

Denormalized Table (UNF)

The **denormalized table** contains data with repeating groups and redundant information. We'll normalize this table step by step.

UNF Table:

Project Code	Project Name	Project Manager	Project Budget	Employee No.	Employee Name	Department No.	Department Name	Hourly Rate
PC010	Reservation System	Mr. Ajay	120500	\$100	Mohan	D03	Database	21.00
PC010	Reservation System	Mr. Ajay	120500	S101	Vipul	D02	Testing	16.50
PC010	Reservation System	Mr. Ajay	120500	\$102	Riyaz	D01	IT	22.00
PC011	HR System	Mrs. Charu	500500	S103	Pavan	D03	Database	18.50
PC011	HR System	Mrs. Charu	500500	\$104	Jitendra	D02	Testing	17.00
PC011	HR System	Mrs. Charu	500500	S315	Pooja	D01	IT	23.50
PC012	Attendance System	Mr. Rajesh	710700	S137	Rahul	D03	Database	21.50
PC012	Attendance System	Mr. Rajesh	710700	S218	Avneesh	D02	Testing	15.50
PC012	Attendance System	Mr. Rajesh	710700	\$109	Vikas	D01	IT	20.50

First Normal Form (1NF)

1NF requires that:

1. Each table contains **atomic values** (no repeating groups).
2. There are **no duplicate rows**.

We will separate **repeating groups** (employee information) into a new table, while keeping the **project** information in the original table.

1NF Tables:

1. **Project Table (Primary Key: Project Code):**

Project Code	Project Name	Project Manager	Project Budget
PC010	Reservation System	Mr. Ajay	120500
PC011	HR System	Mrs. Charu	500500
PC012	Attendance System	Mr. Rajesh	710700

2. Employee Table (Composite Key: Project Code + Employee No.):

Project Code	Employee No.	Employee Name	Department No.	Department Name	Hourly Rate
PC010	\$100	Mohan	D03	Database	21.00
PC010	S101	Vipul	D02	Testing	16.50
PC010	\$102	Riyaz	D01	IT	22.00
PC011	S103	Pavan	D03	Database	18.50
PC011	\$104	Jitendra	D02	Testing	17.00
PC011	S315	Pooja	D01	IT	23.50
PC012	S137	Rahul	D03	Database	21.50
PC012	S218	Avneesh	D02	Testing	15.50
PC012	\$109	Vikas	D01	IT	20.50

Second Normal Form (2NF)

2NF requires that:

1. The table is in **1NF**.
2. All non-key attributes are **fully functionally dependent** on the **primary key** (no partial dependencies).

Here, **Employee** information should be separated into another table. The **Employee Project Assignment Table** will store information specific to each employee's project assignment.

2NF Tables:

1. Project Table (Remains the same as 1NF):

Project Code	Project Name	Project Manager	Project Budget
PC010	Reservation System	Mr. Ajay	120500
PC011	HR System	Mrs. Charu	500500
PC012	Attendance System	Mr. Rajesh	710700

2. Employee Table (Remains the same as 1NF):

Employee No.	Employee Name	Department No.	Department Name
\$100	Mohan	D03	Database
S101	Vipul	D02	Testing
\$102	Riyaz	D01	IT
S103	Pavan	D03	Database
\$104	Jitendra	D02	Testing
S315	Pooja	D01	IT
S137	Rahul	D03	Database
S218	Avneesh	D02	Testing
\$109	Vikas	D01	IT

3. Employee Project Assignment Table:

Project Code	Employee No.	Hourly Rate
PC010	\$100	21.00
PC010	S101	16.50
PC010	\$102	22.00
PC011	S103	18.50
PC011	\$104	17.00
PC011	S315	23.50
PC012	S137	21.50
PC012	S218	15.50
PC012	\$109	20.50

Third Normal Form (3NF)

3NF requires that:

1. The table is in **2NF**.
2. There are **no transitive dependencies** (non-key attributes should not depend on other non-key attributes).

For **3NF**, we separate the **Department** information into its own table, ensuring that there is no dependency between non-key attributes.

3NF Tables:

1. **Project Table (Remains the same as 2NF):**

Project Code	Project Name	Project Manager	Project Budget
PC010	Reservation System	Mr. Ajay	120500
PC011	HR System	Mrs. Charu	500500
PC012	Attendance System	Mr. Rajesh	710700

2. **Employee Table (Remains the same as 2NF):**

Employee No.	Employee Name	Department No.
\$100	Mohan	D03
S101	Vipul	D02
\$102	Riyaz	D01
S103	Pavan	D03
\$104	Jitendra	D02
S315	Pooja	D01
S137	Rahul	D03
S218	Avneesh	D02
\$109	Vikas	D01

3. Department Table:

Department No.	Department Name
D01	IT
D02	Testing
D03	Database

4. Employee Project Assignment Table (Remains the same as 2NF):

Project Code	Employee No.	Hourly Rate
PC010	\$100	21.00
PC010	\$101	16.50
PC010	\$102	22.00
PC011	\$103	18.50
PC011	\$104	17.00
PC011	\$315	23.50
PC012	\$137	21.50
PC012	\$218	15.50
PC012	\$109	20.50

Explanation:

- **1NF:** We broke the data into two tables: one for project details and one for employee details. The data is now atomic, and there are no repeating groups.
- **2NF:** We removed partial dependencies by creating a separate employee table. The employee's details are not dependent on the project anymore.
- **3NF:** We removed transitive dependencies by separating department details into their own table. Each non-key attribute is now only dependent on the primary key of its respective table.

This normalization process ensures data integrity, eliminates redundancy, and makes updates and deletions more manageable.