

# Introduction to the Relational Model (Chapter 2)

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# Structure of Relational Database

- ▶ A relational database consists of a collection of 2D tables, each of which is assigned a unique name.

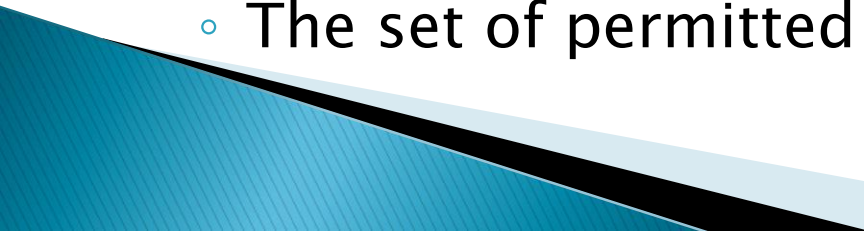
ID	name	dept_name	salary
10101	Srinivasan	Comp. Sci.	65000
12121	Wu	Finance	90000
15151	Mozart	Music	40000
22222	Einstein	Physics	95000
32343	El Said	History	60000
33456	Gold	Physics	87000
45565	Katz	Comp. Sci.	75000
58583	Califieri	History	62000
76543	Singh	Finance	80000
76766	Crick	Biology	72000
83821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

Figure 2.1 The *instructor* relation.

course_id	title	dept_name	credits
BIO-101	Intro. to Biology	Biology	4
BIO-301	Genetics	Biology	4
BIO-399	Computational Biology	Biology	3
CS-101	Intro. to Computer Science	Comp. Sci.	4
CS-190	Game Design	Comp. Sci.	4
CS-315	Robotics	Comp. Sci.	3
CS-319	Image Processing	Comp. Sci.	3
CS-347	Database System Concepts	Comp. Sci.	3
EE-181	Intro. to Digital Systems	Elec. Eng.	3
FIN-201	Investment Banking	Finance	3
HIS-351	World History	History	3
MU-199	Music Video Production	Music	3
PHY-101	Physical Principles	Physics	4

Figure 2.2 The *course* relation.

# RDBMS Cont...

- ▶ **Relation:**
    - Relation refers to a table.
  - ▶ **Tuple:**
    - Tuple refers to a row.
  - ▶ **Attribute:**
    - Attribute refers to a column.
  - ▶ **Relation Instance:**
    - Refers to a specific instance of a relation, i.e. containing specific set of rows. Fig2.1 instructor.
  - ▶ **Domain:**
    - The set of permitted values of an attribute.
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# Database Schema

## ▶ Database Schema:

- The logical design of the database.

Classroom(building, room\_number, capacity)

Department(dept\_name, building, budget)

Course(course\_id, title, dept\_name, credits)

Instructor(ID, name, dept\_name, salary)

Section(course\_id, sec\_id, semester, year, building, room\_number, time\_slot\_id)

Teaches(ID, course\_id, sec\_id, semester, year)

Student(ID, name, dept\_name, tot\_credit)

Takes(ID, course\_id, sec\_id, semester, year, grade)

Advisor(s\_ID, i\_ID)

Time\_slot(time\_slot\_id, day, start\_time, end\_time)

Prereq(course\_id, prereq\_id)

Fig: Schema of University Database

## ▶ Database Instance:

- A snapshot of the data in the database at a given instant in time.

## ▶ Relation:

- The concept of a relation corresponds to the programming language notion of a variable.

## ▶ Relation Schema:

- The concept of relation schema corresponds to the programming language notion of type definition.
- The schema for department relation is:

Department(dept\_name, building, budget)

# Keys

## ▶ Super key:

- A super key is a set of one or more attributes that, taken collectively, allow us to identify uniquely a tuple in a relation.
- Ex: {id}, {id, name}

## ▶ Candidate key:

- Super keys for which no proper subset is a super key are called candidate key.
- Ex: {id}

## ▶ Primary key:

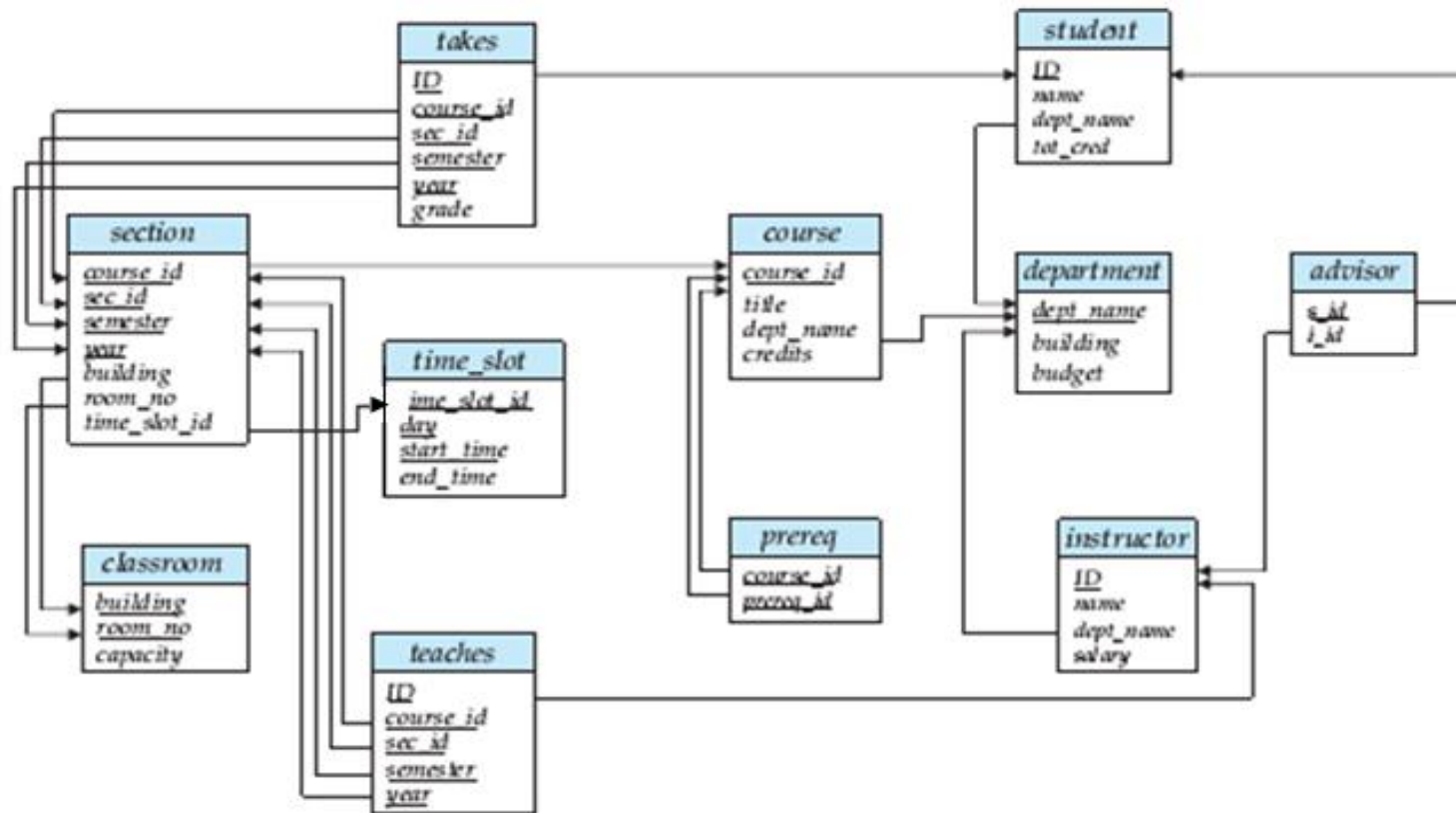
- We use the term primary key to denote a candidate key that is chosen by the database designer.

## ▶ Foreign key:

- Suppose a relation  $r_1$ , include among its attributes the primary key of another relation  $r_2$ , This attribute is called a foreign key from  $r_1$ , referencing  $r_2$ .
- $r_1 \rightarrow$  referencing relation,  $r_2 \rightarrow$  referenced relation.

# Schema Diagram

- ▶ A schema diagram is a pictorial depiction of the schema of a database that shows the relations in the database, their attributes, and primary keys and foreign keys.



# Table Create Sequence

- ▶ The table/relation that has no foreign key (it does not reference any relation) is created first.
- ▶ Relations are created in the following sequence:
  - Department.
  - Instructor.
  - Student.
  - Advisor.
  - Classroom.
  - Course.
  - Prereq.
  - Time\_slot.
  - Section.
  - Takes.
  - Teacher.