# User Management Schema

Functional Dependencies:

* user\_id → email, password\_hash, first\_name, last\_name, year\_level, bio, created\_at, college\_id (FK), major\_id (FK)
* college\_id → college\_name
* major\_id → major\_name
* course\_id → course\_code, course\_name, college\_id (FK)

Highest Normal Form: BCNF

* It is in 1NF, since all attributes are atomic. For example, no attribute in the “user” entity (ie, all attributes implied by user\_id) can be broken down into meaningful smaller parts. This applies to all other relations in the schema.
* It is in 2NF since it is in 1NF, and there are no partial dependencies, since every key is a single key, not a composite one, and every attribute is directly determined by said key. We can see in the ER diagram, and data dictionary that the primary keys are as follows: user\_id, college\_id, major\_id, and course\_id, which are all singular keys.
* It is in 3NF since it is in 2NF, and the left-hand side of every FD is a superkey.
* It is in BCNF, since it is in 3NF, and the left-hand side of every FD is a superkey.

# Study Management Schema

Functional Dependencies:

**task\_id** → user\_id, title, due\_date, status, priority, category

**reminder\_id** → task\_id, reminder\_time, method

**topic\_id** → topic\_name, topic\_type, course\_id, user\_id

**timer\_id** → host\_id, start\_time, end\_time, duration, topic\_id, technique\_type, session\_type

**(user\_id, timer\_id)** →

**(user\_id, timer\_id)** → total\_sessions, total\_focus\_time, most\_frequent\_topic, avg\_duration, last\_session

Highest Normal Form: **BCNF**

First Normal Form (1NF): **Passes**

A table is in 1NF if:

* All attributes contain atomic values (no repeating groups or arrays).
* Each record is unique (no duplicate rows).
* Each table has a primary key.

**All entities have a primary key**

|  |  |
| --- | --- |
| Entities | Example |
| topics | |  | | --- | |  |  |  | | --- | | **topic\_name** and **topic\_type** are atomic. | |
| timerSessions | Attributes like **start\_time, end\_time, duration** store single values. |
| studyStats | Attributes such as **total\_focus\_time, avg\_duration** hold single values. |
| sessionParticipants | Composite key **(user\_id, timer\_id)** ensures uniqueness. |
| tasks | Each **task\_id** is unique; fields like title, **due\_date,** status are single values. |
| reminders | Each **reminder\_id** is unique; each reminder belongs to one task. |

Second Normal Form (2NF): **Passes**

A table is in 2NF if:

* It is already in 1NF
* All non-key attributes depend on the whole primary key, not just part of it (this mainly applies to tables with composite keys).

**There are no partial dependencies found.**

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| --- | --- |
| Entities | Example |
| sessionParticipants (user\_id, timer\_id) | Has only foreign keys and no partial dependencies. |
| studyStats (user\_id, timer\_id) | Attributes like **total\_sessions, avg\_duration** depend on both user and time |

Third Normal Form (3NF): **Passes**

A table is in 3NF if:

* It is already in 2NF
* No transitive dependencies exist (non-key attributes depending on other non-key attributes).

**There are no partial dependencies found.**

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| Entities | Example |
| tasks | **title, status, priority, due\_date** depend only on **task\_id.** |
| reminders | **reminder\_time** and method depend only on **reminder\_id.** |
| timerSessions | **start\_time, end\_time,** and duration depend **on timer\_id.** |
| studyStats | All attributes depend only on (**user\_id, timer\_id)**; no transitive dependency. |

Boyce-Codd Normal Form (BCNF): **Passes**

A table is in BCNF if:

* A table is in BCNF if **every determinant** is a **candidate key** — i.e., no non-key attribute determines another.

|  |  |
| --- | --- |
| Entities | Example |
| tasks | **task\_id** determines all task attributes **(title, due\_date, status, priority, category)**  (No attribute depends on another non-key attribute.) |
| reminders | **reminder\_id** determines all reminder details **(task\_id, reminder\_time, method)**  (No transitive or partial dependency.) |
| timerSessions | **timer\_id** determines all its attributes **(host\_id,** **start\_time, end\_time, duration, technique\_type, session\_type, topic\_id).**  (No non-key attributes determine another.) |
| studyStats | Composite key (**user\_id, timer\_id)** determines all study data **(total\_sessions, total\_focus\_time, most\_frequent\_topic, avg\_duration, last\_session)**  (No transitive dependency; full functional dependency on both keys.) |
| topics | **topic\_id** determines **topic\_name, topic\_type, course\_id,** and **user\_id.**  (All depend directly on the topic’s key.) |
| sessionParticipants | Composite key **(user\_id, timer\_id)** determines the row.  (No partial or transitive dependencies — both attributes together identify participation.) |