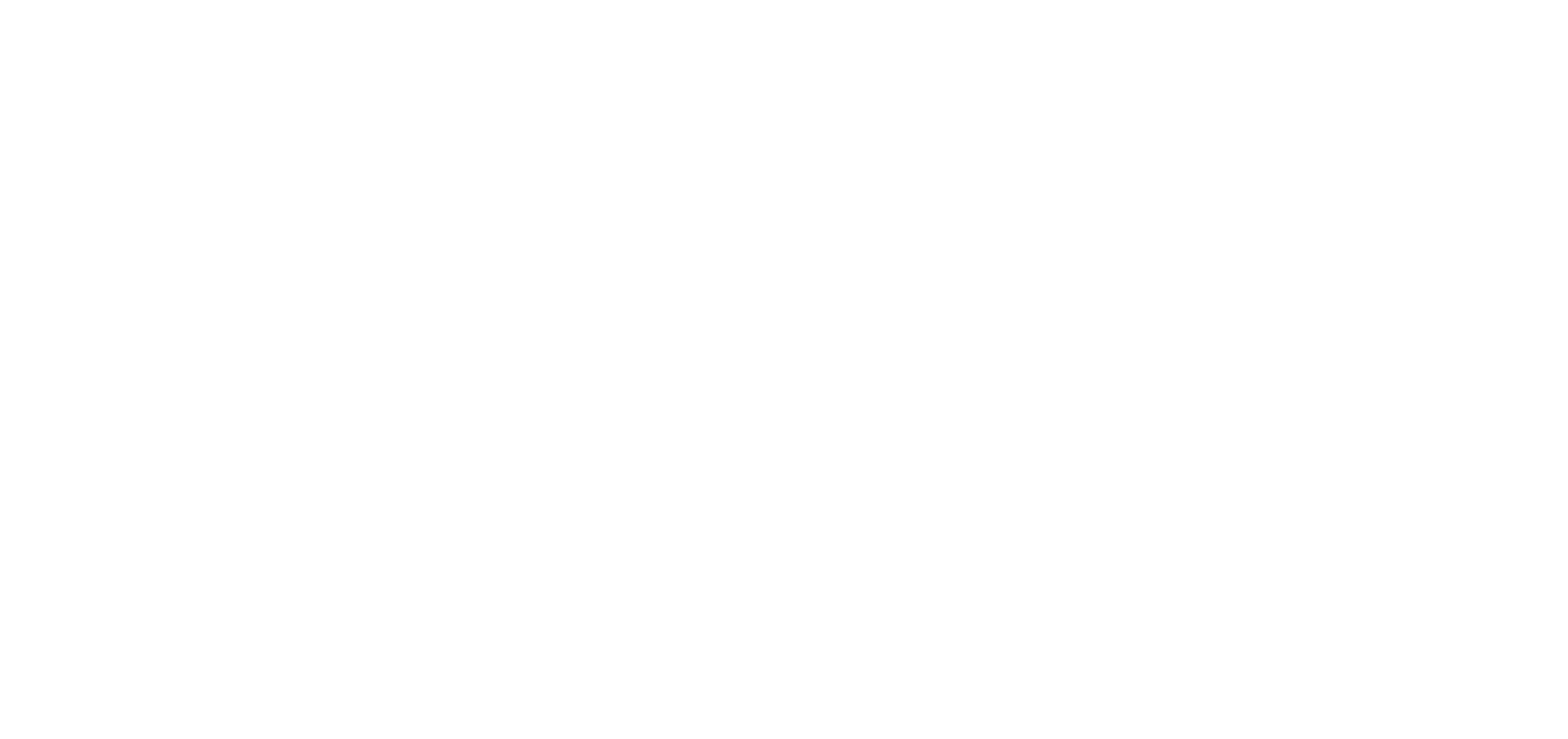
Official (Open)



**Objectives of this practical**

•

Normalize database tables to 1NF, 2NF and 3NF

**Practical 2 – Normalization**

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# Normalization

## Question 1

You are given the following student\_course\_module table containing data as shown:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **adm\_no** | **stud\_name** | **crse\_cd** | **crse\_name** | **mod\_cd** | **mod\_name** | **mark** |
| A001 | Janice | DIT | Diploma in  Information  Technology | SC | Secure Coding | 83 |
| DBS | Database Systems | 72 |
| FOC | Fundamentals of Computing | 78 |
| BED | Back-end Development | 87 |
| A002 | Anita | DAAA | Diploma in AI and Analytics | DL | Deep Learning | 87 |
| DENG | Data Engineering | 83 |
| FOC | Fundamentals of Computing | 78 |
| BED | Back-end Development | 87 |
| … | … | … | … | … | … | … |

1. Is the student\_course\_module table in 0NF? Justify your answer.

Yes, as there multi-valued cells with repeating groups.

1. Write the table in the relational heading format.

student\_course\_module (adm\_no, stud\_name, crse\_cd, crse\_name, {mod\_cd, mod\_name, mark})

1. What is a first normal form (1NF) table? Transform the table, if it is not already in the 1NF, into the first normal form. Present your 1NF table in
   1. a table form as shown above

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **adm\_no** | **stud\_name** | **crse\_cd** | **crse\_name** | **mod\_cd** | **mod\_name** | **mark** |
| A001 | Janice | DIT | Diploma in  Information  Technology | SC | Secure Coding | 83 |
| A001 | Janice | DIT | Diploma in  Information  Technology | DBS | Database Systems | 72 |
| A001 | Janice | DIT | Diploma in  Information  Technology | FOC | Fundamentals of Computing | 78 |
| A001 | Janice | DIT | Diploma in  Information  Technology | BED | Back-end Development | 87 |
| A002 | Anita | DAAA | Diploma in AI and Analytics | DL | Deep Learning | 87 |
| A002 | Anita | DAAA | Diploma in AI and Analytics | DENG | Data Engineering | 83 |
| A002 | Anita | DAAA | Diploma in AI and Analytics | FOC | Fundamentals of Computing | 78 |
| A002 | Anita | DAAA | Diploma in AI and Analytics | BED | Back-end Development | 87 |

* 1. relational heading format

student\_course\_module (adm\_no, stud\_name, crse\_cd, crse\_name, mod\_cd, mod\_name, mark)

1. Using the 1NF table student\_course\_module, explain, what is insert, update and delete anomaly.

Insert Anomaly:

Unable to insert a row when a course exists but with no students enrolled, or when a student has yet to obtain a mark for their module.

Update Anomaly:

If course name or code changes, multiple rows (4 in this case) have to be updated, which can become troublesome and lead to inconsistencies.

Delete Anomaly:

When deleting all of Janice’s rows, there will be an unintended loss of information as we will then lose module information for SC and DBS.

1. Transform the 1NF relation of student\_course\_module into a set of 2NF relations.

student (adm\_no, stud\_name, crse\_cd, crse\_name)

module (mod\_cd, mod\_name, mark)

1. What is a 2NF table?

A 2NF table satisfies the requirements of a 1NF table, and every non-key attribute is functionally dependent of the whole of its primary key. However, there may still be some functional dependencies between the non-key attributes.

1. Transform the set of 2NF relations of into a set of 3NF relations.

student (adm\_no, stud\_name, crse\_cd)

course (crse\_cd, crse\_name)

module (mod\_cd, mod\_name)

student\_course\_module (adm\_no, crse\_cd, mod\_cd, mark)

## Question 2

The following table stores the project charges of a software house:

project\_charges

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **p\_no** | **p\_name** | **e\_no** | **e\_name** | **job\_type** | **man\_day\_ rate** | **man\_day\_**  **billed** | **total\_ charge** |
| 102 | VesselSoft | 565 | Tan | PM | 1000 | 5 | 5,000 |
| 798 | Lim | PL | 800 | 20 | 16,000 |
| 885 | Gay | SE | 400 | 50 | 20,000 |
| 201 | Soft  Machine | 565 | Tan | PM | 1000 | 4 | 4,000 |
| 698 | Lin | PL | 800 | 10 | 8,000 |
| 888 | Sia | SE | 400 | 100 | 40,000 |
| 555 | Chan | Prog | 200 | 100 | 20,000 |

Legend

|  |  |
| --- | --- |
| p\_no | Project Number which uniquely identifies a project |
| p\_name | Project Name |
| e\_no | Employee Number which uniquely identifies an employee |
| e\_name | Employee Name |
| Job\_type | Job designation held by an employee |
| man\_day\_rate | Rate charged per day for a specific job type |
| man\_day\_billed | Number of days to be billed for an employee working in a project |
| total\_charge | Total amount charged for an employee in a project |

* Each employee can only hold one job\_type.
* The man\_day\_rate is dependent on the job\_type
* The number of days an employee worked on a project is recorded in the man\_day\_billed column.

1. The following is an *incorrect* first normal form (1NF) for the above project\_charges table:

project\_charges (**p\_no**, p\_name, {**e\_no, e\_name**, job\_type, man\_day\_rate, man\_day\_billed, total\_charges})

Primary key is given as:

p\_no, e\_no, e\_name

Explain the error(s) in the given 1NF table, and write the corrected 1NF table.

Multiple duplicate cell values

Relational Heading Format

project\_charges (**p\_no**, p\_name, **e\_no,** e\_name, job\_type, man\_day\_rate, man\_day\_billed, total\_charges)

1. State if the following statement is True or False: False

Deletion anomalies cannot exist in second normal form tables.

1. Derive the second normal form relation(s) from the corrected first normal form relation.

project (p\_no, p\_name)

employee (e\_no, e\_name, job\_type, man\_day\_rate, man\_day\_billed, total\_charges)

1. Derive the third normal form relations from the second normal form relations in (c).

project (p\_no, p\_name)

employee (e\_no, e\_name, job\_type)

job (job\_type, man\_day\_rate)

proj\_emp\_job (p\_no, e\_no, man\_day\_billed, total\_charges)