

Second Normal Form

In this lesson, we will discuss how to decompose a table into second normal form and see some examples.

We'll cover the following



- Second normal form (2NF)
- Example

Second normal form (2NF)

To be in second normal form, a relation must be in first normal form (1NF) and it must not contain any [partial dependencies](#). So a relation is in 2NF as long as it has no partial dependencies, i.e., no non-prime attributes (attributes which are not part of any candidate key) is dependent on any proper subset of a composite primary key of the table.

Example

STUDENT Relation

Stud_Id	Course_Id	Course_Fee
1	C1	1000
2	C2	1500
1	C4	2000
4	C3	1000
4	C1	1000

2	C5	3000
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We can determine a few things by looking at the table above. First of all, **Course_Fee** alone cannot be used to identify each tuple uniquely.

Furthermore, the combination of **Course_Fee** together with **Stud_Id** or **Course_Id** also cannot be used to uniquely identify each tuple. Hence, **Course_Fee** would be a non-prime attribute, as it does not belong to the composite primary key { **Stud_Id**, **Course_Id** }.

However, from the table, it is evident that **Course_Id** \rightarrow **Course_Fee**, i.e., **Course_fee** is dependent on **Course_Id** only, which is a proper subset of the primary key. This results in a partial dependency and so this relation is not in 2NF.

To convert the above relation to 2NF, we need to split the table into two other tables such as:

- Table 1: **Stud_Id**, **Course_Id**
- Table 2: **Course_Id**, **Course_Fee**

Table 1

Stud_Id	Course_Id
1	C1
2	C2
1	C4
4	C3
4	C1
2	C5

Table 2

Course_Id	Course_Fee
C1	1000
C2	1500
C3	1000
C4	2000
C5	3000

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In the first table, we keep `Course_Id` as the foreign key so that we can link the two tables together. This allows us to fetch the fee of a particular course from table 1.

It is important to note that 2NF tries to reduce the redundant data being stored in memory. For instance, if 100 students are taking the C1 course, we don't need to store its fee for all 100 records (tuples). Instead, we can store it in the second table just once.

In the next lesson, we will discuss the concepts behind the third normal form (3NF).