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Domain : SQL

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STUDENT DATABASE MANAGEMENT

Creating a database to manage student records is a great way to practice relational database design and SQL queries. Below is a structured approach to designing the database, including table definitions and sample SQL queries.

Database Design

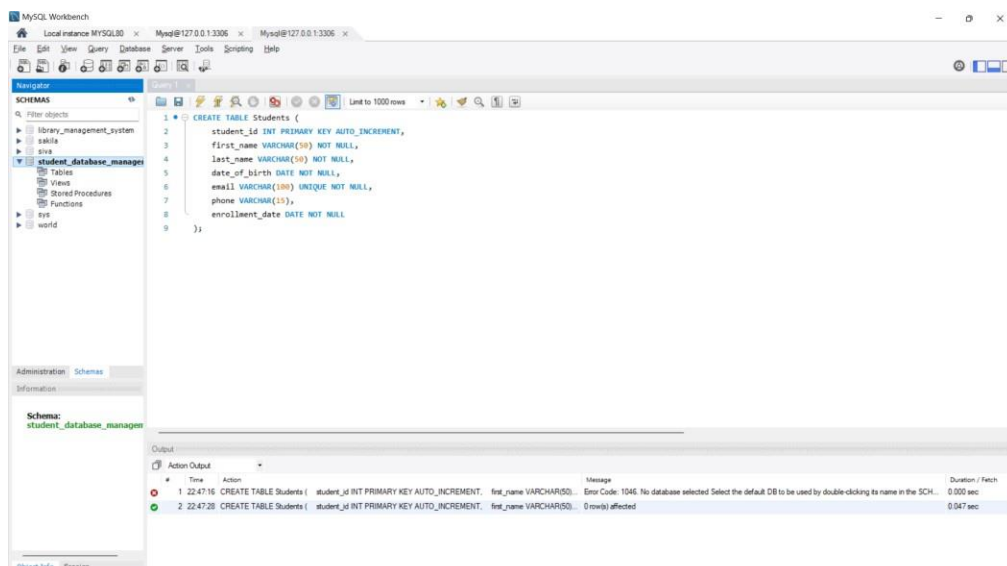
1. Tables Overview :

We'll create three main tables:

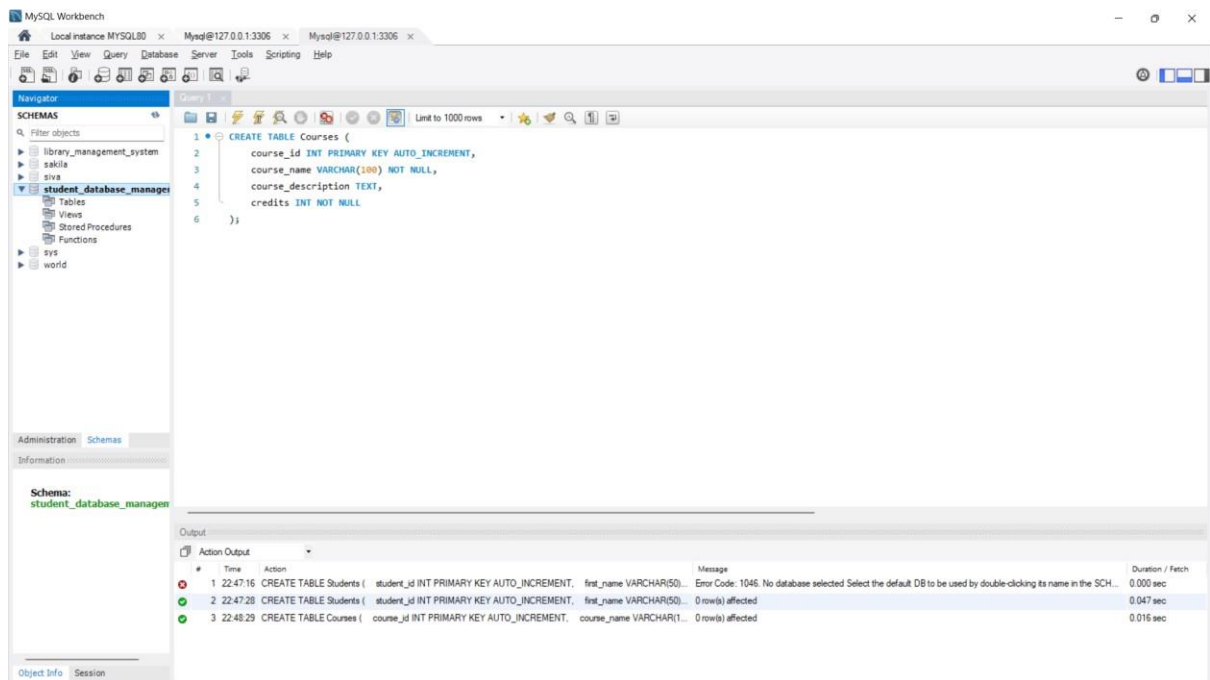
- **Students:** To store personal details of the students.
- **Courses:** To store information about the courses offered.
- **Enrollments:** To manage the relationship between students and courses, including grades.

2. Table Definitions

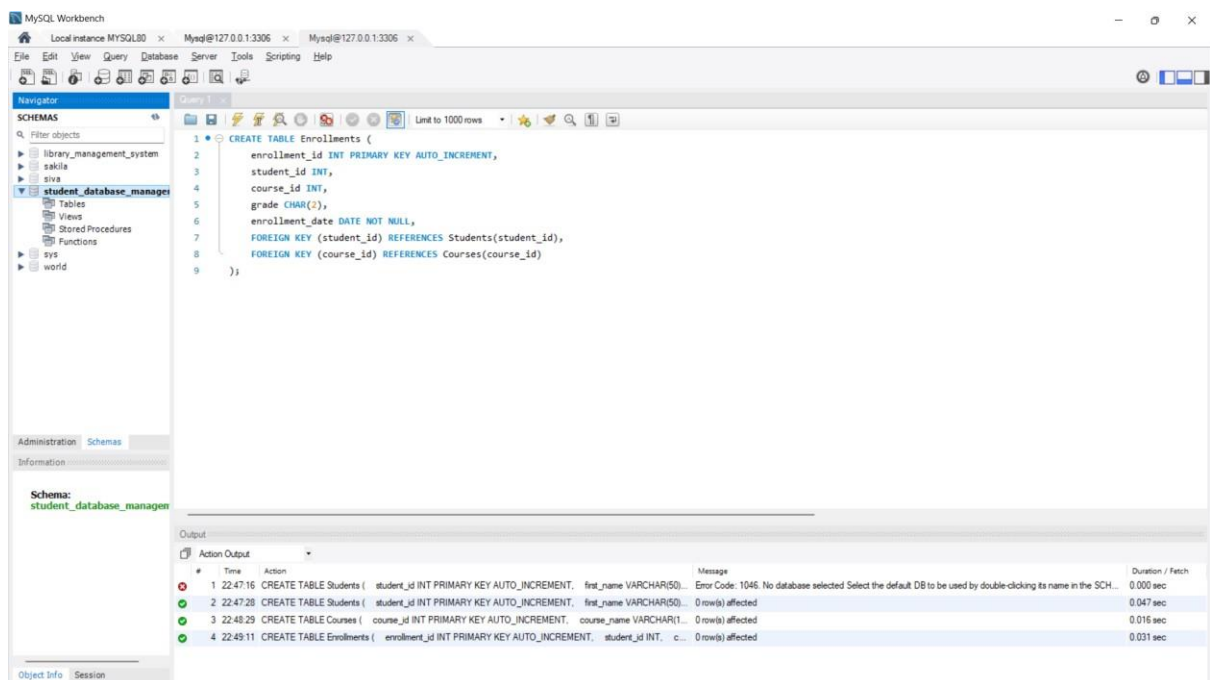
Students Table :



Courses Table :



Enrollments Table :

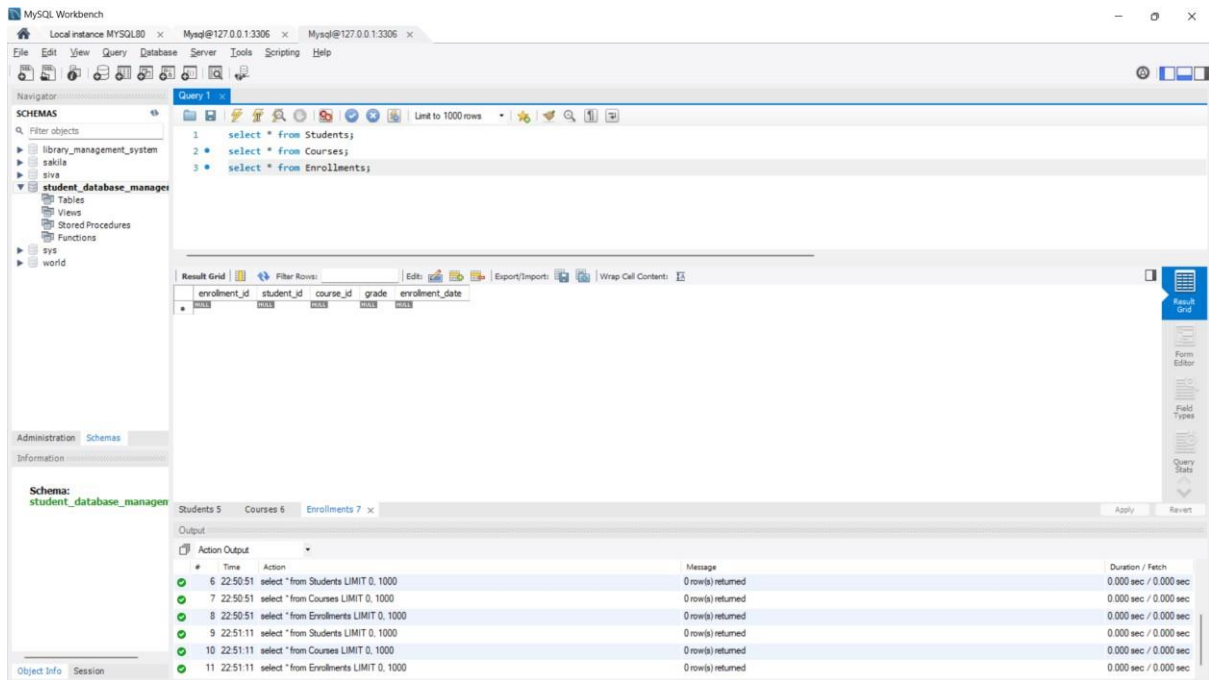


To view the Table :

select * from Students;

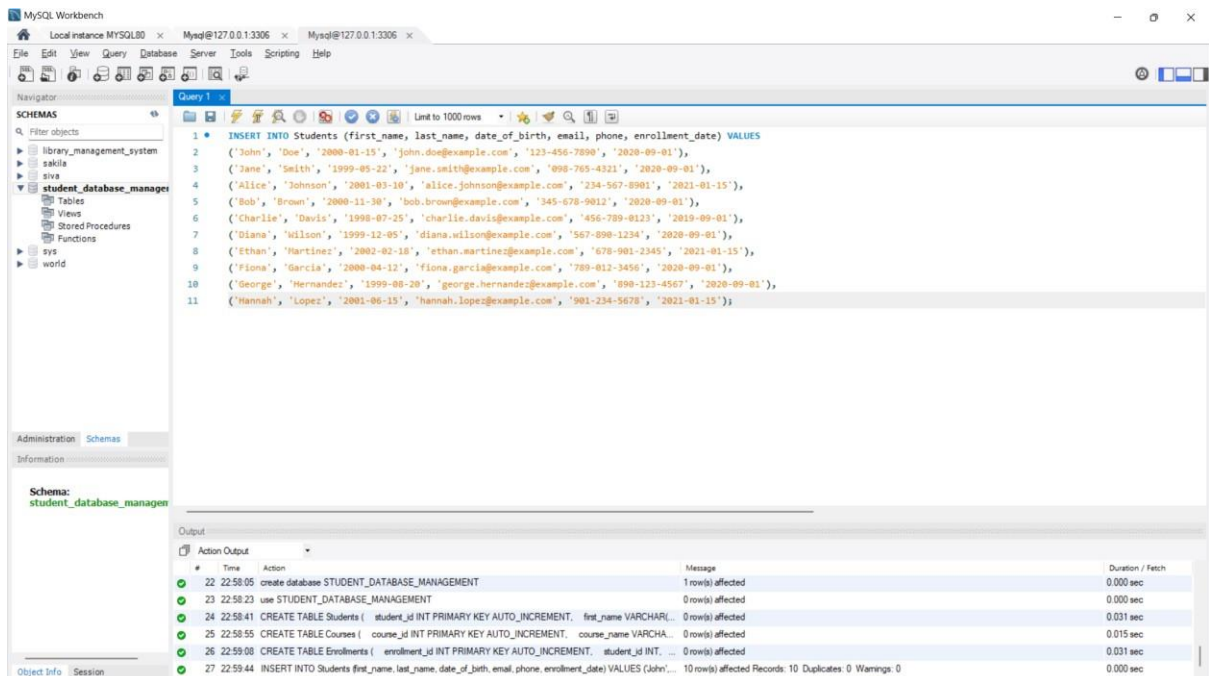
select * from Courses;

select * from Enrollments;



Data Insertion :

Inserting Sample Data :



✓ Students Table has been created.

MySQL Workbench interface showing the 'student_database_managemen' schema. The 'Students' table is created with the following columns: student_id, first_name, last_name, date_of_birth, email, phone, and enrollment_date. The table contains 10 rows of sample data.

student_id	first_name	last_name	date_of_birth	email	phone	enrollment_date
1	John	Doe	2000-01-15	john.doe@example.com	123-456-7890	2020-09-01
2	Jane	Smith	1999-05-22	jane.smith@example.com	098-765-4321	2020-09-01
3	Alice	Johnson	2001-03-10	alice.johnson@example.com	234-567-8901	2021-01-15
4	Bob	Brown	2000-11-30	bob.brown@example.com	345-678-9012	2020-09-01
5	Charlie	Davis	1998-07-25	charlie.davis@example.com	456-789-0123	2019-09-01
6	Diana	Wilson	1999-12-05	diana.wilson@example.com	567-890-1234	2020-09-01
7	Ethan	Martinez	2002-02-18	ethan.martinez@example.com	678-901-2345	2021-01-15
8	Fiona	Garcia	2000-04-12	fiona.garcia@example.com	789-012-3456	2020-09-01
9	George	Hernandez	1999-08-20	george.hernandez@example.com	890-123-4567	2020-09-01
10	Hannah	Lopez	2001-06-15	hannah.lopez@example.com	901-234-5678	2021-01-15

The 'Output' pane shows the execution of the query 'select * from Students' with 10 rows returned.

Inserting Sample Courses:

MySQL Workbench interface showing the 'student_database_managemen' schema. The 'Courses' table is created with the following columns: course_id, course_name, course_description, and credits. The table contains 11 rows of sample data.

course_id	course_name	course_description	credits
1	Database Management	Introduction to database systems.	3
2	Web Development	Learn to build web applications.	4
3	Data Structures	Study of data organization and manipulation.	3
4	Operating Systems	Understanding computer operating systems.	4
5	Software Engineering	Principles of software development.	3
6	Artificial Intelligence	Introduction to AI concepts and applications.	4
7	Machine Learning	Fundamentals of machine learning algorithms.	3
8	Computer Networks	Basics of networking and communication.	4
9	Cybersecurity	Understanding security principles and practices.	3
10	Mobile App Development	Creating applications for mobile devices.	4

The 'Output' pane shows the execution of the query 'INSERT INTO Courses (course_name, course_description, credits) VALUES (Database Management, Introduction to database systems., 3), (Web Development, Learn to build web applications., 4), (Data Structures, Study of data organization and manipulation., 3), (Operating Systems, Understanding computer operating systems., 4), (Software Engineering, Principles of software development., 3), (Artificial Intelligence, Introduction to AI concepts and applications., 4), (Machine Learning, Fundamentals of machine learning algorithms., 3), (Computer Networks, Basics of networking and communication., 4), (Cybersecurity, Understanding security principles and practices., 3), (Mobile App Development, Creating applications for mobile devices., 4);' with 10 rows affected.

✓ Courses Table has been created:

MySQL Workbench

Local instance MYSQL80 x MySQL@127.0.0.1:3306 x MySQL@127.0.0.1:3306 x

File Edit View Query Database Server Tools Scripting Help

Navigator

Filter objects

SCHEMAS

- library_management_system
- sakila
- svs
- student_database_managemen
 - Tables
 - Views
 - Stored Procedures
 - Functions
- sys
- world

Administration Schemas

Schema: student_database_managemen

Information

Query 1

Limit to 1000 rows

1 select * from Courses;

Result Grid

course_id	course_name	course_description	credits
1	Database Management	Introduction to database systems.	3
2	Web Development	Learn to build web applications.	4
3	Data Structures	Study of data organization and manipulation.	3
4	Operating Systems	Understanding computer operating systems.	4
5	Software Engineering	Principles of software development.	3
6	Artificial Intelligence	Introduction to AI concepts and applications.	3
7	Machine Learning	Fundamentals of machine learning algorithms.	4
8	Computer Networks	Basics of networking and communication.	3
9	Cybersecurity	Understanding security principles and practices.	4
10	Mobile App Development	Creating applications for mobile devices.	4

Output

Action Output

#	Time	Action	Message	Duration / Fetch
26	22:58:55	CREATE TABLE Courses (course_id INT PRIMARY KEY AUTO_INCREMENT, course_name VARCHAR...	0 row(s) affected	0.015 sec
27	22:59:08	CREATE TABLE Enrollments (enrollment_id INT PRIMARY KEY AUTO_INCREMENT, student_id INT...	0 row(s) affected	0.031 sec
28	23:00:34	select * from Students LIMIT 0, 1000	10 row(s) affected Records: 10 Duplicates: 0 Warnings: 0	0.000 sec
29	23:01:48	INSERT INTO Students (first_name, last_name, date_of_birth, email, phone, enrollment_date) VALUES (Johni...	10 row(s) returned	0.000 sec / 0.000 sec
30	23:03:17	INSERT INTO Courses (course_name, course_description, credits) VALUES ('Database Management', 'Intro...	10 row(s) affected Records: 10 Duplicates: 0 Warnings: 0	0.000 sec
31	23:03:17	select * from Courses LIMIT 0, 1000	10 row(s) returned	0.000 sec / 0.000 sec

Object Info Session

Inserting Sample Enrollments :

MySQL Workbench

Local instance MYSQL80 x MySQL@127.0.0.1:3306 x MySQL@127.0.0.1:3306 x

File Edit View Query Database Server Tools Scripting Help

Navigator

Filter objects

SCHEMAS

- library_management_system
- sakila
- svs
- student_database_managemen
 - Tables
 - Views
 - Stored Procedures
 - Functions
- sys
- world

Administration Schemas

Schema: student_database_managemen

Information

Query 1

Limit to 1000 rows

1 INSERT INTO Enrollments (student_id, course_id, grade, enrollment_date) VALUES

2 (1, 1, 'A', '2020-09-01');

3 (1, 2, 'B', '2020-09-01');

4 (2, 1, 'A', '2020-09-01');

5 (2, 3, 'B+', '2020-09-01');

6 (3, 4, 'A+', '2021-01-15');

7 (3, 5, 'B', '2021-01-15');

8 (4, 2, 'C', '2020-09-01');

9 (5, 6, 'A+', '2019-09-01');

10 (6, 7, 'B-', '2020-09-01');

11 (7, 8, 'A', '2021-01-15');

12 (8, 9, 'C+', '2020-09-01');

13 (9, 10, 'B', '2020-09-01');

14 (10, 1, 'A+', '2021-01-15');

Output

Action Output

#	Time	Action	Message	Duration / Fetch
26	22:59:08	CREATE TABLE Enrollments (enrollment_id INT PRIMARY KEY AUTO_INCREMENT, student_id INT...	0 row(s) affected	0.031 sec
27	22:59:44	INSERT INTO Students (first_name, last_name, date_of_birth, email, phone, enrollment_date) VALUES (Johni...	10 row(s) affected Records: 10 Duplicates: 0 Warnings: 0	0.000 sec
28	23:00:34	select * from Students LIMIT 0, 1000	10 row(s) returned	0.000 sec / 0.000 sec
29	23:01:48	INSERT INTO Courses (course_name, course_description, credits) VALUES ('Database Management', 'Intro...	10 row(s) affected Records: 10 Duplicates: 0 Warnings: 0	0.000 sec
30	23:03:17	select * from Courses LIMIT 0, 1000	10 row(s) returned	0.000 sec / 0.000 sec
31	23:04:17	INSERT INTO Enrollments (student_id, course_id, grade, enrollment_date) VALUES (1, 1, 'A', '2020-09-01'), (1...	13 row(s) affected Records: 13 Duplicates: 0 Warnings: 0	0.000 sec

Object Info Session

✓ Enrollments Table has been created .

The screenshot shows the MySQL Workbench interface. The left sidebar displays the 'SCHEMAS' tree with 'student_database_manager' selected. The main window shows a query editor with a query that inserts data into the 'Enrollments' table. Below the query editor, the 'Result Grid' displays the data for the 'Enrollments' table. The table has columns: enrollment_id, student_id, course_id, grade, and enrollment_date. The data is as follows:

enrollment_id	student_id	course_id	grade	enrollment_date
1	1	1	A	2020-09-01
2	1	2	B	2020-09-01
3	2	1	A	2020-09-01
4	2	3	B+	2020-09-01
5	3	4	A-	2021-01-15
6	3	5	B	2021-01-15
7	4	2	C	2020-09-01
8	5	6	A+	2019-09-01
9	6	7	B-	2020-09-01
10	7	8	A	2021-01-15
11	8	9	C+	2020-09-01
12	9	10	B	2020-09-01
13	10	1	A-	2021-01-15
14	1	1	A	2020-09-01
15	1	2	B	2020-09-01

The 'Output' pane at the bottom shows the execution of the query, with a message indicating that 13 rows were affected and 0 duplicates were found.

SQL Queries

Retrieve All Students :

The screenshot shows the MySQL Workbench interface. The left sidebar displays the 'SCHEMAS' tree with 'student_database_manager' selected. The main window shows a query editor with a query that selects all data from the 'Students' table. Below the query editor, the 'Result Grid' displays the data for the 'Students' table. The table has columns: student_id, first_name, last_name, date_of_birth, email, phone, and enrollment_date. The data is as follows:

student_id	first_name	last_name	date_of_birth	email	phone	enrollment_date
1	John	Doe	2000-01-15	john.doe@example.com	123-456-7890	2020-09-01
2	Jane	Smith	1999-05-22	jane.smith@example.com	098-765-4321	2020-09-01
3	Alice	Johnson	2001-03-10	alice.johnson@example.com	234-567-8901	2021-01-15
4	Bob	Brown	2000-11-30	bob.brown@example.com	345-678-9012	2020-09-01
5	Charlie	Davis	1998-07-25	charlie.davis@example.com	456-789-0123	2019-09-01
6	Diana	Wilson	1999-12-05	diana.wilson@example.com	567-890-1234	2020-09-01
7	Ethan	Martinez	2002-02-18	ethan.martinez@example.com	678-901-2345	2021-01-15
8	Fiona	Garcia	2000-04-12	fiona.garcia@example.com	789-012-3456	2020-09-01
9	George	Hernandez	1999-08-20	george.hernandez@example.com	890-123-4567	2020-09-01
10	Hannah	Lopez	2001-06-15	hannah.lopez@example.com	901-234-5678	2021-01-15

The 'Output' pane at the bottom shows the execution of the query, with a message indicating that 13 rows were affected and 0 duplicates were found.

Retrieve All Courses :

The screenshot shows the MySQL Workbench interface. The 'Query' tab is active, displaying the following SQL query:

```
SELECT * FROM Courses;
```

The 'Result Grid' shows the results of the query, which are 10 rows of course data:

course_id	course_name	course_description	credits
1	Database Management	Introduction to database systems.	3
2	Web Development	Learn to build web applications.	4
3	Data Structures	Study of data organization and manipulation.	3
4	Operating Systems	Understanding computer operating systems.	4
5	Software Engineering	Principles of software development.	3
6	Artificial Intelligence	Introduction to AI concepts and applications.	4
7	Machine Learning	Fundamentals of machine learning algorithms.	3
8	Computer Networks	Basics of networking and communication.	4
9	Cybersecurity	Understanding security principles and practices.	3
10	Mobile App Development	Creating applications for mobile devices.	4

The 'Action Output' tab shows the execution of the query, indicating that 10 rows were returned.

Retrieve Enrollments with Student and Course Details :

The screenshot shows the MySQL Workbench interface. The 'Query' tab is active, displaying the following SQL query:

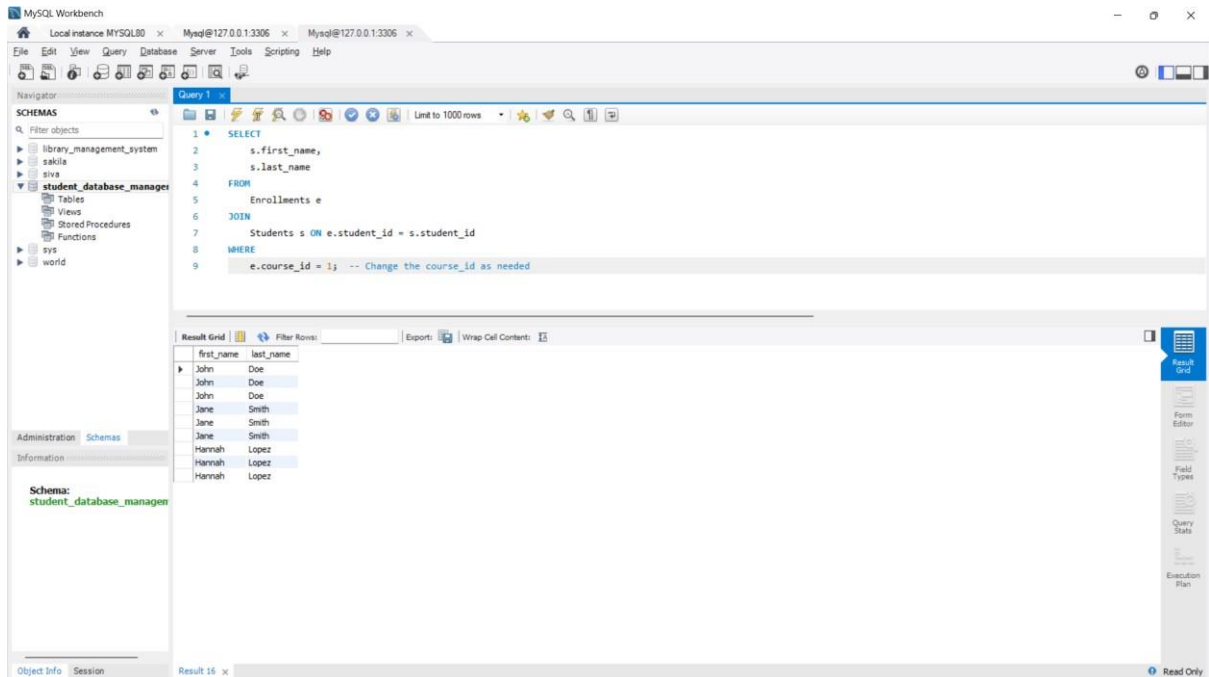
```
SELECT s.first_name, s.last_name, c.course_name, e.grade FROM Enrollments e JOIN Students s ON e.student_id = s.student_id JOIN Courses c ON e.course_id = c.course_id;
```

The 'Result Grid' shows the results of the query, which are 15 rows of enrollment data:

first_name	last_name	course_name	grade
John	Doe	Database Management	A
John	Doe	Web Development	B
John	Doe	Database Management	A
John	Doe	Web Development	B
John	Doe	Database Management	A
John	Doe	Web Development	B
Jane	Smith	Database Management	A
Jane	Smith	Data Structures	B+
Jane	Smith	Database Management	A
Jane	Smith	Data Structures	B+
Jane	Smith	Database Management	A
Jane	Smith	Data Structures	B+
Alice	Johnson	Operating Systems	A-
Alice	Johnson	Software Engineering	B
Alice	Johnson	Operating Systems	A-
Alice	Johnson	Software Engineering	B
Alice	Johnson	Operating Systems	A-
Alice	Johnson	Software Engineering	B
Bob	Brown	Web Development	C
Bob	Brown	Web Development	C
Bob	Brown	Web Development	C
Charlie	Davis	Artificial Intelligence	A+

The 'Action Output' tab shows the execution of the query, indicating that 15 rows were returned.

Find Students Enrolled in a Specific Course :



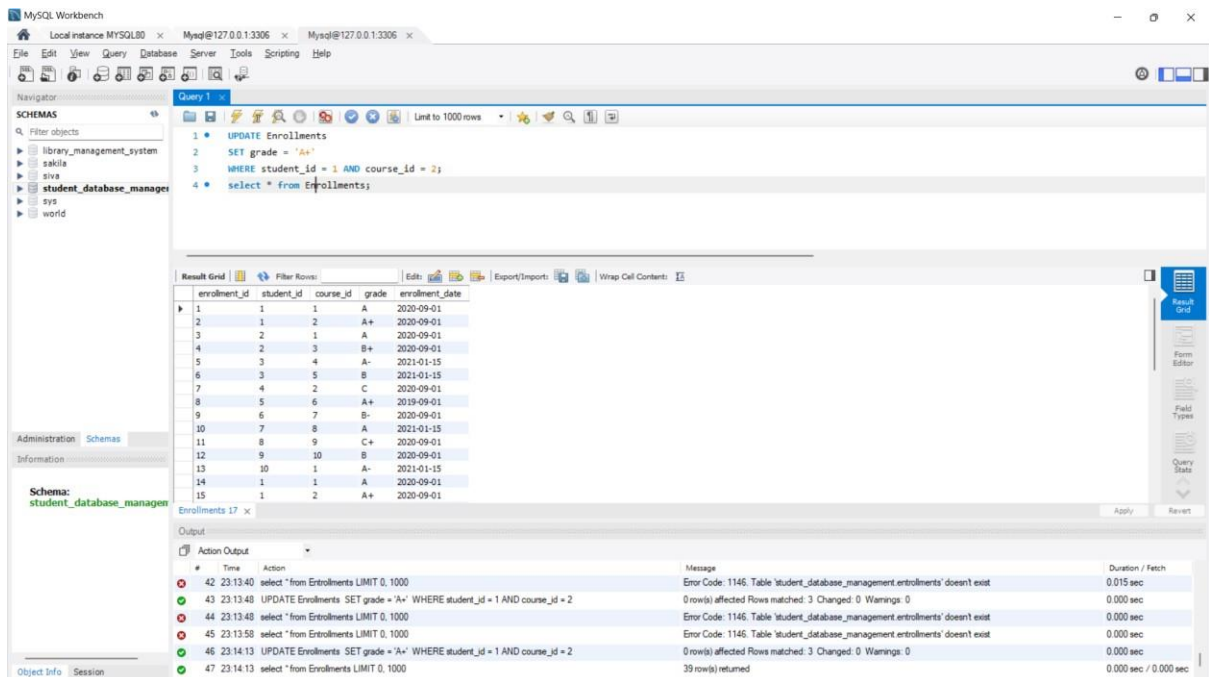
The screenshot shows the MySQL Workbench interface. The left sidebar displays the 'SCHEMAS' list with 'student_database_management' selected. The main query editor contains the following SQL code:

```
1 SELECT
2   s.first_name,
3   s.last_name
4 FROM
5   Enrollments e
6 JOIN
7   Students s ON e.student_id = s.student_id
8 WHERE
9   e.course_id = 1; -- Change the course_id as needed
```

The 'Result Grid' at the bottom displays the following data:

first_name	last_name
John	Doe
John	Doe
John	Doe
Jane	Smith
Jane	Smith
Hannah	Lopez
Hannah	Lopez

Update a Student's Grade :



The screenshot shows the MySQL Workbench interface. The left sidebar displays the 'SCHEMAS' list with 'student_database_management' selected. The main query editor contains the following SQL code:

```
1 UPDATE Enrollments
2 SET grade = 'A+'
3 WHERE student_id = 1 AND course_id = 2;
4 select * from Enrollments;
```

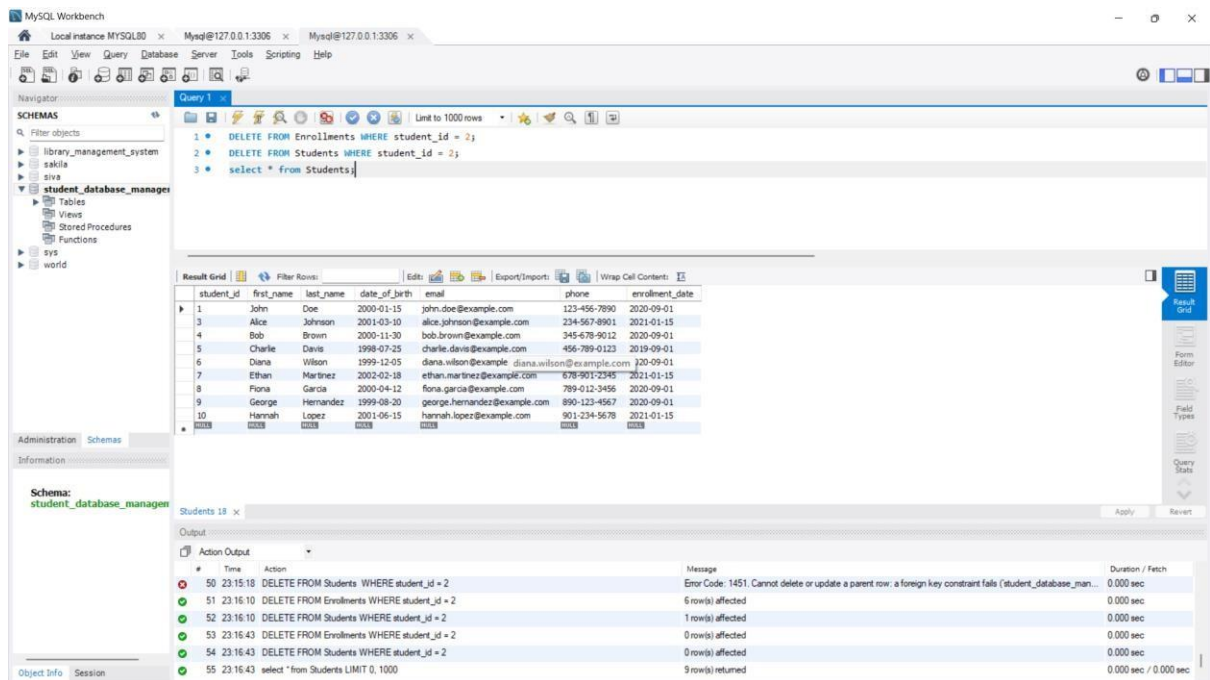
The 'Result Grid' at the bottom displays the following data:

enrollment_id	student_id	course_id	grade	enrollment_date
1	1	1	A	2020-09-01
2	1	2	A+	2020-09-01
3	2	1	A	2020-09-01
4	2	3	B+	2020-09-01
5	3	4	A-	2021-01-15
6	3	5	B	2021-01-15
7	4	2	C	2020-09-01
8	5	6	A+	2019-09-01
9	6	7	B-	2020-09-01
10	7	8	A	2021-01-15
11	8	9	C+	2020-09-01
12	9	10	B	2020-09-01
13	10	1	A-	2021-01-15
14	1	1	A	2020-09-01
15	1	2	A+	2020-09-01

The 'Output' pane at the bottom shows the execution results of the queries:

#	Time	Action	Message	Duration / Fetch
42	23:13:40	select * from Enrollments LIMIT 0, 1000	Error Code: 1146, Table 'student_database_management.enrollments' doesn't exist	0.015 sec
43	23:13:48	UPDATE Enrollments SET grade = 'A+' WHERE student_id = 1 AND course_id = 2	0 row(s) affected Rows matched: 3 Changed: 0 Warnings: 0	0.000 sec
44	23:13:48	select * from Enrollments LIMIT 0, 1000	Error Code: 1146, Table 'student_database_management.enrollments' doesn't exist	0.000 sec
45	23:13:58	select * from Enrollments LIMIT 0, 1000	Error Code: 1146, Table 'student_database_management.enrollments' doesn't exist	0.000 sec
46	23:14:13	UPDATE Enrollments SET grade = 'A+' WHERE student_id = 1 AND course_id = 2	0 row(s) affected Rows matched: 3 Changed: 0 Warnings: 0	0.000 sec
47	23:14:13	select * from Enrollments LIMIT 0, 1000	39 row(s) returned	0.000 sec / 0.000 sec

Delete a Student Record :



The screenshot displays the MySQL Workbench interface. The 'Query 1' window contains the following SQL script:

```
1. DELETE FROM Enrollments WHERE student_id = 2;
2. DELETE FROM Students WHERE student_id = 2;
3. select * from Students;
```

The 'Result Grid' shows the data from the 'Students' table after the deletion of student_id 2:

student_id	first_name	last_name	date_of_birth	email	phone	enrollment_date
1	John	Doe	2000-01-15	john.doe@example.com	123-456-7890	2020-09-01
3	Alice	Johnson	2001-03-10	alice.johnson@example.com	234-567-8901	2021-01-15
4	Bob	Brown	2000-11-30	bob.brown@example.com	345-678-9012	2020-09-01
5	Charlie	Davis	1998-07-25	charlie.davis@example.com	456-789-0123	2019-09-01
6	Dana	Wilson	1999-12-05	dana.wilson@example.com	dana.wilson@example.com	2020-09-01
7	Ethan	Martinez	2002-02-18	ethan.martinez@example.com	567-890-1234	2021-01-15
8	Fiona	Garcia	2000-04-12	fiona.garcia@example.com	789-012-3456	2020-09-01
9	George	Hernandez	1999-08-20	george.hernandez@example.com	890-123-4567	2020-09-01
10	Hannah	Lopez	2001-06-15	hannah.lopez@example.com	901-234-5678	2021-01-15

The 'Action Output' window shows the execution results of the queries:

#	Time	Action	Message	Duration / Fetch
50	23:15:18	DELETE FROM Students WHERE student_id = 2	Error Code: 1451: Cannot delete or update a parent row: a foreign key constraint fails ('student_database_man...	0.000 sec
51	23:16:10	DELETE FROM Enrollments WHERE student_id = 2	6 row(s) affected	0.000 sec
52	23:16:10	DELETE FROM Students WHERE student_id = 2	1 row(s) affected	0.000 sec
53	23:16:43	DELETE FROM Enrollments WHERE student_id = 2	0 row(s) affected	0.000 sec
54	23:16:43	DELETE FROM Students WHERE student_id = 2	0 row(s) affected	0.000 sec
55	23:16:43	select * from Students LIMIT 0, 1000	9 row(s) returned	0.000 sec / 0.000 sec

Conclusion :

Student Database Management System (SDBMS) is essential for educational institutions to efficiently manage student records and streamline administrative processes. It centralizes data, improves accuracy, and enhances communication among students, faculty, and staff.