Table: “**StudentCourses**”

StudentID	StudentName	Course1	Course2	Course3
101	Alice	Math	History	Physics
102	Bob	Physics	NULL	NULL
103	Carol	Chemistry	Biology	NULL

Assignment Tasks:

1. **Identify Normalization Issues:**
   List the normalization issues present in the "StudentCourses" table. Explain why these issues violate normalization rules.

Answer:

Normalization is a technique to reduce redundancy in tables.

In the given table, there are dedicated columns for each course, which is an issue. For example, Alice (ID 101) took 3 courses, and other students didn’t take 3 courses. But the table has three columns for each of the students, whether they took one course or three courses, leaving most of the column values as NULL for the students who took only one course. So, the table is taking up **unnecessary space**. If Allice (ID 101) takes more courses, it will get even worse as the number of columns will increase.

The table also has the insertion anomaly. If Alice (101) takes another course, a new column (Course4) will be added. Then, the other cells of the new column will be filled with NULL values. It is an **insertion anomaly**.

Again, if Bob (102) takes another course, we will need to update the table. In that case, we will need to find first how many courses he already took, and that is one. Then we will get to know in which column we have to add the new course name, which is the “Course2” column. So, it is an **update anomaly**.

If any student cancels any course, when deleting that course, the entire student information will be deleted. This is a **deletion anomaly**.

2. **Normalize the Table:**
   Create one or more normalized tables that represent the same data without the identified normalization issues. Explain how you have transformed the original table to achieve normalization.

Answer:

The final **normalized table** will be like this:

StudentsInfo

StudentID	StudentName
101	Alice
102	Bob
103	Carol

StudentCourses

StudentID	CourseName
101	Math
102	Physics
103	Chemistry
101	History
103	Biology
101	Physics

How the normalization is achieved:

- Firstly, I have made a table which will have only one column for the course that is taken by a student. It will look like this:

StudentCourses

StudentID	StudentName	Course
101	Alice	Math
102	Bob	Physics
103	Carol	Chemistry
101	Alice	History
103	Carol	Biology
101	Alice	Physics

However, it is not normalized yet as the same information is being repeated, which means the table has redundancy.

- To remove the redundancy, two tables are needed.
    - One for storing student information: "**StudentsInfo**".
    - Another for storing courses that have been taken by students: "**StudentCourses**".

StudentsInfo

StudentID (PK)	StudentName
101	Alice
102	Bob
103	Carol

StudentCourses

StudentID (FK)	CourseName
101	Math
102	Physics
103	Chemistry
101	History
103	Biology
101	Physics

Thus, the normalization is achieved.

The students' information is stored in the "**StudentsInfo**" table, which has two columns: StudentID and StudentName. Here, StudentID is the **primary key**.

The course information, along with the studentID of that particular student, is stored in the "**StudentCourses**" table. Here, StudentID is the **foreign key** that makes a relation with the "**StudendsInfo**" table.