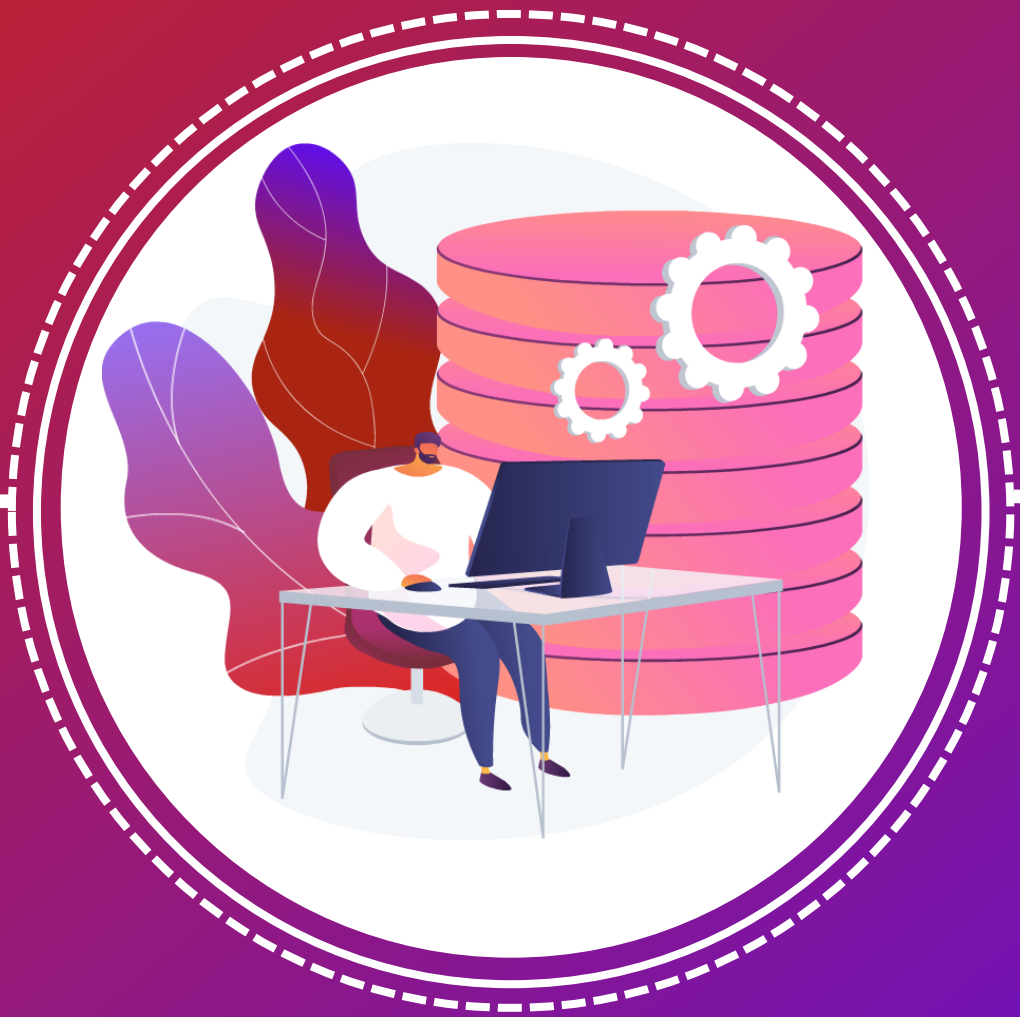
DBMS
Project file



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CHANDIGARH UNIVERSITY
Discover. Learn. Empower.

INDEX

Introduction

What is the system?

- A database that stores all information for online learning courses.
- Keeps track of students, teachers, and courses.
- Stores course materials like videos, readings, and tests.
- Records grades and student progress.
- Handles user logins and accounts.
- Manages course enrollments.
- Tracks when users complete activities.
- Allows for messages between users.

Who will be the user?

- Students who take online courses.
- Teachers who create and teach courses.
- School staff who manage the system.
- IT workers who fix technical problems.
- Parents who check on their children's progress.
- School leaders who review overall results.
- Content creators who make course materials

Introduction

What’s it’s future scope?

- Adding AI to create personal learning plans.
- Better data reports to help teachers.
- Mobile apps for learning anywhere.
- Adding virtual reality for hands-on learning.
- Making learning work better for people with disabilities.
- Connecting with other school systems.
- Using data to predict which students need help.
- Adding game-like features to make learning fun.
- Supporting very small lessons for busy learners.
- Adding ways to prove skills learned, not just grades

Objective

- Make learning available to everyone, anywhere, anytime.
- Create an organized way to store and manage all course content.
- Track student progress and performance accurately.
- Provide easy access to learning materials for students.
- Help teachers manage their courses efficiently.
- Simplify administrative tasks like enrollment and grading.
- Enable communication between students and teachers.
- Improve learning outcomes through data analysis.
- Reduce costs compared to traditional classroom teaching.
- Allow for self-paced learning options.
- Support different learning styles with various content types.
- Provide secure storage for educational records.
- Make it easy to update course materials.
- Generate useful reports on student performance.
- Create a central place for all learning activities

ONLINE LEARNING MANAGEMENT SYSTEM

Relational Schema

Instructor

int	Emp_id	PK
string	Department	
string	Contact_no	

Teaches

Course

int	Course_id	PK
string	Course_name	
string	Description	
int	Emp_id	FK

Has

Contains

Has

Includes

Assignment

int	Assignment_id	PK
string	Title	
string	Description	
date	Due_date	
int	Course_id	FK

Student

Varchar	Uid	PK
string	First_name	
string	Last_name	
string	Contact_no	

Enrolls in

Submits

Creates

Receives

Exam

int	Exam_id	PK
date	Exam_date	
int	Duration	
int	Course_id	FK

Produces

Enrollment

int	Enrollment_id	PK
date	Enrollment_date	
int	Course_id	FK
varchar	Uid	FK

Receives

Submission

int	Submission_id	PK
string	Submission_date	
string	File_link	
string	Grade	
int	Assignment_id	FK
varchar	Uid	FK

Discussion_post

int	Post_id	PK
string	Post_content	
varchar	Uid	FK

Receives

Exam_result

int	Exam_result_id	PK
float	Marks_obtained	
float	Total_marks	
varchar	Uid	FK
int	Course_id	FK

ONLINE LEARNING MANAGEMENT SYSTEM

ER Diagram

Primary Key

Foreign Key

Instructor

Contact_no

Department

Assignment

Assignment_id

Due_date

Title

Description

Teaches

Emp_id

Emp_name

Course

Course_id

Description

Course_name

Instructor_id

Has

Exam

Exam_date

Duration

Exam_id

Course_id

Produces

Exam_result

Marks_obtained

Exam_result_id

Uid

Course_id

Total_marks

Receives

Course_id

Assignment_id

Uid

Submission_id

Submission

File_link

Submission_date

Grade

Submits

Enrollment

Enrollment_id

Course_id

Uid

Enrollment_date

Enrolls

Discussion_post

Post_content

Uid

Post_id

Creates

Receives

Student

Uid

Last_name

First_name

Contact_no

DDL Commands

Create Command

```
-- Create the database
CREATE DATABASE OLMS;
USE olms;

-- Create Instructor table
CREATE TABLE Instructor (
    id INT PRIMARY KEY AUTO_INCREMENT,
    Emp_id INT NOT NULL UNIQUE,
    Department VARCHAR(100) NOT NULL,
    Contact_no VARCHAR(20) NOT NULL,
    CHECK (LENGTH(Contact_no) >= 10)
);

-- Create Course table
CREATE TABLE Course (
    Course_id INT PRIMARY KEY AUTO_INCREMENT,
    Course_name VARCHAR(100) NOT NULL UNIQUE,
    Description TEXT,
    Emp_id INT,
    FOREIGN KEY (Emp_id) REFERENCES Instructor(id),
    CHECK (LENGTH(Course_name) >= 3)
);

-- Create Student table
CREATE TABLE Student (
    Uid VARCHAR(20) PRIMARY KEY,
    First_name VARCHAR(50) NOT NULL,
    Last_name VARCHAR(50) NOT NULL,
    Contact_no VARCHAR(20) NOT NULL UNIQUE,
    CHECK (LENGTH(Contact_no) >= 10),
    CHECK (LENGTH(Uid) >= 5)
);
```

```
-- Create Assignment table
CREATE TABLE Assignment (
    Assignment_id INT PRIMARY KEY AUTO_INCREMENT,
    Title VARCHAR(100) NOT NULL,
    Description TEXT,
    Due_date DATE NOT NULL,
    Course_id INT NOT NULL,
    FOREIGN KEY (Course_id) REFERENCES Course(Course_id),
    CHECK (Due_date > '2023-01-01')
);

-- Create Enrollment table
CREATE TABLE Enrollment (
    Enrollment_id INT PRIMARY KEY AUTO_INCREMENT,
    Enrollment_date DATE NOT NULL DEFAULT (CURRENT_DATE),
    Course_id INT NOT NULL,
    Uid VARCHAR(20) NOT NULL,
    FOREIGN KEY (Course_id) REFERENCES Course(Course_id),
    FOREIGN KEY (Uid) REFERENCES Student(Uid),
    UNIQUE (Course_id, Uid)
);

-- Create Submission table
CREATE TABLE Submission (
    Submission_id INT PRIMARY KEY AUTO_INCREMENT,
    Submission_date VARCHAR(50) NOT NULL,
    File_link VARCHAR(255) NOT NULL,
    Grade VARCHAR(10) DEFAULT 'Pending',
    Assignment_id INT NOT NULL,
    Uid VARCHAR(20) NOT NULL,
    FOREIGN KEY (Assignment_id) REFERENCES Assignment(Assignment_id),
    FOREIGN KEY (Uid) REFERENCES Student(Uid),
    UNIQUE (Assignment_id, Uid),
    CHECK (Grade IN ('A+', 'A', 'A-', 'B+', 'B', 'B-', 'C+', 'C', 'C-', 'D', 'F', 'Pending'))
);
```

```
-- Create Exam table
CREATE TABLE Exam (
    Exam_id INT PRIMARY KEY AUTO_INCREMENT,
    Exam_date DATE NOT NULL,
    Duration INT NOT NULL DEFAULT 120,
    Course_id INT NOT NULL,
    FOREIGN KEY (Course_id) REFERENCES Course(Course_id),
    CHECK (Duration > 0 AND Duration <= 240),
    CHECK (Exam_date > '2023-01-01')
);

-- Create Exam_result table
CREATE TABLE Exam_result (
    Exam_result_id INT PRIMARY KEY AUTO_INCREMENT,
    Marks_obtained FLOAT NOT NULL,
    Total_marks FLOAT NOT NULL DEFAULT 100.0,
    Uid VARCHAR(20) NOT NULL,
    Course_id INT NOT NULL,
    FOREIGN KEY (Uid) REFERENCES Student(Uid),
    FOREIGN KEY (Course_id) REFERENCES Course(Course_id),
    UNIQUE (Uid, Course_id),
    CHECK (Marks_obtained >= 0 AND Marks_obtained <= Total_marks),
    CHECK (Total_marks > 0)
);

-- Create Discussion_post table
CREATE TABLE Discussion_post (
    Post_id INT PRIMARY KEY AUTO_INCREMENT,
    Post_content TEXT NOT NULL,
    Post_date DATETIME DEFAULT CURRENT_TIMESTAMP,
    Uid VARCHAR(20) NOT NULL,
    FOREIGN KEY (Uid) REFERENCES Student(Uid),
    CHECK (LENGTH(Post_content) > 0)
);
```

Alter Command

```
-- Add a new column to the Student table
ALTER TABLE Student ADD COLUMN Graduation_year INT;

-- Modify a column in the Course table
ALTER TABLE Course MODIFY COLUMN Course_name VARCHAR(100) NOT NULL;

-- Add a constraint to the Assignment table
ALTER TABLE Assignment ADD CONSTRAINT check_deadline
CHECK (Due_date > '2023-01-01');

-- Drop a column from the Submission table
ALTER TABLE Submission DROP COLUMN File_link;

-- Add a foreign key constraint
ALTER TABLE Discussion_post ADD COLUMN Course_id INT;
ALTER TABLE Discussion_post ADD CONSTRAINT fk_course_discussion
FOREIGN KEY (Course_id) REFERENCES Course(Course_id);
```

Drop Command

```
-- Drop a table if it exists
DROP TABLE IF EXISTS Temporary_records;

-- Drop multiple tables
DROP TABLE IF EXISTS Old_assignments, Archived_submissions;
```

Rename Command

```
-- Rename a single table
RENAME TABLE Exam TO Course_exam;
```

```
-- Rename multiple tables
RENAME TABLE
    Discussion_post TO Forum_post,
    Submission TO Assignment_submission;
```

Truncate Command

```
-- Remove all data from a table but keep the structure
TRUNCATE TABLE Exam_result;
```

```
mysql> show tables;
+-----------------+
| Tables_in_olms  |
+-----------------+
| assignment      |
| course          |
| discussion_post |
| enrollment      |
| exam            |
| exam_result     |
| instructor      |
| student         |
| submission      |
+-----------------+
9 rows in set (0.00 sec)
```

```
mysql> show tables;
+----------------------+
| Tables_in_olms       |
+----------------------+
| assignment           |
| assignment_submission |
| course               |
| course_exam          |
| enrollment           |
| exam_result          |
| forum_post           |
| instructor           |
| student              |
+----------------------+
9 rows in set (0.00 sec)
```

```
mysql> show columns in assignment;
+---------------+--------------+------+-----+---------+----------------+
| Field         | Type         | Null | Key | Default | Extra          |
+---------------+--------------+------+-----+---------+----------------+
| Assignment_id | int          | NO   | PRI | NULL    | auto_increment |
| Title         | varchar(100) | NO   |     | NULL    |                |
| Description   | text         | YES  |     | NULL    |                |
| Due_date      | date         | NO   |     | NULL    |                |
| Course_id     | int          | NO   | MUL | NULL    |                |
+---------------+--------------+------+-----+---------+----------------+
5 rows in set (0.03 sec)

mysql> show columns in assignment_submission;
+-----------------+-------------+------+-----+---------+----------------+
| Field           | Type        | Null | Key | Default | Extra          |
+-----------------+-------------+------+-----+---------+----------------+
| Submission_id   | int         | NO   | PRI | NULL    | auto_increment |
| Submission_date | varchar(50) | NO   |     | NULL    |                |
| Grade           | varchar(10) | YES  |     | Pending |                |
| Assignment_id   | int         | NO   | MUL | NULL    |                |
| Uid             | varchar(20) | NO   | MUL | NULL    |                |
+-----------------+-------------+------+-----+---------+----------------+
5 rows in set (0.02 sec)

mysql> show columns in course;
+-------------+--------------+------+-----+---------+----------------+
| Field       | Type         | Null | Key | Default | Extra          |
+-------------+--------------+------+-----+---------+----------------+
| Course_id   | int          | NO   | PRI | NULL    | auto_increment |
| Course_name | varchar(100) | NO   | UNI | NULL    |                |
| Description | text         | YES  |     | NULL    |                |
| Emp_id      | int          | YES  | MUL | NULL    |                |
+-------------+--------------+------+-----+---------+----------------+
4 rows in set (0.01 sec)

mysql> show columns in course_exam;
+-----------+------+------+-----+---------+----------------+
| Field     | Type | Null | Key | Default | Extra          |
+-----------+------+------+-----+---------+----------------+
| Exam_id   | int  | NO   | PRI | NULL    | auto_increment |
| Exam_date | date | NO   |     | NULL    |                |
| Duration  | int  | NO   |     | 120     |                |
| Course_id | int  | NO   | MUL | NULL    |                |
+-----------+------+------+-----+---------+----------------+
4 rows in set (0.01 sec)
```

```
mysql> show columns in enrollment;
+-----------------+-------------+------+-----+-----------+-------------------+
| Field           | Type        | Null | Key | Default   | Extra             |
+-----------------+-------------+------+-----+-----------+-------------------+
| Enrollment_id   | int         | NO   | PRI | NULL      | auto_increment    |
| Enrollment_date | date        | NO   |     | curdate() | DEFAULT_GENERATED |
| Course_id       | int         | NO   | MUL | NULL      |                   |
| Uid             | varchar(20) | NO   | MUL | NULL      |                   |
+-----------------+-------------+------+-----+-----------+-------------------+
4 rows in set (0.01 sec)

mysql> show columns in exam_result;
+----------------+-------------+------+-----+---------+----------------+
| Field          | Type        | Null | Key | Default | Extra          |
+----------------+-------------+------+-----+---------+----------------+
| Exam_result_id | int         | NO   | PRI | NULL    | auto_increment |
| Marks_obtained | float       | NO   |     | NULL    |                |
| Total_marks    | float       | NO   |     | 100     |                |
| Uid            | varchar(20) | NO   | MUL | NULL    |                |
| Course_id      | int         | NO   | MUL | NULL    |                |
+----------------+-------------+------+-----+---------+----------------+
5 rows in set (0.00 sec)

mysql> show columns in forum_post;
+--------------+-------------+------+-----+-------------------+-------------------+
| Field        | Type        | Null | Key | Default           | Extra             |
+--------------+-------------+------+-----+-------------------+-------------------+
| Post_id      | int         | NO   | PRI | NULL              | auto_increment    |
| Post_content | text        | NO   |     | NULL              |                   |
| Post_date    | datetime    | YES  |     | CURRENT_TIMESTAMP | DEFAULT_GENERATED |
| Uid          | varchar(20) | NO   | MUL | NULL              |                   |
| Course_id    | int         | YES  | MUL | NULL              |                   |
+--------------+-------------+------+-----+-------------------+-------------------+
5 rows in set (0.01 sec)

mysql> show columns in instructor;
+------------+--------------+------+-----+---------+----------------+
| Field      | Type         | Null | Key | Default | Extra          |
+------------+--------------+------+-----+---------+----------------+
| id         | int          | NO   | PRI | NULL    | auto_increment |
| Emp_id     | int          | NO   | UNI | NULL    |                |
| Department | varchar(100) | NO   |     | NULL    |                |
| Contact_no | varchar(20)  | NO   |     | NULL    |                |
+------------+--------------+------+-----+---------+----------------+
4 rows in set (0.00 sec)

mysql> show columns in student;
+-----------------+-------------+------+-----+---------+-------+
| Field           | Type        | Null | Key | Default | Extra |
+-----------------+-------------+------+-----+---------+-------+
| Uid             | varchar(20) | NO   | PRI | NULL    |       |
| First_name      | varchar(50) | NO   |     | NULL    |       |
| Last_name       | varchar(50) | NO   |     | NULL    |       |
| Contact_no      | varchar(20) | NO   | UNI | NULL    |       |
| Graduation_year | int         | YES  |     | NULL    |       |
+-----------------+-------------+------+-----+---------+-------+
5 rows in set (0.00 sec)
```

DML Commands

Insert Command

```
-- Insert data into Instructor table
INSERT INTO Instructor (Emp_id, Department, Contact_no) VALUES
(3782, 'Computer Science', '9876543210'),
(3783, 'Computer Applications', '9876543211'),
(3784, 'Information Technology', '9876543212'),
(3785, 'Data Science', '9876543213'),
(3786, 'Artificial Intelligence', '9876543214'),
(3787, 'Software Engineering', '9876543215'),
(3788, 'Cyber Security', '9876543216'),
(3789, 'Cloud Computing', '9876543217'),
(3790, 'Machine Learning', '9876543218'),
(3791, 'Mobile Development', '9876543219');
```

```
-- Insert data into Course table
INSERT INTO Course (Course_name, Description, Emp_id) VALUES
('Python Programming', 'Introduction to Python programming language',
1),
('Database Management', 'Fundamentals of DBMS and SQL', 2),
('Web Development', 'HTML, CSS, and JavaScript basics', 3),
('Data Structures', 'Advanced data structures and algorithms', 4),
('Artificial Intelligence', 'Basics of AI and Machine Learning', 5),
('Java Programming', 'Core Java and OOP concepts', 6),
('Network Security', 'Fundamentals of cybersecurity', 7),
('Cloud Architecture', 'AWS and Azure fundamentals', 8),
('Mobile App Development', 'Android and iOS development', 9),
('Operating Systems', 'OS concepts and administration', 10);
```

-- Insert data into Student table

```
INSERT INTO Student (Uid, First_name, Last_name, Contact_no,
Graduation_year) VALUES
('23BCA10301', 'Aarav', 'Sharma', '9898989801', 2026),
('23BCA10302', 'Diya', 'Patel', '9898989802', 2026),
('23MCA10303', 'Arjun', 'Kumar', '9898989803', 2025),
('23MCA10304', 'Ananya', 'Singh', '9898989804', 2025),
('23BIT10305', 'Advait', 'Verma', '9898989805', 2026),
('23BCA10306', 'Ishaan', 'Malhotra', '9898989806', 2026),
('23MCA10307', 'Zara', 'Kapoor', '9898989807', 2025),
('23BIT10308', 'Vihaan', 'Reddy', '9898989808', 2026),
('23BCA10309', 'Riya', 'Gupta', '9898989809', 2026),
('23MCA10310', 'Kabir', 'Mehra', '9898989810', 2025),
('23BIT10311', 'Aisha', 'Joshi', '9898989811', 2026),
('23BCA10312', 'Vivaan', 'Choudhury', '9898989812', 2026);
```

-- Insert data into Assignment table

```
INSERT INTO Assignment (Title, Description, Due_date, Course_id) VALUES
('Python Basics', 'Create a simple calculator program', '2024-03-30', 1),
('SQL Queries', 'Write complex SQL queries', '2024-04-15', 2),
('HTML Portfolio', 'Create a personal portfolio website', '2024-04-20', 3),
('DSA Project', 'Implement a balanced BST', '2024-04-25', 4),
('AI Model', 'Build a simple classification model', '2024-05-01', 5),
('Java Classes', 'Create a library management system', '2024-05-05', 6),
('Security Audit', 'Perform security assessment', '2024-05-10', 7),
('Cloud Deploy', 'Deploy application on AWS', '2024-05-15', 8),
('Android App', 'Create a todo list app', '2024-05-20', 9),
('Shell Script', 'Write backup automation script', '2024-05-25', 10);
```

-- Insert data into Enrollment table

```
INSERT INTO Enrollment (Course_id, Uid) VALUES
(1, '23BCA10301'), (2, '23BCA10301'), (3, '23BCA10301'),
(1, '23BCA10302'), (4, '23BCA10302'),
(2, '23MCA10303'), (5, '23MCA10303'), (6, '23MCA10303'),
(3, '23MCA10304'), (7, '23MCA10304'),
```

(4, '23BIT10305'), (8, '23BIT10305'),
(5, '23BCA10306'), (9, '23BCA10306'),
(6, '23MCA10307'), (10, '23MCA10307'),
(7, '23BIT10308'), (1, '23BIT10308'),
(8, '23BCA10309'), (2, '23BCA10309'),
(9, '23MCA10310'), (3, '23MCA10310');

-- Insert data into Assignment_submission

INSERT INTO Assignment_submission (Submission_date, Grade, Assignment_id, Uid) VALUES
('2024-03-25', 'A', 1, '23BCA10301'),
('2024-03-26', 'B+', 1, '23BCA10302'),
('2024-04-10', 'A-', 2, '23MCA10303'),
('2024-04-12', 'A+', 3, '23MCA10304'),
('2024-04-15', 'B', 4, '23BIT10305'),
('2024-04-18', 'A', 5, '23BCA10306'),
('2024-04-20', 'B+', 6, '23MCA10307'),
('2024-04-22', 'A-', 7, '23BIT10308'),
('2024-04-25', 'B-', 8, '23BCA10309'),
('2024-04-28', 'A', 9, '23MCA10310'),
('2024-05-01', 'A+', 10, '23MCA10307'),
('2024-05-03', 'B+', 1, '23BIT10308');

-- Insert data into Course_exam

INSERT INTO Course_exam (Exam_date, Duration, Course_id) VALUES
('2024-05-15', 180, 1),
('2024-05-16', 180, 2),
('2024-05-17', 180, 3),
('2024-05-18', 180, 4),
('2024-05-19', 180, 5),
('2024-05-20', 180, 6),
('2024-05-21', 180, 7),
('2024-05-22', 180, 8),
('2024-05-23', 180, 9),
('2024-05-24', 180, 10);

```
-- Insert data into Exam_result
INSERT INTO Exam_result (Marks_obtained, Total_marks, Uid, Course_id)
VALUES
(85.5, 100.0, '23BCA10301', 1),
(92.0, 100.0, '23BCA10302', 1),
(88.5, 100.0, '23MCA10303', 2),
(95.0, 100.0, '23MCA10304', 3),
(87.5, 100.0, '23BIT10305', 4),
(91.0, 100.0, '23BCA10306', 5),
(89.5, 100.0, '23MCA10307', 6),
(93.5, 100.0, '23BIT10308', 7),
(86.0, 100.0, '23BCA10309', 8),
(90.5, 100.0, '23MCA10310', 9),
(88.0, 100.0, '23BIT10311', 10),
('94.5', 100.0, '23BCA10312', 1);

-- Insert data into Forum_post
INSERT INTO Forum_post (Post_content, Uid, Course_id) VALUES
('Need help with Python loops concept', '23BCA10301', 1),
('Sharing my SQL assignment approach', '23BCA10302', 2),
('HTML vs CSS discussion', '23MCA10303', 3),
('Binary Tree implementation doubt', '23MCA10304', 4),
('AI project group formation', '23BIT10305', 5),
('Java inheritance example needed', '23BCA10306', 6),
('Cybersecurity best practices', '23MCA10307', 7),
('AWS deployment issues', '23BIT10308', 8),
('Android Studio setup problem', '23BCA10309', 9),
('Linux commands cheat sheet', '23MCA10310', 10),
('Database normalization doubt', '23BIT10311', 2),
('Web hosting recommendations?', '23BCA10312', 3);
```

Select Command

-- Select all records from Instructor table

SELECT * FROM Instructor;

```
mysql> SELECT * FROM Instructor;
+----+--------+------------------------+------------+
| id | Emp_id | Department             | Contact_no |
+----+--------+------------------------+------------+
|  1 |   1001 | Computer Science       | 9876543210 |
|  2 |   1002 | Mathematics            | 9765432109 |
|  3 |   1003 | Physics                | 9654321098 |
|  4 |   1004 | Chemistry              | 9543210987 |
|  5 |   1005 | English Literature     | 9432109876 |
|  6 |   1006 | Economics              | 9321098765 |
|  7 |   1007 | Mechanical Engineering | 9210987654 |
|  8 |   1008 | Biotechnology          | 9109876543 |
|  9 |   1009 | History                | 9098765432 |
| 10 |   1010 | Fine Arts              | 9987654321 |
| 11 |   3782 | Computer Science       | 9876543210 |
| 12 |   3783 | Computer Applications  | 9876543211 |
| 13 |   3784 | Information Technology | 9876543212 |
| 14 |   3785 | Data Science           | 9876543213 |
| 15 |   3786 | Artificial Intelligence| 9876543214 |
| 16 |   3787 | Software Engineering   | 9876543215 |
| 17 |   3788 | Cyber Security         | 9876543216 |
| 18 |   3789 | Cloud Computing        | 9876543217 |
| 19 |   3790 | Machine Learning       | 9876543218 |
| 20 |   3791 | Mobile Development     | 9876543219 |
+----+--------+------------------------+------------+
20 rows in set (0.00 sec)
```

--Select all records from Course table

SELECT * FROM Course;

```
mysql> SELECT * FROM Course;
+-----------+-----------------------------+-------------------------------------------------------------+--------+
| Course_id | Course_name                 | Description                                                 | Emp_id |
+-----------+-----------------------------+-------------------------------------------------------------+--------+
|         1 | Introduction to Programming | Basic programming concepts using Python                     |      1 |
|         2 | Calculus I                  | Fundamental concepts of differential and integral calculus  |      2 |
|         3 | Quantum Physics             | Introduction to quantum mechanics and its applications      |      3 |
|         4 | Organic Chemistry           | Study of carbon compounds and reactions                     |      4 |
|         5 | Modern Indian Literature    | Exploration of contemporary Indian literary works           |      5 |
|         6 | Microeconomics              | Study of market behavior of individuals and firms           |      6 |
|         7 | Thermodynamics              | Principles of energy transfer and work                      |      7 |
|         8 | Molecular Biology           | Study of cellular processes and DNA                         |      8 |
|         9 | Ancient Indian Civilization | Exploring the Indus Valley and Vedic periods                |      9 |
|        10 | Contemporary Art            | Modern and post-modern art movements in India               |     10 |
|        11 | Python Programming          | Introduction to Python programming language                 |      1 |
|        12 | Database Management         | Fundamentals of DBMS and SQL                                |      2 |
|        13 | Web Development             | HTML, CSS, and JavaScript basics                            |      3 |
|        14 | Data Structures             | Advanced data structures and algorithms                     |      4 |
|        15 | Artificial Intelligence     | Basics of AI and Machine Learning                           |      5 |
|        16 | Java Programming            | Core Java and OOP concepts                                  |      6 |
|        17 | Network Security            | Fundamentals of cybersecurity                               |      7 |
|        18 | Cloud Architecture          | AWS and Azure fundamentals                                  |      8 |
|        19 | Mobile App Development      | Android and iOS development                                 |      9 |
|        20 | Operating Systems           | OS concepts and administration                              |     10 |
+-----------+-----------------------------+-------------------------------------------------------------+--------+
20 rows in set (0.00 sec)
```

--Select all records from Student table

SELECT * FROM Student;

```
mysql> SELECT * FROM Student;
+--------------+------------+-----------+------------+-----------------+
| Uid          | First_name | Last_name | Contact_no | Graduation_year |
+--------------+------------+-----------+------------+-----------------+
| 23 ART 10313 | Rohan      | Nair      | 7432109876 |            NULL |
| 23 BCA 10301 | Rahul      | Sharma    | 8765432109 |            NULL |
| 23 BCA 10306 | Ananya     | Gupta     | 8210987654 |            NULL |
| 23 BIO 10311 | Aditya     | Verma     | 7654321098 |            NULL |
| 23 BIO 10316 | Kavita     | Tiwari    | 7109876543 |            NULL |
| 23 CHM 10304 | Neha       | Singh     | 8432109876 |            NULL |
| 23 ECO 10309 | Karan      | Kapoor    | 7876543210 |            NULL |
| 23 ECO 10314 | Anjali     | Menon     | 7321098765 |            NULL |
| 23 ENG 10305 | Vikram     | Malhotra  | 8321098765 |            NULL |
| 23 HIS 10312 | Pooja      | Choudhary | 7543210987 |            NULL |
| 23 MEC 10310 | Meera      | Desai     | 7765432109 |            NULL |
| 23 MEC 10315 | Siddharth  | Bose      | 7210987654 |            NULL |
| 23 MTH 10302 | Priya      | Patel     | 8654321098 |            NULL |
| 23 MTH 10307 | Raj        | Kumar     | 8109876543 |            NULL |
| 23 PHY 10303 | Arjun      | Reddy     | 8543210987 |            NULL |
| 23 PHY 10308 | Divya      | Joshi     | 8987654321 |            NULL |
| 23BCA10301   | Aarav      | Sharma    | 9898989801 |            2026 |
| 23BCA10302   | Diya       | Patel     | 9898989802 |            2026 |
| 23BCA10306   | Ishaan     | Malhotra  | 9898989806 |            2026 |
| 23BCA10309   | Riya       | Gupta     | 9898989809 |            2026 |
| 23BCA10312   | Vivaan     | Choudhury | 9898989812 |            2026 |
| 23BIT10305   | Advait     | Verma     | 9898989805 |            2026 |
| 23BIT10308   | Vihaan     | Reddy     | 9898989808 |            2026 |
| 23BIT10311   | Aisha      | Joshi     | 9898989811 |            2026 |
| 23MCA10303   | Arjun      | Kumar     | 9898989803 |            2025 |
| 23MCA10304   | Ananya     | Singh     | 9898989804 |            2025 |
| 23MCA10307   | Zara       | Kapoor    | 9898989807 |            2025 |
| 23MCA10310   | Kabir      | Mehra     | 9898989810 |            2025 |
+--------------+------------+-----------+------------+-----------------+
28 rows in set (0.00 sec)
```

--Select all records from Assignment table

SELECT * FROM Assignment;

```
mysql> SELECT * FROM Assignment;
+---------------+---------------------+-------------------------------------------------------------+------------+-----------+
| Assignment_id | Title               | Description                                                 | Due_date   | Course_id |
+---------------+---------------------+-------------------------------------------------------------+------------+-----------+
|             1 | Python Basics       | Create a simple calculator using Python                     | 2023-06-15 |         1 |
|             2 | Integration Problems | Solve 10 integration problems from Chapter 5               | 2023-06-20 |         2 |
|             3 | Quantum States      | Write a paper on quantum states and probabilities           | 2023-06-25 |         3 |
|             4 | Synthesis of Aspirin | Lab report on aspirin synthesis experiment                 | 2023-06-18 |         4 |
|             5 | Book Review         | Review of "The God of Small Things" by Arundhati Roy        | 2023-06-22 |         5 |
|             6 | Market Analysis     | Analyze a local market using microeconomic principles       | 2023-06-17 |         6 |
|             7 | Heat Engine Design  | Design a theoretical heat engine with maximum efficiency    | 2023-06-23 |         7 |
|             8 | DNA Extraction      | Lab report on DNA extraction and analysis                   | 2023-06-19 |         8 |
|             9 | Historical Essay    | Essay on the impact of Ashokan edicts on Indian governance  | 2023-06-24 |         9 |
|            10 | Art Portfolio       | Create a portfolio inspired by contemporary Indian artists  | 2023-06-21 |        10 |
|            11 | Python Basics       | Create a simple calculator program                          | 2024-03-30 |         1 |
|            12 | SQL Queries         | Write complex SQL queries                                   | 2024-04-15 |         2 |
|            13 | HTML Portfolio      | Create a personal portfolio website                         | 2024-04-20 |         3 |
|            14 | DSA Project         | Implement a balanced BST                                    | 2024-04-25 |         4 |
|            15 | AI Model            | Build a simple classification model                         | 2024-05-01 |         5 |
|            16 | Java Classes        | Create a library management system                          | 2024-05-05 |         6 |
|            17 | Security Audit      | Perform security assessment                                 | 2024-05-10 |         7 |
|            18 | Cloud Deploy        | Deploy application on AWS                                   | 2024-05-15 |         8 |
|            19 | Android App         | Create a todo list app                                      | 2024-05-20 |         9 |
|            20 | Shell Script        | Write backup automation script                              | 2024-05-25 |        10 |
+---------------+---------------------+-------------------------------------------------------------+------------+-----------+
20 rows in set (0.00 sec)
```

--Select all records from Assignment_submission table

SELECT * FROM Assignment_submission;

```
mysql> SELECT * FROM Assignment_submission;
+---------------+-----------------+-------+---------------+------------+
| Submission_id | Submission_date | Grade | Assignment_id | Uid        |
+---------------+-----------------+-------+---------------+------------+
|             1 | 2024-03-25      | A     |             1 | 23BCA10301 |
|             2 | 2024-03-26      | B+    |             1 | 23BCA10302 |
|             3 | 2024-04-10      | A-    |             2 | 23MCA10303 |
|             4 | 2024-04-12      | A+    |             3 | 23MCA10304 |
|             5 | 2024-04-15      | B     |             4 | 23BIT10305 |
|             6 | 2024-04-18      | A     |             5 | 23BCA10306 |
|             7 | 2024-04-20      | B+    |             6 | 23MCA10307 |
|             8 | 2024-04-22      | A-    |             7 | 23BIT10308 |
|             9 | 2024-04-25      | B-    |             8 | 23BCA10309 |
|            10 | 2024-04-28      | A     |             9 | 23MCA10310 |
|            11 | 2024-05-01      | A+    |            10 | 23MCA10307 |
|            12 | 2024-05-03      | B+    |             1 | 23BIT10308 |
+---------------+-----------------+-------+---------------+------------+
12 rows in set (0.00 sec)
```

--Select all records from Enrollment table

SELECT * FROM Enrollment;

```
mysql> SELECT * FROM Enrollment;
+---------------+-----------------+-----------+-------------+
| Enrollment_id | Enrollment_date | Course_id | Uid         |
+---------------+-----------------+-----------+-------------+
|             1 | 2023-05-01      |         1 | 23 BCA 10301 |
|             2 | 2023-05-01      |         2 | 23 BCA 10301 |
|             3 | 2023-05-02      |         1 | 23 MTH 10302 |
|             4 | 2023-05-03      |         3 | 23 PHY 10303 |
|             5 | 2023-05-03      |         4 | 23 CHM 10304 |
|             6 | 2023-05-04      |         5 | 23 ENG 10305 |
|             7 | 2023-05-04      |         1 | 23 BCA 10306 |
|             8 | 2023-05-05      |         2 | 23 MTH 10307 |
|             9 | 2023-05-05      |         3 | 23 PHY 10308 |
|            10 | 2023-05-06      |         4 | 23 MTH 10302 |
|            11 | 2023-05-07      |         6 | 23 ECO 10309 |
|            12 | 2023-05-08      |         7 | 23 MEC 10310 |
|            13 | 2023-05-09      |         8 | 23 BIO 10311 |
|            14 | 2023-05-10      |         9 | 23 HIS 10312 |
|            15 | 2023-05-11      |        10 | 23 ART 10313 |
|            16 | 2023-05-12      |         6 | 23 ECO 10314 |
|            17 | 2023-05-13      |         7 | 23 MEC 10315 |
|            18 | 2023-05-14      |         8 | 23 BIO 10316 |
|            19 | 2023-05-15      |         9 | 23 BCA 10301 |
|            20 | 2023-05-16      |        10 | 23 MTH 10302 |
|            21 | 2025-04-03      |         1 | 23BCA10301   |
|            22 | 2025-04-03      |         2 | 23BCA10301   |
|            23 | 2025-04-03      |         3 | 23BCA10301   |
|            24 | 2025-04-03      |         1 | 23BCA10302   |
|            25 | 2025-04-03      |         4 | 23BCA10302   |
|            26 | 2025-04-03      |         2 | 23MCA10303   |
|            27 | 2025-04-03      |         5 | 23MCA10303   |
|            28 | 2025-04-03      |         6 | 23MCA10303   |
|            29 | 2025-04-03      |         3 | 23MCA10304   |
|            30 | 2025-04-03      |         7 | 23MCA10304   |
|            31 | 2025-04-03      |         4 | 23BIT10305   |
|            32 | 2025-04-03      |         8 | 23BIT10305   |
|            33 | 2025-04-03      |         5 | 23BCA10306   |
|            34 | 2025-04-03      |         9 | 23BCA10306   |
|            35 | 2025-04-03      |         6 | 23MCA10307   |
|            36 | 2025-04-03      |        10 | 23MCA10307   |
|            37 | 2025-04-03      |         7 | 23BIT10308   |
|            38 | 2025-04-03      |         1 | 23BIT10308   |
|            39 | 2025-04-03      |         8 | 23BCA10309   |
|            40 | 2025-04-03      |         2 | 23BCA10309   |
|            41 | 2025-04-03      |         9 | 23MCA10310   |
|            42 | 2025-04-03      |         3 | 23MCA10310   |
+---------------+-----------------+-----------+-------------+
42 rows in set (0.01 sec)
```

--Select all records from Course_exam table

SELECT * FROM Course_exam;

```
mysql> SELECT * FROM Course_exam;
+---------+------------+----------+-----------+
| Exam_id | Exam_date  | Duration | Course_id |
+---------+------------+----------+-----------+
|       1 | 2023-07-10 |      120 |         1 |
|       2 | 2023-07-12 |      180 |         2 |
|       3 | 2023-07-15 |      150 |         3 |
|       4 | 2023-07-18 |      120 |         4 |
|       5 | 2023-07-20 |       90 |         5 |
|       6 | 2023-07-22 |      120 |         6 |
|       7 | 2023-07-25 |      150 |         7 |
|       8 | 2023-07-28 |      120 |         8 |
|       9 | 2023-07-30 |       90 |         9 |
|      10 | 2023-08-02 |      120 |        10 |
|      11 | 2024-05-15 |      180 |         1 |
|      12 | 2024-05-16 |      180 |         2 |
|      13 | 2024-05-17 |      180 |         3 |
|      14 | 2024-05-18 |      180 |         4 |
|      15 | 2024-05-19 |      180 |         5 |
|      16 | 2024-05-20 |      180 |         6 |
|      17 | 2024-05-21 |      180 |         7 |
|      18 | 2024-05-22 |      180 |         8 |
|      19 | 2024-05-23 |      180 |         9 |
|      20 | 2024-05-24 |      180 |        10 |
+---------+------------+----------+-----------+
20 rows in set (0.00 sec)
```

--Select all records from Exam_result table

SELECT * FROM Exam_result;

```
mysql> SELECT * FROM Exam_result;
+---------------+---------------+-------------+-----------+-----------+
| Exam_result_id | Marks_obtained | Total_marks | Uid       | Course_id |
+---------------+---------------+-------------+-----------+-----------+
|             1 |          85.5 |         100 | 23BCA10301 |         1 |
|             2 |            92 |         100 | 23BCA10302 |         1 |
|             3 |          88.5 |         100 | 23MCA10303 |         2 |
|             4 |            95 |         100 | 23MCA10304 |         3 |
|             5 |          87.5 |         100 | 23BIT10305 |         4 |
|             6 |            91 |         100 | 23BCA10306 |         5 |
|             7 |          89.5 |         100 | 23MCA10307 |         6 |
|             8 |          93.5 |         100 | 23BIT10308 |         7 |
|             9 |            86 |         100 | 23BCA10309 |         8 |
|            10 |          90.5 |         100 | 23MCA10310 |         9 |
|            11 |            88 |         100 | 23BIT10311 |        10 |
|            12 |          94.5 |         100 | 23BCA10312 |         1 |
+---------------+---------------+-------------+-----------+-----------+
12 rows in set (0.00 sec)
```

--Select all records from Forum_post table

SELECT * FROM Forum_post;

```
mysql> SELECT * FROM Forum_post;
+---------+-------------------------------------+---------------------+------------+-----------+
| Post_id | Post_content                        | Post_date           | Uid        | Course_id |
+---------+-------------------------------------+---------------------+------------+-----------+
|       1 | Need help with Python loops concept | 2025-04-03 03:12:29 | 23BCA10301 |         1 |
|       2 | Sharing my SQL assignment approach  | 2025-04-03 03:12:29 | 23BCA10302 |         2 |
|       3 | HTML vs CSS discussion              | 2025-04-03 03:12:29 | 23MCA10303 |         3 |
|       4 | Binary Tree implementation doubt    | 2025-04-03 03:12:29 | 23MCA10304 |         4 |
|       5 | AI project group formation          | 2025-04-03 03:12:29 | 23BIT10305 |         5 |
|       6 | Java inheritance example needed     | 2025-04-03 03:12:29 | 23BCA10306 |         6 |
|       7 | Cybersecurity best practices        | 2025-04-03 03:12:29 | 23MCA10307 |         7 |
|       8 | AWS deployment issues               | 2025-04-03 03:12:29 | 23BIT10308 |         8 |
|       9 | Android Studio setup problem        | 2025-04-03 03:12:29 | 23BCA10309 |         9 |
|      10 | Linux commands cheat sheet          | 2025-04-03 03:12:29 | 23MCA10310 |        10 |
|      11 | Database normalization doubt        | 2025-04-03 03:12:29 | 23BIT10311 |         2 |
|      12 | Web hosting recommendations?        | 2025-04-03 03:12:29 | 23BCA10312 |         3 |
+---------+-------------------------------------+---------------------+------------+-----------+
12 rows in set (0.00 sec)
```

-- Select specific columns from Instructor

SELECT Emp_id, Department, Contact_no FROM Instructor;

```
mysql> SELECT Emp_id, Department, Contact_no FROM Instructor;
+--------+-------------------------+------------+
| Emp_id | Department              | Contact_no |
+--------+-------------------------+------------+
|   1001 | Computer Science        | 9876543210 |
|   1002 | Mathematics             | 9765432109 |
|   1003 | Physics                 | 9654321098 |
|   1004 | Chemistry               | 9543210987 |
|   1005 | English Literature      | 9432109876 |
|   1006 | Economics               | 9321098765 |
|   1007 | Mechanical Engineering  | 9210987654 |
|   1008 | Biotechnology           | 9109876543 |
|   1009 | History                 | 9098765432 |
|   1010 | Fine Arts               | 9987654321 |
|   3782 | Computer Science        | 9876543210 |
|   3783 | Computer Applications   | 9876543211 |
|   3784 | Information Technology  | 9876543212 |
|   3785 | Data Science            | 9876543213 |
|   3786 | Artificial Intelligence | 9876543214 |
|   3787 | Software Engineering    | 9876543215 |
|   3788 | Cyber Security          | 9876543216 |
|   3789 | Cloud Computing         | 9876543217 |
|   3790 | Machine Learning        | 9876543218 |
|   3791 | Mobile Development      | 9876543219 |
+--------+-------------------------+------------+
20 rows in set (0.00 sec)
```

-- Select specific columns from Course

SELECT Course_id, Course_name, Description FROM Course;

```
mysql> SELECT Course_id, Course_name, Description FROM Course;
+-----------+-----------------------------+-------------------------------------------------------------+
| Course_id | Course_name                 | Description                                                 |
+-----------+-----------------------------+-------------------------------------------------------------+
|         1 | Introduction to Programming | Basic programming concepts using Python                     |
|         2 | Calculus I                  | Fundamental concepts of differential and integral calculus  |
|         3 | Quantum Physics             | Introduction to quantum mechanics and its applications      |
|         4 | Organic Chemistry           | Study of carbon compounds and reactions                     |
|         5 | Modern Indian Literature    | Exploration of contemporary Indian literary works           |
|         6 | Microeconomics              | Study of market behavior of individuals and firms           |
|         7 | Thermodynamics              | Principles of energy transfer and work                      |
|         8 | Molecular Biology           | Study of cellular processes and DNA                         |
|         9 | Ancient Indian Civilization | Exploring the Indus Valley and Vedic periods                |
|        10 | Contemporary Art            | Modern and post-modern art movements in India               |
|        11 | Python Programming          | Introduction to Python programming language                 |
|        12 | Database Management         | Fundamentals of DBMS and SQL                                |
|        13 | Web Development             | HTML, CSS, and JavaScript basics                            |
|        14 | Data Structures             | Advanced data structures and algorithms                     |
|        15 | Artificial Intelligence     | Basics of AI and Machine Learning                           |
|        16 | Java Programming            | Core Java and OOP concepts                                  |
|        17 | Network Security            | Fundamentals of cybersecurity                               |
|        18 | Cloud Architecture          | AWS and Azure fundamentals                                  |
|        19 | Mobile App Development      | Android and iOS development                                 |
|        20 | Operating Systems           | OS concepts and administration                              |
+-----------+-----------------------------+-------------------------------------------------------------+
20 rows in set (0.00 sec)
```

-- Select specific columns from Assignment

SELECT Assignment_id, Title, Due_date FROM Assignment;

```
mysql> SELECT Assignment_id, Title, Due_date FROM Assignment;
+---------------+----------------------+------------+
| Assignment_id | Title                | Due_date   |
+---------------+----------------------+------------+
|             1 | Python Basics        | 2023-06-15 |
|             2 | Integration Problems | 2023-06-20 |
|             3 | Quantum States       | 2023-06-25 |
|             4 | Synthesis of Aspirin | 2023-06-18 |
|             5 | Book Review          | 2023-06-22 |
|             6 | Market Analysis      | 2023-06-17 |
|             7 | Heat Engine Design   | 2023-06-23 |
|             8 | DNA Extraction       | 2023-06-19 |
|             9 | Historical Essay     | 2023-06-24 |
|            10 | Art Portfolio        | 2023-06-21 |
|            11 | Python Basics        | 2024-03-30 |
|            12 | SQL Queries          | 2024-04-15 |
|            13 | HTML Portfolio       | 2024-04-20 |
|            14 | DSA Project          | 2024-04-25 |
|            15 | AI Model             | 2024-05-01 |
|            16 | Java Classes         | 2024-05-05 |
|            17 | Security Audit       | 2024-05-10 |
|            18 | Cloud Deploy         | 2024-05-15 |
|            19 | Android App          | 2024-05-20 |
|            20 | Shell Script         | 2024-05-25 |
+---------------+----------------------+------------+
20 rows in set (0.00 sec)
```

-- Select specific columns from Student

SELECT Uid, First_name, Last_name, Graduation_year FROM Student;

```
mysql> SELECT Uid, First_name, Last_name, Graduation_year FROM Student;
+--------------+------------+-----------+-----------------+
| Uid          | First_name | Last_name | Graduation_year |
+--------------+------------+-----------+-----------------+
| 23 ART 10313 | Rohan      | Nair      |            NULL |
| 23 BCA 10301 | Rahul      | Sharma    |            NULL |
| 23 BCA 10306 | Ananya     | Gupta     |            NULL |
| 23 BIO 10311 | Aditya     | Verma     |            NULL |
| 23 BIO 10316 | Kavita     | Tiwari    |            NULL |
| 23 CHM 10304 | Neha       | Singh     |            NULL |
| 23 ECO 10309 | Karan      | Kapoor    |            NULL |
| 23 ECO 10314 | Anjali     | Menon     |            NULL |
| 23 ENG 10305 | Vikram     | Malhotra  |            NULL |
| 23 HIS 10312 | Pooja      | Choudhary |            NULL |
| 23 MEC 10310 | Meera      | Desai     |            NULL |
| 23 MEC 10315 | Siddharth  | Bose      |            NULL |
| 23 MTH 10302 | Priya      | Patel     |            NULL |
| 23 MTH 10307 | Raj        | Kumar     |            NULL |
| 23 PHY 10303 | Arjun      | Reddy     |            NULL |
| 23 PHY 10308 | Divya      | Joshi     |            NULL |
| 23BCA10301   | Aarav      | Sharma    |            2026 |
| 23BCA10302   | Diya       | Patel     |            2026 |
| 23BCA10306   | Ishaan     | Malhotra  |            2026 |
| 23BCA10309   | Riya       | Gupta     |            2026 |
| 23BCA10312   | Vivaan     | Choudhury |            2026 |
| 23BIT10305   | Advait     | Verma     |            2026 |
| 23BIT10308   | Vihaan     | Reddy     |            2026 |
| 23BIT10311   | Aisha      | Joshi     |            2026 |
| 23MCA10303   | Arjun      | Kumar     |            2025 |
| 23MCA10304   | Ananya     | Singh     |            2025 |
| 23MCA10307   | Zara       | Kapoor    |            2025 |
| 23MCA10310   | Kabir      | Mehra     |            2025 |
+--------------+------------+-----------+-----------------+
28 rows in set (0.00 sec)
```

-- Select specific columns from Assignment_submission

```
SELECT Assignment_id, Submission_date, Grade
FROM Assignment_submission;
```

```
mysql> SELECT Assignment_id, Submission_date, Grade FROM Assignment_submission;
+---------------+-----------------+-------+
| Assignment_id | Submission_date | Grade |
+---------------+-----------------+-------+
|             1 | 2024-03-25      | A     |
|             1 | 2024-03-26      | B+    |
|             2 | 2024-04-10      | A-    |
|             3 | 2024-04-12      | A+    |
|             4 | 2024-04-15      | B     |
|             5 | 2024-04-18      | A     |
|             6 | 2024-04-20      | B+    |
|             7 | 2024-04-22      | A-    |
|             8 | 2024-04-25      | B-    |
|             9 | 2024-04-28      | A     |
|            10 | 2024-05-01      | A+    |
|             1 | 2024-05-03      | B+    |
+---------------+-----------------+-------+
12 rows in set (0.00 sec)
```

-- Select specific columns from Course_exam

```
SELECT Exam_id, Exam_date, Duration FROM Course_exam;
```

```
mysql> SELECT Exam_id, Exam_date, Duration FROM Course_exam;
+---------+------------+----------+
| Exam_id | Exam_date  | Duration |
+---------+------------+----------+
|       1 | 2023-07-10 |      120 |
|       2 | 2023-07-12 |      180 |
|       3 | 2023-07-15 |      150 |
|       4 | 2023-07-18 |      120 |
|       5 | 2023-07-20 |       90 |
|       6 | 2023-07-22 |      120 |
|       7 | 2023-07-25 |      150 |
|       8 | 2023-07-28 |      120 |
|       9 | 2023-07-30 |       90 |
|      10 | 2023-08-02 |      120 |
|      11 | 2024-05-15 |      180 |
|      12 | 2024-05-16 |      180 |
|      13 | 2024-05-17 |      180 |
|      14 | 2024-05-18 |      180 |
|      15 | 2024-05-19 |      180 |
|      16 | 2024-05-20 |      180 |
|      17 | 2024-05-21 |      180 |
|      18 | 2024-05-22 |      180 |
|      19 | 2024-05-23 |      180 |
|      20 | 2024-05-24 |      180 |
+---------+------------+----------+
20 rows in set (0.00 sec)
```

Update Command

```
-- Update Assignment submission grade
UPDATE Assignment_submission SET Grade = 'A+'
WHERE Assignment_id = 1 AND Uid = '23BCA10301';
```

```
mysql> select * from Assignment_submission;
+---------------+-----------------+-------+---------------+------------+
| Submission_id | Submission_date | Grade | Assignment_id | Uid        |
+---------------+-----------------+-------+---------------+------------+
|             1 | 2024-03-25      | A+    |             1 | 23BCA10301 |
|             2 | 2024-03-26      | B+    |             1 | 23BCA10302 |
|             3 | 2024-04-10      | A-    |             2 | 23MCA10303 |
|             4 | 2024-04-12      | A+    |             3 | 23MCA10304 |
|             5 | 2024-04-15      | B     |             4 | 23BIT10305 |
|             6 | 2024-04-18      | A     |             5 | 23BCA10306 |
|             7 | 2024-04-20      | B+    |             6 | 23MCA10307 |
|             8 | 2024-04-22      | A-    |             7 | 23BIT10308 |
|             9 | 2024-04-25      | B-    |             8 | 23BCA10309 |
|            10 | 2024-04-28      | A     |             9 | 23MCA10310 |
|            11 | 2024-05-01      | A+    |            10 | 23MCA10307 |
|            12 | 2024-05-03      | B+    |             1 | 23BIT10308 |
+---------------+-----------------+-------+---------------+------------+
12 rows in set (0.00 sec)
```

Delete Command

-- Delete a forum post

DELETE FROM Forum_post WHERE Post_id = 1;

```
mysql> select * from Forum_post;
+---------+-------------------------------------+---------------------+------------+-----------+
| Post_id | Post_content                        | Post_date           | Uid        | Course_id |
+---------+-------------------------------------+---------------------+------------+-----------+
|       1 | Need help with Python loops concept | 2025-04-03 03:12:29 | 23BCA10301 |         1 |
|       2 | Sharing my SQL assignment approach  | 2025-04-03 03:12:29 | 23BCA10302 |         2 |
|       3 | HTML vs CSS discussion              | 2025-04-03 03:12:29 | 23MCA10303 |         3 |
|       4 | Binary Tree implementation doubt    | 2025-04-03 03:12:29 | 23MCA10304 |         4 |
|       5 | AI project group formation          | 2025-04-03 03:12:29 | 23BIT10305 |         5 |
|       6 | Java inheritance example needed     | 2025-04-03 03:12:29 | 23BCA10306 |         6 |
|       7 | Cybersecurity best practices        | 2025-04-03 03:12:29 | 23MCA10307 |         7 |
|       8 | AWS deployment issues               | 2025-04-03 03:12:29 | 23BIT10308 |         8 |
|       9 | Android Studio setup problem        | 2025-04-03 03:12:29 | 23BCA10309 |         9 |
|      10 | Linux commands cheat sheet          | 2025-04-03 03:12:29 | 23MCA10310 |        10 |
|      11 | Database normalization doubt        | 2025-04-03 03:12:29 | 23BIT10311 |         2 |
|      12 | Web hosting recommendations?        | 2025-04-03 03:12:29 | 23BCA10312 |         3 |
+---------+-------------------------------------+---------------------+------------+-----------+
12 rows in set (0.00 sec)

mysql> select * from Forum_post;
+---------+-------------------------------------+---------------------+------------+-----------+
| Post_id | Post_content                        | Post_date           | Uid        | Course_id |
+---------+-------------------------------------+---------------------+------------+-----------+
|       2 | Sharing my SQL assignment approach  | 2025-04-03 03:12:29 | 23BCA10302 |         2 |
|       3 | HTML vs CSS discussion              | 2025-04-03 03:12:29 | 23MCA10303 |         3 |
|       4 | Binary Tree implementation doubt    | 2025-04-03 03:12:29 | 23MCA10304 |         4 |
|       5 | AI project group formation          | 2025-04-03 03:12:29 | 23BIT10305 |         5 |
|       6 | Java inheritance example needed     | 2025-04-03 03:12:29 | 23BCA10306 |         6 |
|       7 | Cybersecurity best practices        | 2025-04-03 03:12:29 | 23MCA10307 |         7 |
|       8 | AWS deployment issues               | 2025-04-03 03:12:29 | 23BIT10308 |         8 |
|       9 | Android Studio setup problem        | 2025-04-03 03:12:29 | 23BCA10309 |         9 |
|      10 | Linux commands cheat sheet          | 2025-04-03 03:12:29 | 23MCA10310 |        10 |
|      11 | Database normalization doubt        | 2025-04-03 03:12:29 | 23BIT10311 |         2 |
|      12 | Web hosting recommendations?        | 2025-04-03 03:12:29 | 23BCA10312 |         3 |
+---------+-------------------------------------+---------------------+------------+-----------+
11 rows in set (0.00 sec)
```

DCL Commands

Grant Command

```
-- Create users
CREATE USER 'professor'@'localhost' IDENTIFIED BY 'prof123';
CREATE USER 'student'@'localhost' IDENTIFIED BY 'stud123';
CREATE USER 'admin'@'localhost' IDENTIFIED BY 'admin123';
```

```
--View created users
SELECT user, host FROM mysql.user;
```

```
mysql> SELECT user, host FROM mysql.user;
+------------------+-----------+
| user             | host      |
+------------------+-----------+
| admin            | localhost |
| anubhav          | localhost |
| mysql.infoschema | localhost |
| mysql.session    | localhost |
| mysql.sys        | localhost |
| professor        | localhost |
| root             | localhost |
| student          | localhost |
+------------------+-----------+
8 rows in set (0.00 sec)
```

```
-- Grant privileges to admin (full access)
GRANT ALL PRIVILEGES ON olms.*
TO 'admin'@'localhost';
```

```
-- Grant privileges to professor
GRANT SELECT, INSERT, UPDATE, DELETE
ON olms.Course TO 'professor'@'localhost';

GRANT SELECT, INSERT, UPDATE, DELETE
ON olms.Assignment TO 'professor'@'localhost';
```

```
GRANT SELECT, INSERT, UPDATE
ON olms.Assignment_submission TO 'professor'@'localhost';

GRANT SELECT, INSERT, UPDATE, DELETE
ON olms.Course_exam TO 'professor'@'localhost';

GRANT SELECT, INSERT, UPDATE
ON olms.Exam_result TO 'professor'@'localhost';

GRANT SELECT ON olms.Student TO 'professor'@'localhost';

GRANT SELECT ON olms.Enrollment TO 'professor'@'localhost';

-- Grant privileges to student
GRANT SELECT ON olms.Course TO 'student'@'localhost';

GRANT SELECT ON olms.Assignment TO 'student'@'localhost';

GRANT SELECT, INSERT ON olms.Assignment_submission
TO 'student'@'localhost';

GRANT SELECT ON olms.Course_exam TO 'student'@'localhost';

GRANT SELECT ON olms.Exam_result TO 'student'@'localhost';

GRANT SELECT, INSERT ON olms.Forum_post TO 'student'@'localhost';

-- Show granted privileges

SHOW GRANTS FOR 'professor'@'localhost';

SHOW GRANTS FOR 'student'@'localhost';

SHOW GRANTS FOR 'admin'@'localhost';
```

```
mysql> SHOW GRANTS FOR 'professor'@'localhost';
+-----------------------------------------------------------------------------------------------+
| Grants for professor@localhost                                                                |
+-----------------------------------------------------------------------------------------------+
| GRANT USAGE ON *.* TO `professor`@`localhost`                                                 |
| GRANT SELECT, INSERT, UPDATE ON `olms`.`assignment_submission` TO `professor`@`localhost`     |
| GRANT SELECT, INSERT, UPDATE, DELETE ON `olms`.`assignment` TO `professor`@`localhost`        |
| GRANT SELECT, INSERT, UPDATE, DELETE ON `olms`.`course_exam` TO `professor`@`localhost`       |
| GRANT SELECT, INSERT, UPDATE, DELETE ON `olms`.`course` TO `professor`@`localhost`            |
| GRANT SELECT ON `olms`.`enrollment` TO `professor`@`localhost`                                |
| GRANT SELECT, INSERT, UPDATE ON `olms`.`exam_result` TO `professor`@`localhost`               |
| GRANT SELECT ON `olms`.`student` TO `professor`@`localhost`                                   |
+-----------------------------------------------------------------------------------------------+
8 rows in set (0.00 sec)

mysql> SHOW GRANTS FOR 'student'@'localhost';
+-------------------------------------------------------------------------------+
| Grants for student@localhost                                                  |
+-------------------------------------------------------------------------------+
| GRANT USAGE ON *.* TO `student`@`localhost`                                   |
| GRANT SELECT, INSERT ON `olms`.`assignment_submission` TO `student`@`localhost` |
| GRANT SELECT ON `olms`.`assignment` TO `student`@`localhost`                  |
| GRANT SELECT ON `olms`.`course_exam` TO `student`@`localhost`                 |
| GRANT SELECT ON `olms`.`course` TO `student`@`localhost`                      |
| GRANT SELECT ON `olms`.`exam_result` TO `student`@`localhost`                 |
| GRANT SELECT, INSERT ON `olms`.`forum_post` TO `student`@`localhost`          |
+-------------------------------------------------------------------------------+
7 rows in set (0.00 sec)

mysql> SHOW GRANTS FOR 'admin'@'localhost';
+-----------------------------------------------------+
| Grants for admin@localhost                          |
+-----------------------------------------------------+
| GRANT USAGE ON *.* TO `admin`@`localhost`           |
| GRANT ALL PRIVILEGES ON `olms`.* TO `admin`@`localhost` |
+-----------------------------------------------------+
2 rows in set (0.00 sec)
```

-- Testing Users

Note: run the following commands in powers shell

-- Login as professor

mysql -u professor -p

-- Test professor privileges

SELECT * FROM olms.Course; *-- Should work*

DELETE FROM olms.Student; *-- Should fail*

UPDATE olms.Assignment_submission SET Grade = 'A'; *-- Should work*

```
PS C:\Users\Anubhav Ghosh> mysql -u professor -p
Enter password: *******
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 10
Server version: 8.0.40 MySQL Community Server - GPL

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Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> SELECT * FROM olms.Course;
+-----------+-----------------------------+-----------------------------------------------------------------+--------+
| Course_id | Course_name                 | Description                                                     | Emp_id |
+-----------+-----------------------------+-----------------------------------------------------------------+--------+
|         1 | Introduction to Programming | Basic programming concepts using Python                         |      1 |
|         2 | Calculus I                  | Fundamental concepts of differential and integral calculus      |      2 |
|         3 | Quantum Physics             | Introduction to quantum mechanics and its applications          |      3 |
|         4 | Organic Chemistry           | Study of carbon compounds and reactions                         |      4 |
|         5 | Modern Indian Literature    | Exploration of contemporary Indian literary works               |      5 |
|         6 | Microeconomics              | Study of market behavior of individuals and firms               |      6 |
|         7 | Thermodynamics              | Principles of energy transfer and work                          |      7 |
|         8 | Molecular Biology           | Study of cellular processes and DNA                             |      8 |
|         9 | Ancient Indian Civilization | Exploring the Indus Valley and Vedic periods                    |      9 |
|        10 | Contemporary Art            | Modern and post-modern art movements in India                   |     10 |
|        11 | Python Programming          | Introduction to Python programming language                     |      1 |
|        12 | Database Management         | Fundamentals of DBMS and SQL                                    |      2 |
|        13 | Web Development             | HTML, CSS, and JavaScript basics                                |      3 |
|        14 | Data Structures             | Advanced data structures and algorithms                         |      4 |
|        15 | Artificial Intelligence     | Basics of AI and Machine Learning                               |      5 |
|        16 | Java Programming            | Core Java and OOP concepts                                      |      6 |
|        17 | Network Security            | Fundamentals of cybersecurity                                   |      7 |
|        18 | Cloud Architecture          | AWS and Azure fundamentals                                      |      8 |
|        19 | Mobile App Development      | Android and iOS development                                     |      9 |
|        20 | Operating Systems           | OS concepts and administration                                  |     10 |
+-----------+-----------------------------+-----------------------------------------------------------------+--------+
20 rows in set (0.02 sec)

mysql> DELETE FROM olms.Student;
ERROR 1142 (42000): DELETE command denied to user 'professor'@'localhost' for table 'student'
mysql> UPDATE olms.Assignment_submission SET Grade = 'A';
Query OK, 10 rows affected (0.01 sec)
Rows matched: 12  Changed: 10  Warnings: 0

mysql> select * from olms.Assignment_submission;
+---------------+-----------------+-------+---------------+------------+
| Submission_id | Submission_date | Grade | Assignment_id | Uid        |
+---------------+-----------------+-------+---------------+------------+
|             1 | 2024-03-25      | A     |             1 | 23BCA10301 |
|             2 | 2024-03-26      | A     |             1 | 23BCA10302 |
|             3 | 2024-04-10      | A     |             2 | 23MCA10303 |
|             4 | 2024-04-12      | A     |             3 | 23MCA10304 |
|             5 | 2024-04-15      | A     |             4 | 23BIT10305 |
|             6 | 2024-04-18      | A     |             5 | 23BCA10306 |
|             7 | 2024-04-20      | A     |             6 | 23MCA10307 |
|             8 | 2024-04-22      | A     |             7 | 23BIT10308 |
|             9 | 2024-04-25      | A     |             8 | 23BCA10309 |
|            10 | 2024-04-28      | A     |             9 | 23MCA10310 |
|            11 | 2024-05-01      | A     |            10 | 23MCA10307 |
|            12 | 2024-05-03      | A     |             1 | 23BIT10308 |
+---------------+-----------------+-------+---------------+------------+
12 rows in set (0.00 sec)
```

-- Login as student

mysql -u student -p

-- Test student privileges

SELECT * FROM olms.Course; *-- Should work*

INSERT INTO olms.Course VALUES
(21,'OOPs','Object Oriented Programming',2); -- *Should fail*

SELECT * FROM olms.Assignment; *-- Should work*

```
PS C:\Users\Anubhav Ghosh> mysql -u student -p
Enter password: *******
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 14
Server version: 8.0.40 MySQL Community Server - GPL

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> SELECT * FROM olms.Course;
+-----------+-----------------------------+-----------------------------------------------------------------+---------+
| Course_id | Course_name                 | Description                                                     | Emp_id |
+-----------+-----------------------------+-----------------------------------------------------------------+---------+
|         1 | Introduction to Programming | Basic programming concepts using Python                         |      1 |
|         2 | Calculus I                  | Fundamental concepts of differential and integral calculus      |      2 |
|         3 | Quantum Physics             | Introduction to quantum mechanics and its applications          |      3 |
|         4 | Organic Chemistry           | Study of carbon compounds and reactions                         |      4 |
|         5 | Modern Indian Literature    | Exploration of contemporary Indian literary works               |      5 |
|         6 | Microeconomics              | Study of market behavior of individuals and firms               |      6 |
|         7 | Thermodynamics              | Principles of energy transfer and work                          |      7 |
|         8 | Molecular Biology           | Study of cellular processes and DNA                             |      8 |
|         9 | Ancient Indian Civilization | Exploring the Indus Valley and Vedic periods                    |      9 |
|        10 | Contemporary Art            | Modern and post-modern art movements in India                   |     10 |
|        11 | Python Programming          | Introduction to Python programming language                     |      1 |
|        12 | Database Management         | Fundamentals of DBMS and SQL                                    |      2 |
|        13 | Web Development             | HTML, CSS, and JavaScript basics                                |      3 |
|        14 | Data Structures             | Advanced data structures and algorithms                         |      4 |
|        15 | Artificial Intelligence     | Basics of AI and Machine Learning                               |      5 |
|        16 | Java Programming            | Core Java and OOP concepts                                      |      6 |
|        17 | Network Security            | Fundamentals of cybersecurity                                   |      7 |
|        18 | Cloud Architecture          | AWS and Azure fundamentals                                      |      8 |
|        19 | Mobile App Development      | Android and iOS development                                     |      9 |
|        20 | Operating Systems           | OS concepts and administration                                  |     10 |
+-----------+-----------------------------+-----------------------------------------------------------------+---------+
20 rows in set (0.00 sec)
```

```
mysql> INSERT INTO olms.Course VALUES
    -> (21,'OOPs','Object Oriented Programming',2);
ERROR 1142 (42000): INSERT command denied to user 'student'@'localhost' for table 'course'
mysql> SELECT * FROM olms.Assignment;
+---------------+---------------------+-------------------------------------------------------------+------------+-----------+
| Assignment_id | Title               | Description                                                 | Due_date   | Course_id |
+---------------+---------------------+-------------------------------------------------------------+------------+-----------+
|             1 | Python Basics       | Create a simple calculator using Python                     | 2023-06-15 |         1 |
|             2 | Integration Problems | Solve 10 integration problems from Chapter 5               | 2023-06-20 |         2 |
|             3 | Quantum States      | Write a paper on quantum states and probabilities           | 2023-06-25 |         3 |
|             4 | Synthesis of Aspirin | Lab report on aspirin synthesis experiment                 | 2023-06-18 |         4 |
|             5 | Book Review         | Review of "The God of Small Things" by Arundhati Roy        | 2023-06-22 |         5 |
|             6 | Market Analysis     | Analyze a local market using microeconomic principles       | 2023-06-17 |         6 |
|             7 | Heat Engine Design  | Design a theoretical heat engine with maximum efficiency    | 2023-06-23 |         7 |
|             8 | DNA Extraction      | Lab report on DNA extraction and analysis                   | 2023-06-19 |         8 |
|             9 | Historical Essay    | Essay on the impact of Ashokan edicts on Indian governance  | 2023-06-24 |         9 |
|            10 | Art Portfolio       | Create a portfolio inspired by contemporary Indian artists  | 2023-06-21 |        10 |
|            11 | Python Basics       | Create a simple calculator program                          | 2024-03-30 |         1 |
|            12 | SQL Queries         | Write complex SQL queries                                   | 2024-04-15 |         2 |
|            13 | HTML Portfolio      | Create a personal portfolio website                         | 2024-04-20 |         3 |
|            14 | DSA Project         | Implement a balanced BST                                    | 2024-04-25 |         4 |
|            15 | AI Model            | Build a simple classification model                         | 2024-05-01 |         5 |
|            16 | Java Classes        | Create a library management system                          | 2024-05-05 |         6 |
|            17 | Security Audit      | Perform security assessment                                 | 2024-05-10 |         7 |
|            18 | Cloud Deploy        | Deploy application on AWS                                   | 2024-05-15 |         8 |
|            19 | Android App         | Create a todo list app                                      | 2024-05-20 |         9 |
|            20 | Shell Script        | Write backup automation script                              | 2024-05-25 |        10 |
+---------------+---------------------+-------------------------------------------------------------+------------+-----------+
20 rows in set (0.01 sec)
```

Revoke Command

-- Revoke specific privileges

REVOKE DELETE ON olms.Assignment_submission
FROM 'professor'@'localhost';

```
mysql> SHOW GRANTS FOR 'professor'@'localhost';
+-----------------------------------------------------------------------------------------------+
| Grants for professor@localhost                                                                |
+-----------------------------------------------------------------------------------------------+
| GRANT USAGE ON *.* TO `professor`@`localhost`                                                 |
| GRANT SELECT, INSERT, UPDATE ON `olms`.`assignment_submission` TO `professor`@`localhost`     |
| GRANT SELECT, INSERT, UPDATE, DELETE ON `olms`.`assignment` TO `professor`@`localhost`        |
| GRANT SELECT, INSERT, UPDATE, DELETE ON `olms`.`course_exam` TO `professor`@`localhost`       |
| GRANT SELECT, INSERT, UPDATE, DELETE ON `olms`.`course` TO `professor`@`localhost`            |
| GRANT SELECT ON `olms`.`enrollment` TO `professor`@`localhost`                                |
| GRANT SELECT, INSERT, UPDATE ON `olms`.`exam_result` TO `professor`@`localhost`               |
| GRANT SELECT ON `olms`.`student` TO `professor`@`localhost`                                   |
+-----------------------------------------------------------------------------------------------+
8 rows in set (0.00 sec)
```

REVOKE INSERT ON olms.Forum_post
FROM 'student'@'localhost';

```
mysql> SHOW GRANTS FOR 'student'@'localhost';
+-----------------------------------------------------------------------------------+
| Grants for student@localhost                                                      |
+-----------------------------------------------------------------------------------+
| GRANT USAGE ON *.* TO `student`@`localhost`                                       |
| GRANT SELECT, INSERT ON `olms`.`assignment_submission` TO `student`@`localhost`   |
| GRANT SELECT ON `olms`.`assignment` TO `student`@`localhost`                      |
| GRANT SELECT ON `olms`.`course_exam` TO `student`@`localhost`                     |
| GRANT SELECT ON `olms`.`course` TO `student`@`localhost`                          |
| GRANT SELECT ON `olms`.`exam_result` TO `student`@`localhost`                     |
| GRANT SELECT ON `olms`.`forum_post` TO `student`@`localhost`                      |
+-----------------------------------------------------------------------------------+
7 rows in set (0.00 sec)
```

-- Revoke all privileges

REVOKE ALL PRIVILEGES ON olms.*
FROM 'student'@'localhost';

TCL Commands

Commit Command

-- START TRANSACTION with COMMIT

START TRANSACTION;

INSERT INTO Course (Course_name, Description, Emp_id)
VALUES ('Blockchain Technology', 'Introduction to cryptocurrency and blockchain', 1);

COMMIT;

```
mysql> START TRANSACTION;
Query OK, 0 rows affected (0.00 sec)

mysql> INSERT INTO Course (Course_name, Description, Emp_id)
    -> VALUES ('Blockchain Technology', 'Introduction to cryptocurrency and blockchain', 1);
Query OK, 1 row affected (0.00 sec)

mysql> SELECT * FROM Course
    -> ORDER BY Course_id DESC
    -> LIMIT 5;
+-----------+-----------------------+-----------------------------------------------+--------+
| Course_id | Course_name           | Description                                   | Emp_id |
+-----------+-----------------------+-----------------------------------------------+--------+
|        26 | Blockchain Technology | Introduction to cryptocurrency and blockchain |      1 |
|        20 | Operating Systems     | OS concepts and administration                |     10 |
|        19 | Mobile App Development| Android and iOS development                   |      9 |
|        18 | Cloud Architecture    | AWS and Azure fundamentals                    |      8 |
|        17 | Network Security      | Fundamentals of cybersecurity                 |      7 |
+-----------+-----------------------+-----------------------------------------------+--------+
5 rows in set (0.00 sec)
```

```
mysql> commit;
Query OK, 0 rows affected (0.02 sec)

mysql> SELECT * FROM Course
    -> ORDER BY Course_id DESC
    -> LIMIT 5;
+-----------+------------------------+-------------------------------------------------+--------+
| Course_id | Course_name            | Description                                     | Emp_id |
+-----------+------------------------+-------------------------------------------------+--------+
|        26 | Blockchain Technology  | Introduction to cryptocurrency and blockchain   |      1 |
|        20 | Operating Systems      | OS concepts and administration                  |     10 |
|        19 | Mobile App Development | Android and iOS development                     |      9 |
|        18 | Cloud Architecture     | AWS and Azure fundamentals                      |      8 |
|        17 | Network Security       | Fundamentals of cybersecurity                   |      7 |
+-----------+------------------------+-------------------------------------------------+--------+
5 rows in set (0.00 sec)
```

Rollback Command

START TRANSACTION;

```
-- Update a student's grade
UPDATE Assignment_submission SET Grade = 'B+'
WHERE Assignment_id = 5;

-- Check if we want to keep this change
-- If we don't like the change, we can rollback

ROLLBACK;
```

```
mysql> START TRANSACTION;
Query OK, 0 rows affected (0.00 sec)

mysql> UPDATE Assignment_submission SET Grade = 'B+' WHERE Assignment_id = 5;
Query OK, 1 row affected (0.01 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> select * from Assignment_submission;
+---------------+-----------------+-------+---------------+------------+
| Submission_id | Submission_date | Grade | Assignment_id | Uid        |
+---------------+-----------------+-------+---------------+------------+
|             1 | 2024-03-25      | A     |             1 | 23BCA10301 |
|             2 | 2024-03-26      | A     |             1 | 23BCA10302 |
|             3 | 2024-04-10      | A     |             2 | 23MCA10303 |
|             4 | 2024-04-12      | A     |             3 | 23MCA10304 |
|             5 | 2024-04-15      | A     |             4 | 23BIT10305 |
|             6 | 2024-04-18      | B+    |             5 | 23BCA10306 |
|             7 | 2024-04-20      | A     |             6 | 23MCA10307 |
|             8 | 2024-04-22      | A     |             7 | 23BIT10308 |
|             9 | 2024-04-25      | A     |             8 | 23BCA10309 |
|            10 | 2024-04-28      | A     |             9 | 23MCA10310 |
|            11 | 2024-05-01      | A     |            10 | 23MCA10307 |
|            12 | 2024-05-03      | A     |             1 | 23BIT10308 |
+---------------+-----------------+-------+---------------+------------+
12 rows in set (0.00 sec)

mysql> ROLLBACK;
Query OK, 0 rows affected (0.01 sec)
```

```
mysql> select * from Assignment_submission;
+---------------+-----------------+-------+---------------+------------+
| Submission_id | Submission_date | Grade | Assignment_id | Uid        |
+---------------+-----------------+-------+---------------+------------+
|             1 | 2024-03-25      | A     |             1 | 23BCA10301 |
|             2 | 2024-03-26      | A     |             1 | 23BCA10302 |
|             3 | 2024-04-10      | A     |             2 | 23MCA10303 |
|             4 | 2024-04-12      | A     |             3 | 23MCA10304 |
|             5 | 2024-04-15      | A     |             4 | 23BIT10305 |
|             6 | 2024-04-18      | A     |             5 | 23BCA10306 |
|             7 | 2024-04-20      | A     |             6 | 23MCA10307 |
|             8 | 2024-04-22      | A     |             7 | 23BIT10308 |
|             9 | 2024-04-25      | A     |             8 | 23BCA10309 |
|            10 | 2024-04-28      | A     |             9 | 23MCA10310 |
|            11 | 2024-05-01      | A     |            10 | 23MCA10307 |
|            12 | 2024-05-03      | A     |             1 | 23BIT10308 |
+---------------+-----------------+-------+---------------+------------+
12 rows in set (0.00 sec)
```

Savepoint Command

```
START TRANSACTION;

INSERT INTO Student (Uid, First_name, Last_name, Contact_no,
Graduation_year)
VALUES ('23BCA10313', 'Rohan', 'Mehta', '9898989813', 2026);

SAVEPOINT after_student_insert;

INSERT INTO Enrollment (Course_id, Uid)
VALUES (1, '23BCA10313'), (2, '23BCA10313');

SAVEPOINT after_enrollment;

INSERT INTO Forum_post (Post_content, Uid, Course_id)
VALUES ('Hello everyone! New to the course.', '23BCA10313', 1);

ROLLBACK TO after_student_insert;

COMMIT;
```

```
mysql> START TRANSACTION;
Query OK, 0 rows affected (0.00 sec)

mysql> INSERT INTO Student (Uid, First_name, Last_name, Contact_no, Graduation_year)
    -> VALUES ('23BCA10313', 'Rohan', 'Mehta', '9898989813', 2026);
Query OK, 1 row affected (0.01 sec)

mysql> SAVEPOINT after_student_insert;
Query OK, 0 rows affected (0.00 sec)

mysql> INSERT INTO Enrollment (Course_id, Uid) VALUES (1, '23BCA10313'), (2, '23BCA10313');
Query OK, 2 rows affected (0.00 sec)
Records: 2  Duplicates: 0  Warnings: 0

mysql>
mysql> SAVEPOINT after_enrollment;
Query OK, 0 rows affected (0.00 sec)

mysql> INSERT INTO Forum_post (Post_content, Uid, Course_id)
    -> VALUES ('Hello everyone! New to the course.', '23BCA10313', 1);
Query OK, 1 row affected (0.00 sec)
```

```
mysql> select * from Student;
+--------------+------------+-----------+------------+-----------------+
| Uid          | First_name | Last_name | Contact_no | Graduation_year |
+--------------+------------+-----------+------------+-----------------+
| 23 ART 10313 | Rohan      | Nair      | 7432109876 |            NULL |
| 23 BCA 10301 | Rahul      | Sharma    | 8765432109 |            NULL |
| 23 BCA 10306 | Ananya     | Gupta     | 8210987654 |            NULL |
| 23 BIO 10311 | Aditya     | Verma     | 7654321098 |            NULL |
| 23 BIO 10316 | Kavita     | Tiwari    | 7109876543 |            NULL |
| 23 CHM 10304 | Neha       | Singh     | 8432109876 |            NULL |
| 23 ECO 10309 | Karan      | Kapoor    | 7876543210 |            NULL |
| 23 ECO 10314 | Anjali     | Menon     | 7321098765 |            NULL |
| 23 ENG 10305 | Vikram     | Malhotra  | 8321098765 |            NULL |
| 23 HIS 10312 | Pooja      | Choudhary | 7543210987 |            NULL |
| 23 MEC 10310 | Meera      | Desai     | 7765432109 |            NULL |
| 23 MEC 10315 | Siddharth  | Bose      | 7210987654 |            NULL |
| 23 MTH 10302 | Priya      | Patel     | 8654321098 |            NULL |
| 23 MTH 10307 | Raj        | Kumar     | 8109876543 |            NULL |
| 23 PHY 10303 | Arjun      | Reddy     | 8543210987 |            NULL |
| 23 PHY 10308 | Divya      | Joshi     | 8987654321 |            NULL |
| 23BCA10301   | Aarav      | Sharma    | 9898989801 |            2026 |
| 23BCA10302   | Diya       | Patel     | 9898989802 |            2026 |
| 23BCA10306   | Ishaan     | Malhotra  | 9898989806 |            2026 |
| 23BCA10309   | Riya       | Gupta     | 9898989809 |            2026 |
| 23BCA10312   | Vivaan     | Choudhury | 9898989812 |            2026 |
| 23BCA10313   | Rohan      | Mehta     | 9898989813 |            2026 |
| 23BIT10305   | Advait     | Verma     | 9898989805 |            2026 |
| 23BIT10308   | Vihaan     | Reddy     | 9898989808 |            2026 |
| 23BIT10311   | Aisha      | Joshi     | 9898989811 |            2026 |
| 23MCA10303   | Arjun      | Kumar     | 9898989803 |            2025 |
| 23MCA10304   | Ananya     | Singh     | 9898989804 |            2025 |
| 23MCA10307   | Zara       | Kapoor    | 9898989807 |            2025 |
| 23MCA10310   | Kabir      | Mehra     | 9898989810 |            2025 |
+--------------+------------+-----------+------------+-----------------+
29 rows in set (0.00 sec)
```

```
mysql> select * from Enrollment ORDER BY Enrollment_id DESC LIMIT 5;
+---------------+-----------------+-----------+------------+
| Enrollment_id | Enrollment_date | Course_id | Uid        |
+---------------+-----------------+-----------+------------+
|            44 | 2025-04-04      |         2 | 23BCA10313 |
|            43 | 2025-04-04      |         1 | 23BCA10313 |
|            42 | 2025-04-03      |         3 | 23MCA10310 |
|            41 | 2025-04-03      |         9 | 23MCA10310 |
|            40 | 2025-04-03      |         2 | 23BCA10309 |
+---------------+-----------------+-----------+------------+
5 rows in set (0.00 sec)

mysql> select * from Forum_post;
+---------+-----------------------------------+---------------------+------------+-----------+
| Post_id | Post_content                      | Post_date           | Uid        | Course_id |
+---------+-----------------------------------+---------------------+------------+-----------+
|       2 | Sharing my SQL assignment approach | 2025-04-03 03:12:29 | 23BCA10302 |         2 |
|       3 | HTML vs CSS discussion            | 2025-04-03 03:12:29 | 23MCA10303 |         3 |
|       4 | Binary Tree implementation doubt  | 2025-04-03 03:12:29 | 23MCA10304 |         4 |
|       5 | AI project group formation        | 2025-04-03 03:12:29 | 23BIT10305 |         5 |
|       6 | Java inheritance example needed   | 2025-04-03 03:12:29 | 23BCA10306 |         6 |
|       7 | Cybersecurity best practices      | 2025-04-03 03:12:29 | 23MCA10307 |         7 |
|       8 | AWS deployment issues             | 2025-04-03 03:12:29 | 23BIT10308 |         8 |
|       9 | Android Studio setup problem      | 2025-04-03 03:12:29 | 23BCA10309 |         9 |
|      10 | Linux commands cheat sheet        | 2025-04-03 03:12:29 | 23MCA10310 |        10 |
|      11 | Database normalization doubt      | 2025-04-03 03:12:29 | 23BIT10311 |         2 |
|      12 | Web hosting recommendations?      | 2025-04-03 03:12:29 | 23BCA10312 |         3 |
|      13 | Hello everyone! New to the course. | 2025-04-04 00:43:38 | 23BCA10313 |         1 |
+---------+-----------------------------------+---------------------+------------+-----------+
12 rows in set (0.00 sec)

mysql> ROLLBACK TO after_student_insert;
Query OK, 0 rows affected (0.00 sec)
```

```
mysql> select * from Enrollment ORDER BY Enrollment_id DESC LIMIT 5;
+---------------+-----------------+-----------+------------+
| Enrollment_id | Enrollment_date | Course_id | Uid        |
+---------------+-----------------+-----------+------------+
|            42 | 2025-04-03      |         3 | 23MCA10310 |
|            41 | 2025-04-03      |         9 | 23MCA10310 |
|            40 | 2025-04-03      |         2 | 23BCA10309 |
|            39 | 2025-04-03      |         8 | 23BCA10309 |
|            38 | 2025-04-03      |         1 | 23BIT10308 |
+---------------+-----------------+-----------+------------+
5 rows in set (0.00 sec)

mysql> select * from Forum_post;
+---------+-----------------------------------+---------------------+------------+-----------+
| Post_id | Post_content                      | Post_date           | Uid        | Course_id |
+---------+-----------------------------------+---------------------+------------+-----------+
|       2 | Sharing my SQL assignment approach | 2025-04-03 03:12:29 | 23BCA10302 |         2 |
|       3 | HTML vs CSS discussion            | 2025-04-03 03:12:29 | 23MCA10303 |         3 |
|       4 | Binary Tree implementation doubt  | 2025-04-03 03:12:29 | 23MCA10304 |         4 |
|       5 | AI project group formation        | 2025-04-03 03:12:29 | 23BIT10305 |         5 |
|       6 | Java inheritance example needed   | 2025-04-03 03:12:29 | 23BCA10306 |         6 |
|       7 | Cybersecurity best practices      | 2025-04-03 03:12:29 | 23MCA10307 |         7 |
|       8 | AWS deployment issues             | 2025-04-03 03:12:29 | 23BIT10308 |         8 |
|       9 | Android Studio setup problem      | 2025-04-03 03:12:29 | 23BCA10309 |         9 |
|      10 | Linux commands cheat sheet        | 2025-04-03 03:12:29 | 23MCA10310 |        10 |
|      11 | Database normalization doubt      | 2025-04-03 03:12:29 | 23BIT10311 |         2 |
|      12 | Web hosting recommendations?      | 2025-04-03 03:12:29 | 23BCA10312 |         3 |
+---------+-----------------------------------+---------------------+------------+-----------+
11 rows in set (0.00 sec)
```

Aggregate Function

-- COUNT: Count the total number of students enrolled in each course

```
SELECT c.Course_name, COUNT(e.Uid) as Total_Students
FROM Course c
LEFT JOIN Enrollment e ON c.Course_id = e.Course_id
GROUP BY c.Course_name;
```

```
mysql> SELECT c.Course_name, COUNT(e.Uid) as Total_Students
    -> FROM Course c
    -> LEFT JOIN Enrollment e ON c.Course_id = e.Course_id
    -> GROUP BY c.Course_name;
+----------------------------+----------------+
| Course_name                | Total_Students |
+----------------------------+----------------+
| Ancient Indian Civilization |              4 |
| Artificial Intelligence    |              0 |
| Blockchain Technology      |              0 |
| Calculus I                 |              5 |
| Cloud Architecture         |              0 |
| Contemporary Art           |              3 |
| Data Structures            |              0 |
| Database Management        |              0 |
| Introduction to Programming |              6 |
| Java Programming           |              0 |
| Microeconomics             |              4 |
| Mobile App Development     |              0 |
| Modern Indian Literature   |              3 |
| Molecular Biology          |              4 |
| Network Security           |              0 |
| Operating Systems          |              0 |
| Organic Chemistry          |              4 |
| Python Programming         |              0 |
| Quantum Physics            |              5 |
| Thermodynamics             |              4 |
| Web Development            |              0 |
+----------------------------+----------------+
21 rows in set (0.01 sec)
```

-- SUM: Calculate total marks obtained by each student across all exams

```
SELECT s.First_name, s.Last_name, SUM(er.Marks_obtained) as Total_Marks
FROM Student s
JOIN Exam_result er ON s.Uid = er.Uid
GROUP BY s.Uid, s.First_name, s.Last_name;
```

```
mysql> SELECT s.First_name, s.Last_name, SUM(er.Marks_obtained) as Total_Marks
    -> FROM Student s
    -> JOIN Exam_result er ON s.Uid = er.Uid
    -> GROUP BY s.Uid, s.First_name, s.Last_name;
+------------+-----------+-------------+
| First_name | Last_name | Total_Marks |
+------------+-----------+-------------+
| Aarav      | Sharma    |        85.5 |
| Diya       | Patel     |          92 |
| Arjun      | Kumar     |        88.5 |
| Ananya     | Singh     |          95 |
| Advait     | Verma     |        87.5 |
| Ishaan     | Malhotra  |          91 |
| Zara       | Kapoor    |        89.5 |
| Vihaan     | Reddy     |        93.5 |
| Riya       | Gupta     |          86 |
| Kabir      | Mehra     |        90.5 |
| Aisha      | Joshi     |          88 |
| Vivaan     | Choudhury |        94.5 |
+------------+-----------+-------------+
12 rows in set (0.01 sec)
```

-- AVG: Calculate average marks for each course

```
SELECT c.Course_name, AVG(er.Marks_obtained) as Average_Marks
FROM Course c
JOIN Exam_result er ON c.Course_id = er.Course_id
GROUP BY c.Course_name;
```

```
mysql> SELECT c.Course_name, AVG(er.Marks_obtained) as Average_Marks
    -> FROM Course c
    -> JOIN Exam_result er ON c.Course_id = er.Course_id
    -> GROUP BY c.Course_name;
+----------------------------+-------------------+
| Course_name                | Average_Marks     |
+----------------------------+-------------------+
| Introduction to Programming | 90.66666666666667 |
| Calculus I                 |              88.5 |
| Quantum Physics            |                95 |
| Organic Chemistry          |              87.5 |
| Modern Indian Literature   |                91 |
| Microeconomics             |              89.5 |
| Thermodynamics             |              93.5 |
| Molecular Biology          |                86 |
| Ancient Indian Civilization |              90.5 |
| Contemporary Art           |                88 |
+----------------------------+-------------------+
10 rows in set (0.00 sec)
```

-- MAX: Find the highest marks obtained in each course

```
SELECT c.Course_name, MAX(er.Marks_obtained) as Highest_Marks
FROM Course c
JOIN Exam_result er ON c.Course_id = er.Course_id
GROUP BY c.Course_name;
```

```
mysql> -- MAX: Find the highest marks obtained in each course
mysql> SELECT c.Course_name, MAX(er.Marks_obtained) as Highest_Marks
    -> FROM Course c
    -> JOIN Exam_result er ON c.Course_id = er.Course_id
    -> GROUP BY c.Course_name;
+----------------------------+---------------+
| Course_name                | Highest_Marks |
+----------------------------+---------------+
| Introduction to Programming |          94.5 |
| Calculus I                 |          88.5 |
| Quantum Physics            |            95 |
| Organic Chemistry          |          87.5 |
| Modern Indian Literature   |            91 |
| Microeconomics             |          89.5 |
| Thermodynamics             |          93.5 |
| Molecular Biology          |            86 |
| Ancient Indian Civilization |          90.5 |
| Contemporary Art           |            88 |
+----------------------------+---------------+
10 rows in set (0.00 sec)
```

-- MIN: Find the lowest marks obtained in each course

```
SELECT c.Course_name, MIN(er.Marks_obtained) as Lowest_Marks
FROM Course c
JOIN Exam_result er ON c.Course_id = er.Course_id
GROUP BY c.Course_name;
```

```
mysql> -- MIN: Find the lowest marks obtained in each course
mysql> SELECT c.Course_name, MIN(er.Marks_obtained) as Lowest_Marks
    -> FROM Course c
    -> JOIN Exam_result er ON c.Course_id = er.Course_id
    -> GROUP BY c.Course_name;
+----------------------------+--------------+
| Course_name                | Lowest_Marks |
+----------------------------+--------------+
| Introduction to Programming |         85.5 |
| Calculus I                 |         88.5 |
| Quantum Physics            |           95 |
| Organic Chemistry          |         87.5 |
| Modern Indian Literature   |           91 |
| Microeconomics             |         89.5 |
| Thermodynamics             |         93.5 |
| Molecular Biology          |           86 |
| Ancient Indian Civilization |         90.5 |
| Contemporary Art           |           88 |
+----------------------------+--------------+
10 rows in set (0.00 sec)
```

-- GROUP_CONCAT: List all students enrolled in each course

SELECT c.Course_name,

```
GROUP_CONCAT(CONCAT(s.First_name, ' ', s.Last_name) SEPARATOR ', ') as
Enrolled_Students
FROM Course c
JOIN Enrollment e ON c.Course_id = e.Course_id
JOIN Student s ON e.Uid = s.Uid
GROUP BY c.Course_name;
```

```
mysql> -- GROUP_CONCAT: List all students enrolled in each course
mysql> SELECT c.Course_name,
    -> GROUP_CONCAT(CONCAT(s.First_name, ' ', s.Last_name) SEPARATOR ', ') as Enrolled_Students
    -> FROM Course c
    -> JOIN Enrollment e ON c.Course_id = e.Course_id
    -> JOIN Student s ON e.Uid = s.Uid
    -> GROUP BY c.Course_name;
+-----------------------------+-------------------------------------------------------------------------------+
| Course_name                 | Enrolled_Students                                                             |
+-----------------------------+-------------------------------------------------------------------------------+
| Ancient Indian Civilization | Ishaan Malhotra, Rahul Sharma, Pooja Choudhary, Kabir Mehra                    |
| Calculus I                  | Arjun Kumar, Rahul Sharma, Raj Kumar, Aarav Sharma, Riya Gupta                 |
| Contemporary Art            | Priya Patel, Zara Kapoor, Rohan Nair                                          |
| Introduction to Programming | Ananya Gupta, Priya Patel, Aarav Sharma, Diya Patel, Vihaan Reddy, Rahul Sharma |
| Microeconomics              | Karan Kapoor, Anjali Menon, Arjun Kumar, Zara Kapoor                           |
| Modern Indian Literature    | Arjun Kumar, Vikram Malhotra, Ishaan Malhotra                                 |
| Molecular Biology           | Kavita Tiwari, Riya Gupta, Advait Verma, Aditya Verma                         |
| Organic Chemistry           | Neha Singh, Advait Verma, Diya Patel, Priya Patel                             |
| Quantum Physics             | Arjun Reddy, Divya Joshi, Aarav Sharma, Ananya Singh, Kabir Mehra              |
| Thermodynamics              | Meera Desai, Siddharth Bose, Vihaan Reddy, Ananya Singh                       |
+-----------------------------+-------------------------------------------------------------------------------+
10 rows in set (0.02 sec)
```

Views in MySQL

```
-- This view joins Course and Instructor tables to show course details with instructor information

CREATE VIEW course_details AS
SELECT
    c.Course_id,
    c.Course_name,
    c.Description,
    i.Department AS Instructor_Department,
    i.Contact_no AS Instructor_Contact
FROM Course c
JOIN Instructor i ON c.Emp_id = i.id;

-- Shows total number of students in each course

CREATE VIEW course_statistics AS
SELECT
    c.Course_name,
    COUNT(e.Uid) AS Total_Students
FROM Course c
LEFT JOIN Enrollment e ON c.Course_id = e.Course_id
GROUP BY c.Course_name;
```

-- Query to show all create view

```
SHOW FULL TABLES
IN olms
WHERE TABLE_TYPE LIKE 'VIEW';
```

```
mysql> SHOW FULL TABLES IN olms WHERE TABLE_TYPE LIKE 'VIEW';
+------------------+------------+
| Tables_in_olms   | Table_type |
+------------------+------------+
| course_details   | VIEW       |
| course_statistics | VIEW      |
+------------------+------------+
2 rows in set (0.00 sec)
```

-- Query the course_statistics view

```
SELECT * FROM course_statistics;
```

```
mysql> SELECT * FROM course_statistics;
+----------------------------+----------------+
| Course_name                | Total_Students |
+----------------------------+----------------+
| Ancient Indian Civilization |              4 |
| Artificial Intelligence    |              0 |
| Blockchain Technology      |              0 |
| Calculus I                 |              5 |
| Cloud Architecture         |              0 |
| Contemporary Art           |              3 |
| Data Structures            |              0 |
| Database Management        |              0 |
| Introduction to Programming |             6 |
| Java Programming           |              0 |
| Microeconomics             |              4 |
| Mobile App Development     |              0 |
| Modern Indian Literature   |              3 |
| Molecular Biology          |              4 |
| Network Security           |              0 |
| Operating Systems          |              0 |
| Organic Chemistry          |              4 |
| Python Programming         |              0 |
| Quantum Physics            |              5 |
| Thermodynamics             |              4 |
| Web Development            |              0 |
+----------------------------+----------------+
```

-- Query the course_details view

SELECT * FROM course_details;

```
mysql> SELECT * FROM course_details;
+-----------+-----------------------------+-------------------------------------------------------------+-----------------------+--------------------+
| Course_id | Course_name                 | Description                                                 | Instructor_Department | Instructor_Contact |
+-----------+-----------------------------+-------------------------------------------------------------+-----------------------+--------------------+
|         1 | Introduction to Programming | Basic programming concepts using Python                     | Computer Science      | 9876543210         |
|         2 | Calculus I                  | Fundamental concepts of differential and integral calculus  | Mathematics           | 9765432109         |
|         3 | Quantum Physics             | Introduction to quantum mechanics and its applications      | Physics               | 9654321098         |
|         4 | Organic Chemistry           | Study of carbon compounds and reactions                     | Chemistry             | 9543210987         |
|         5 | Modern Indian Literature    | Exploration of contemporary Indian literary works           | English Literature    | 9432109876         |
|         6 | Microeconomics              | Study of market behavior of individuals and firms           | Economics             | 9321098765         |
|         7 | Thermodynamics              | Principles of energy transfer and work                      | Mechanical Engineering| 9210987654         |
|         8 | Molecular Biology           | Study of cellular processes and DNA                         | Biotechnology         | 9109876543         |
|         9 | Ancient Indian Civilization | Exploring the Indus Valley and Vedic periods                | History               | 9098765432         |
|        10 | Contemporary Art            | Modern and post-modern art movements in India               | Fine Arts             | 9987654321         |
|        11 | Python Programming          | Introduction to Python programming language                 | Computer Science      | 9876543210         |
|        12 | Database Management         | Fundamentals of DBMS and SQL                                | Mathematics           | 9765432109         |
|        13 | Web Development             | HTML, CSS, and JavaScript basics                            | Physics               | 9654321098         |
|        14 | Data Structures             | Advanced data structures and algorithms                     | Chemistry             | 9543210987         |
|        15 | Artificial Intelligence     | Basics of AI and Machine Learning                           | English Literature    | 9432109876         |
|        16 | Java Programming            | Core Java and OOP concepts                                  | Economics             | 9321098765         |
|        17 | Network Security            | Fundamentals of cybersecurity                               | Mechanical Engineering| 9210987654         |
|        18 | Cloud Architecture          | AWS and Azure fundamentals                                  | Biotechnology         | 9109876543         |
|        19 | Mobile App Development      | Android and iOS development                                 | History               | 9098765432         |
|        20 | Operating Systems           | OS concepts and administration                              | Fine Arts             | 9987654321         |
|        26 | Blockchain Technology       | Introduction to cryptocurrency and blockchain               | Computer Science      | 9876543210         |
+-----------+-----------------------------+-------------------------------------------------------------+-----------------------+--------------------+
21 rows in set (0.00 sec)
```

-- Drop View

SELECT * FROM course_details;

```
mysql> DROP VIEW IF EXISTS course_details;
Query OK, 0 rows affected (0.01 sec)

mysql> SHOW FULL TABLES IN olms WHERE TABLE_TYPE LIKE 'VIEW';
+--------------------+------------+
| Tables_in_olms     | Table_type |
+--------------------+------------+
| course_statistics  | VIEW       |
+--------------------+------------+
1 row in set (0.00 sec)
```

Conclusion

The OLMS database project shows how to build an online system for managing education. It includes important database ideas while keeping it easy to scalability, security, and performance. This project helps understand database management and can be used in online education systems.

Good database design, security, and powerful search features make this project useful for learning and school management. Its simple structure makes it easy to update and improve in the future, making it a long-term solution for schools.

Learning Outcomes

1. Database Design

   - ✓ Understanding of entity-relationship modeling
   - ✓ Normalization principles
   - ✓ Schema design best practices

2. SQL Proficiency

   - ✓ DDL, DCL, and TCL command mastery
   - ✓ Complex query writing
   - ✓ Data manipulation and retrieval
   - ✓ Aggregate function implementation

Conclusion

3. Security Awareness

- ✓ User management
- ✓ Access control
- ✓ Privilege management
- ✓ Data protection