

[illegible]

Database System Concept (CSE 3103)

Lecture 03-Day 02

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Second Normal Form (2NF)

- As per the Second Normal Form there must not be any partial dependency of any column on primary key. It means that for a table that has concatenated primary key, each column in the table that is not part of the primary key must depend upon the entire concatenated key for its existence. If any column depends only on one part of the concatenated key, then the table fails **Second normal form**.
- In example of First Normal Form there are two rows for Adam, to include multiple subjects that he has opted for. While this is searchable, and follows First normal form, it is an inefficient use of space. Also in the above Table in First Normal Form, while the candidate key is {**Student, Subject**}, **Age** of Student only depends on Student column, which is incorrect as per Second Normal Form. To achieve second normal form, it would be helpful to split out the subjects into an independent table, and match them up using the student names as foreign keys.

Second Normal Form (2NF)

New Student Table following 2NF will be :

Student	Age
Adam	15
Alex	14
Stuart	17

In Student Table the candidate key will be **Student** column, because all other column i.e **Age** is dependent on it.

Second Normal Form (2NF)

New Subject Table introduced for 2NF will be :

Student	Subject
Adam	Biology
Adam	Maths
Alex	Maths
Stuart	Maths

In Subject Table the candidate key will be {**Student, Subject**} column.

Now, both the above tables qualifies for Second Normal Form and will never suffer from Update Anomalies. Although there are a few complex cases in which table in Second Normal Form suffers Update Anomalies, and to handle those scenarios Third Normal Form is there.

Third Normal Form (3NF)

- **Third Normal form** applies that every non-prime attribute of table must be dependent on primary key, or we can say that, there should not be the case that a non-prime attribute is determined by another non-prime attribute. So this *transitive functional dependency* should be removed from the table and also the table must be in **Second Normal**
- **Student_Detail Table : form.** For example, consider a table with following fields.

Student_id	Student_name	DOB	Street	city	State	Zip

Third Normal Form (3NF)

- In this table Student_id is Primary key, but street, city and state depends upon Zip. The dependency between zip and other fields is called **transitive dependency**. Hence to apply **3NF**, we need to move the street, city and state to new table, with **Zip** as primary key.
- **New Student_Detail Table :**

Student_id	Student_name	DOB	Zip
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Address Table :

Zip	Street	city	state
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Third Normal Form (3NF)

- The advantage of removing transitive dependency is,
- Amount of data duplication is reduced.
- Data integrity achieved.