




# CSE 215: Database

Department of CSE  
Bangladesh University of Engineering & Technology

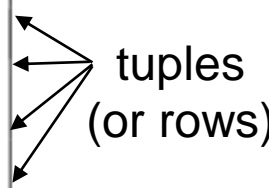




## Instructor Relation



<i>ID</i>	<i>name</i>	<i>dept_name</i>	<i>salary</i>
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







## Relation Schema and Instance

- $A_1, A_2, \dots, A_n$  are *attributes*
- $R = (A_1, A_2, \dots, A_n)$  is a *relation schema*

Example:

*instructor* = (*ID*, *name*, *dept\_name*, *salary*)

- A relation instance  $r$  defined over schema  $R$  is denoted by  $r(R)$
- The current values a relation are specified by a table
- An element  $t$  of relation  $r$  is called a *tuple* and is represented by a *row* in a table





## Attributes

- The set of allowed values for each attribute is called the domain of the attribute
- Attribute values are (normally) required to be atomic; that is, indivisible
- The special value null is a member of every domain. Indicated that the value is “unknown”
- The null value causes complications in the definition of many operations





## Relations are Unordered

- Order of tuples is irrelevant (tuples may be stored in an arbitrary order)
- Example: instructor relation with unordered tuples

<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
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## Database Schema

- Database schema -- is the logical structure of the database.
- Database instance -- is a snapshot of the data in the database at a given instant in time.
- schema: instructor (ID, name, dept\_name, salary)
- Instance:

<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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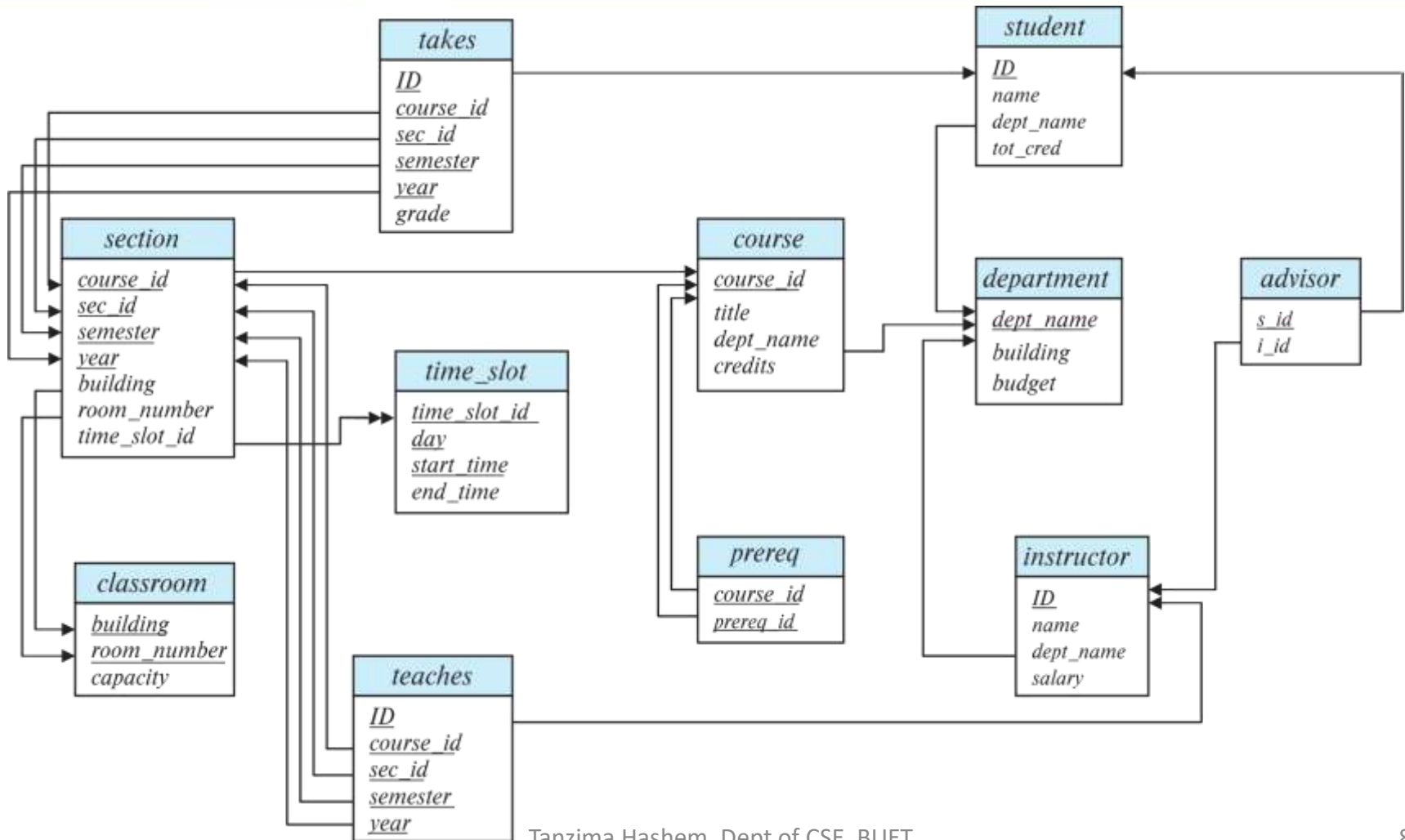
## Keys

- Let  $K \subseteq R$
- $K$  is a **superkey** of  $R$  if values for  $K$  are sufficient to identify a unique tuple of each possible relation  $r(R)$ 
  - Example:  $\{ID\}$  and  $\{ID, name\}$  are both superkeys of *instructor*
- Superkey  $K$  is a **candidate key** if  $K$  is minimal  
Example:  $\{ID\}$  is a candidate key for *Instructor*
- One of the candidate keys is selected to be the **primary key**
- **Foreign key** constraint: Value in one relation must appear in another
  - **Referencing** relation, **Referenced** relation
  - Example: *dept\_name* in *instructor* is a foreign key from *instructor* referencing *department*





## Schema Diagram







## Acknowledgement

- Some slides and figures are collected from
  - <https://www.db-book.com/>