**🧩 Detailed Data Flow: Course → Subject → Topic → Student**

**🎓 1. Course Structure**

**Entity: courses**

* Fields: course\_id, name, program\_type (UG/PG), duration, affiliation\_board (CU)

**📘 2. Subjects per Course & Semester**

**Entity: subjects**

* Fields:
  + subject\_id
  + course\_id
  + semester\_no
  + subject\_name
  + subject\_type (Core/GE/AECC/SEC)
  + credit\_hours

**Entity: course\_subject\_map**

* Fields:
  + id
  + academic\_year\_id
  + course\_id
  + semester\_no
  + subject\_id

✅ This allows mapping different subjects for each academic year/session (as syllabi change over time).

**📚 3. Topics under Each Subject**

**Entity: topics**

* Fields:
  + topic\_id
  + subject\_id
  + topic\_name
  + sequence\_order
  + is\_active

✅ Enables LMS content delivery, attendance tracking per topic, and smart curriculum updates.

**👤 4. Student Enrollment in Course + Subjects**

**Entity: students**

* Fields: student\_id, name, course\_id, semester\_no, admission\_year, etc.

**Entity: student\_subject\_enrollment**

* Fields:
  + id
  + student\_id
  + academic\_year\_id
  + course\_id
  + semester\_no
  + subject\_id
  + is\_optional (for GE/SEC choices)

✅ Allows partial enrollments for electives or subject-specific batch management.

**🧠 5. Usage of Mapping in Key Modules**

| **Module** | **Mapping Use** |
| --- | --- |
| **Attendance** | Mark attendance topic-wise or subject-wise |
| **Internal Exams** | Subject-specific exam assignment and evaluation |
| **LMS/Content** | Deliver notes/videos topic-wise, link with subjects |
| **CU Registration** | Extract enrolled subject list per student |
| **Result Processing** | Grade entry linked to subject enrollments |
| **Timetable** | Generate timetable by course + subject combination |

**🧩 Optional: Subject Batch Mapping**

To handle **lab groups**, **GE combinations**, or **large batches**:

**Entity: subject\_batches**

* Fields: batch\_id, subject\_id, name, max\_size

**Entity: student\_subject\_batch\_map**

* student\_id, subject\_id, batch\_id

**🧾 Example Flow (B.Com Semester 1)**

* **Course:** B.Com
* **Semester:** 1
* **Subjects:**
  + Financial Accounting (Core)
  + Business Law (Core)
  + English (AECC)
  + Environmental Studies (AECC)
  + Bengali (MIL)
* **Topics under Financial Accounting:**
  + Basics of Accounting
  + Journal & Ledger
  + Trial Balance
  + Depreciation
* **Student:** Admitted in 2024 to B.Com, Semester 1
* **Mapped Subjects:** 5 (as above)
* **Topic Progress:** 2/4 topics completed in Financial Accounting

Absolutely, here's a clean and simple **textual flow for Course–Subject Mapping Design**, optimized for clarity in database structure and developer implementation.

**🧩 Course–Subject Mapping Flow**

**🧱 1. Define Subjects (Master Table)**

* Each subject is created **once**, regardless of how many courses use it.

**Table: subjects**

| **Field** | **Description** |
| --- | --- |
| subject\_id | Unique ID |
| subject\_code | e.g., ENG-AECC-01 |
| subject\_name | e.g., English Communication |
| subject\_type | Core / GE / AECC / SEC / MIL |
| credit\_hours | Credit value |
| is\_active | Flag for current validity |

**📚 2. Map Subjects to Courses per Semester**

* Allows **same subject** to be mapped to **multiple courses**, possibly in **different semesters**.

**Table: course\_subject\_map**

| **Field** | **Description** |
| --- | --- |
| id | Mapping ID |
| academic\_year\_id | Academic session/year |
| course\_id | Linked course (e.g., B.Com) |
| semester\_no | Semester number (1–6) |
| subject\_id | Refers to master subject |
| is\_mandatory | Boolean: Core/compulsory |
| is\_elective | Boolean: Elective (optional for student) |

**👨‍🎓 3. Student Subject Enrollment**

* Records **which subjects a student is actually enrolled in**, either auto (for core) or manual (for elective/GE/SEC).

**Table: student\_subject\_enrollment**

| **Field** | **Description** |
| --- | --- |
| student\_id | Refers to the student |
| academic\_year\_id | For the current academic session |
| course\_id | Course enrolled in |
| semester\_no | Semester number |
| subject\_id | Selected subject |
| enrollment\_type | Auto / GE / Elective / Lab |

**✅ Flow Summary**

1. Admin creates Subject in master list ➝

2. Admin maps Subject to Course + Semester via `course\_subject\_map` ➝

3. On admission, system auto-enrolls student in core subjects ➝

4. Student selects optional subjects via UI (if any) ➝

5. All subject enrollments stored in `student\_subject\_enrollment`