship Model

- Models an enterprise as a collection of *entities* and *relationships*
  - Entity: a “thing” or “object” in the enterprise that is distinguishable from other objects
    - Described by a set of *attributes*
  - Relationship: an association among several entities



- Represented diagrammatically by an *entity-relationship diagram*:

simple E-R diagram with three entity sets, their attributes and the relationship between the entity sets.

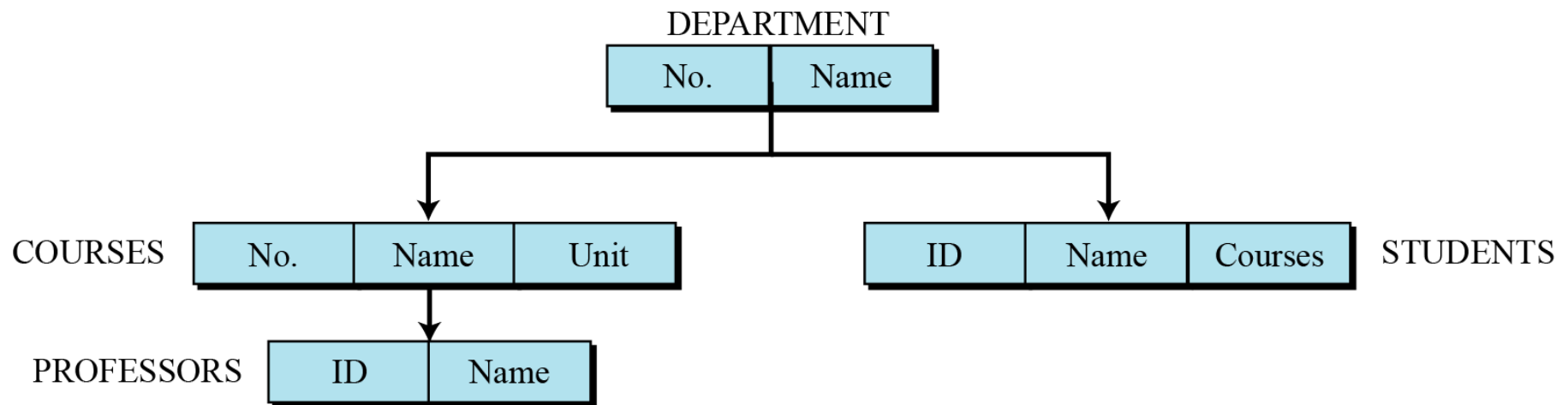


Entities, attributes and relationships in an E-R diagram



# Hierarchical Model

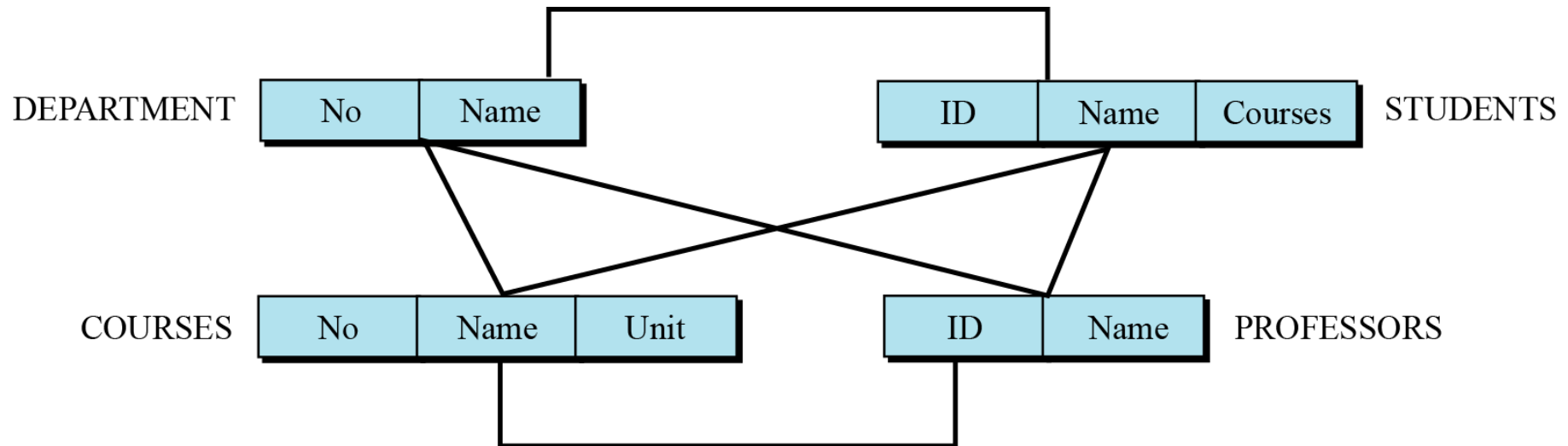
In the hierarchical model, data is organized as an inverted tree. Each entity has only one parent but can have several children. At the top of the hierarchy, there is one entity, which is called the root.



An example of the hierarchical model representing a university

# Network Model

In the network model, the entities are organized in a graph, in which some entities can be accessed through several paths



An example of the network model representing a university

# Object Oriented Model

An object-oriented database tries to keep the advantages of the relational model and at the same time allows applications to access structured data. In an object-oriented database, **objects and their relations** are defined. In addition, each **object can have attributes** that can be expressed as fields.

## XML

The query language normally used for objected-oriented databases is XML (Extensible Markup Language).

XML was originally designed to add markup information to text documents, but it has also found its application as a query language in databases. XML can represent data with nested structures.

# Distributed Model

The distributed database model is not a new model, but is based on the relational model. However, the **data is stored on several computers that communicate through the Internet** or a private wide area network.

Each computer (or site) maintains either part of the database or the whole database.

# Thank You