1. Good Evening

2. Lecture will begin at 9:05pm

3. Topic : Schema Design.

Agenda.

1. Keys → PK, FK, UK

2. Relationships → Types, Identify, Create

3. Schema Design → what, why, when, How

4. Case Study

KEYS

Composite key]

[Super keys →

Candidate keys →

e.g. Student [$\boxed{\text{id}}$, → PK
fname, lname, email, phone]

Candidate keys → 1. email
2. phone

Candidate keys
x
↙ 1 ↘ x-1
PK Alternate keys

Student

✓ id	fname	lname	✓ email	phone
1	A	B	—	—
2	C	D	—	—
3	E	F	—	—

CK → id ① [PK]
→ email ②
→ phone [Alternate Keys.]
3

Properties about Primary keys

1. Only 1 PK per table. [Why?]
2. NULL is not allowed
3. Unique values.
4. It can be composite.

Show-id	Seat-id	Available
1.	1.	✓.
1.	2.	x.
2.	1.	✓.
2.	2.	x.

Show Seat

Unique key

→ So that no two values in the same column could be duplicates

PK UK UK

Student

id	first.name	l.name	email	phone
1	A	B	a@b.com	XXX
2	C	D	c@d.com	YYY
3	E	F	e@f.com	ZZZ
4	G	H	g@h.com	XXX
5	—	—	NULL	NULL
6	—	—	NULL	NULL

Properties of unique keys

1. Multiple unique keys are allowed in same table.
2. Allows NULL values.
3. Doesn't allow duplicates.
4. It can be composite also.

	PK	UK
Diff	→ Only 1 per table	→ Multiple allowed per table
Diff	→ NULL not allowed	→ NULLs are allowed

Sim	→ Unique values	→ Unique values [but multiple nulls are allowed]
Sim	→ Composite allowed	→ Composite allowed
	* Default way of identifying records.	* To disallow duplicacy in a column.

Student

PK			UK	UK
id	f-name	l-name	email	phone

FOREIGN KEY

Student

id	name	PK bid	mid
1	A	1	
2	B	1	
3	C	2	
4	D	2	
5	E	NULL	

Batch

PK id	name
1	B1
2	B2
3	B3

Properties of FK

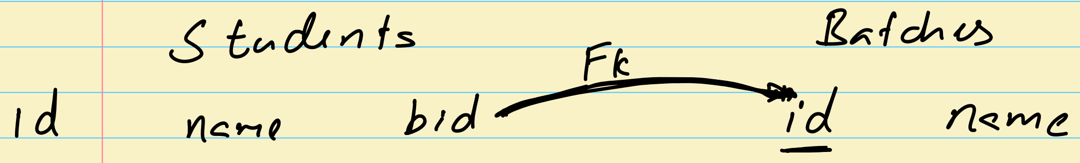
1. Multiple FK are allowed

2. Will nulls be allowed

3. Duplicates are allowed

Purpose → To limit values on basis of values in column of other table.

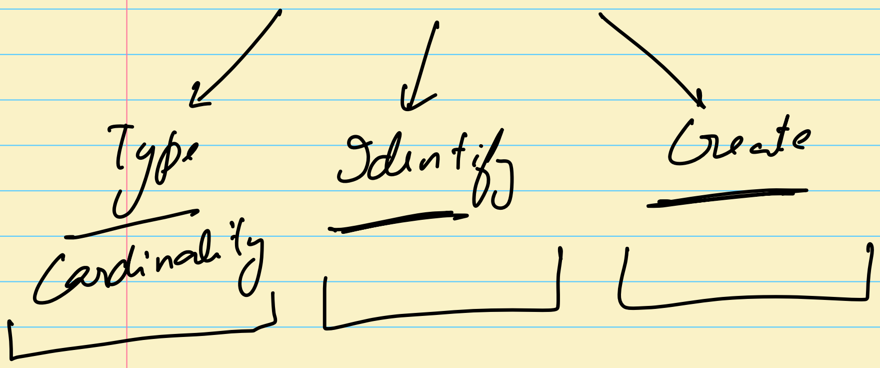
4. FK can reference only PK or UK in other table.



5. Composite Foreign keys are allowed { not practically used]

PK	OK	FK
1	many	many
Composite ✓	Composite ✓	Composite ✗
Unique	Unique	Not necessarily unique.
No nulls	Nulls	Depends on column
✰ Uniquely identify a record	✰ Unique values	✰ Limit the values to valid values.

2. Relationships



1 : 1 Relationship [Spouse Relationship]

Men		Women		
id	name	id	name.	sid

Men : Women

1 : 1.

1 : 1

1 : 1

Create 1 : 1 relationship.

1. Add extra column on any side
2. Add UK to extra column.
3. [Make FK on extra column pointing to PK of other side.

UK

Men

id	name	sid
1	A	1
2	B	5
3	C	3
4	D	4
5	E	2

Women

id	name
1	Z
2	Y
3	X
4	W
5	V

A - Z
B - V   D - W
C - X   E - Y

---

1 : m [m : 1] relationship.

Instructor : Lecture

1 : m
1 : 1

---

1 : m

Create 1:m relationship

1. Add extra column on m side.

2. Make FK on extra column, point to PK of 1 side.

Instructor

id	name
1	I1
2	I2
3	I3

Lectures.

id	topic	iid
1	SQL	3
2	OS	2
3	CN	1
4	Spring	3
5	React	1

I1 = CN, React

I2 = OS

I3 = SQL, Spring

m : m relationship.

Batch : Lecture.

1 : m

m : 1

m : m

Create

1. Make a new mapping table with two columns.
2. Make a composite PK in mapping table.
3. Make two FK, one each to the original table.

Batch

id	name
1	B1
2	B2
3	B3.

Batch_Lecture

bid	lid
1	1
2	1

Lecture.

id	topic
1	SQL
2	OS
3	CN
4	React
5	Spring.

SQL : B1, B2

OS : B2, B3

CN = B1, B3

React = B1

Spring = B1, B2, B3

1 : 1 → Extra column on any side
UK
FK

1 : m → Extra column on m side
FK

m : m → Mapping table.
PK composite
2 FKs

Schema Design [DB Design]

What? → Process of creating DB
- Tables
- Columns
- Constraints

Business Req → Dev → ER Diagram

When?

Business Analysts → Business Requirement

Designing Phase → ER Diagram
[Schema Design]

Why?

1. Because DB change is costly

expensive

- → Models ✓
- → Services ✓
- → Repositories ✓

DB migration is reqd.

Downtime.

How to do schema design? BRs

1. Identify Entities Nouns

→ tables! ✓

non-relationship.

2. " attributes of entities Adjectives

→ columns of table.

3. Identify & create relationships

1:1 1:m m:m

Break : 10:58 - 11:08

Student → id, name, email, pno

Batch → id, name, sd, ed

Lecture → id, topic

Instructor → id, name, dob, exp

Mentor → id, name, dob, exp

current batch

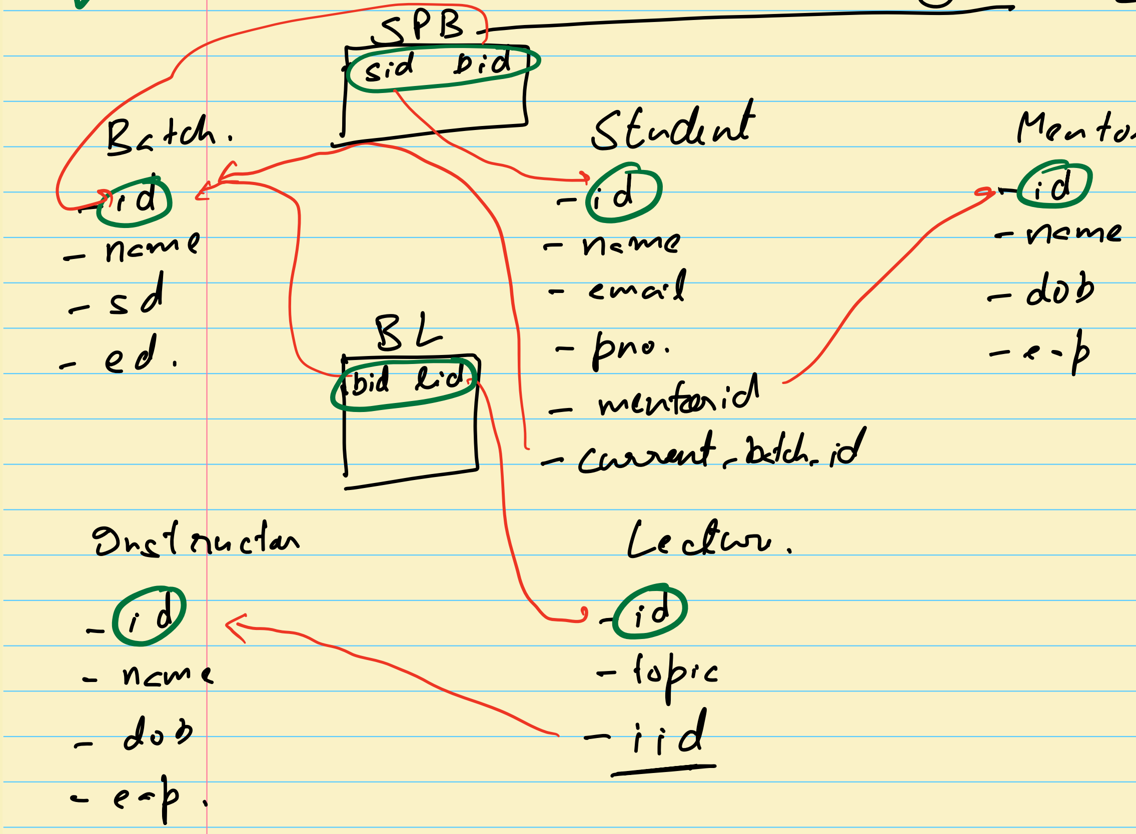
1. Each student is assigned to a batch
2. Student can shift batches. → prev batches.

✓ 3. " has a mentor.

✓ 4. Batches have lectures.

✓ 5. Multiple batches can learn together.

✓ 6. Each lecture is taken by instr.



B : L

1 : m

m : 1

m : m

PK,	UK,	FK
1	many	many
No nulls	Nulls	depends
No.dupli	No dupli	Yes dupli

Relationships.

1:1	1:m	m:m
→ col on any side	→ Col on m side	→ Mapping tbl
		→ Composite PK
→ uk	→ FK	→ 2 Fks.
→ Fk		

Schema Design

What?	When?	Why?	How?
I/P → BR	Before	Expensive	→ Entities [Nouns]
O/P → ER	Coding.		→ Attributes non-relnship
			→ Relationships.

→ Public

→ Skip the doubt : end of class

→ appropriate lecture.

1:1 → FK + UK

1:m → FK

m:m → Mapping Table