

Experiment -7

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Subject: Project Based Learning
in Java with Lab

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7.1.1.Aim: Create a Java program to connect to a MySQL database and fetch data from a single table. The program should: Use DriverManager and Connection objects. Retrieve and display all records from a table named Employee with columns EmpID, Name, and Salary..

7.1.2 Objective: To develop a Java program that connects to a MySQL database, retrieves data from the Employee table, and displays all records, demonstrating basic JDBC connectivity and data retrieval operations.

7.1.3 Code: import
java.sql.*;

```
public class FetchEmployeeData { public
    static void main(String[] args) {
        String url = "jdbc:mysql://localhost:3306/testdb";
        String user = "root";
        String password = "password";

        String query = "SELECT EmpID, Name, Salary FROM Employee";

        try {
            // Load MySQL JDBC driver
            Class.forName("com.mysql.cj.jdbc.Driver");

            // Establish connection
            Connection con = DriverManager.getConnection(url, user, password);
            System.out.println("Connected to the database!");

            // Create statement and execute query
            Statement stmt = con.createStatement();
            ResultSet rs = stmt.executeQuery(query);
```

```
// Display results
System.out.println("\nEmployee Records:");
System.out.println("-----");
System.out.printf("%-10s    %-20s    %-10s\n", "EmpID", "Name", "Salary");
System.out.println("-----");

while (rs.next()) { int empID =
    rs.getInt("EmpID"); String name =
    rs.getString("Name"); double salary =
    rs.getDouble("Salary");

    System.out.printf("%-10d %-20s %-10.2f\n", empID, name, salary);
}

// Close resources
rs.close();
stmt.close();
con.close();
System.out.println("\nConnection closed.");

} catch (ClassNotFoundException e) {
    System.out.println("MySQL Driver not found: " + e.getMessage());
} catch (SQLException e) {
    System.out.println("SQL Error: " + e.getMessage()); }
}
}
```

7.1.4 Output:

```
(base) PS C:\Users\virat\OneDrive\Desktop\java exp7> java -cp ".;lib/mysql-connector-j-9.2.0.jar" FetchEmployeeD
ata
>>
Connected to the database!

Employee Records:
-----
EmpID    Name                Salary
-----
1        Alice               50000.00
2        Bob                 60000.00
3        Charlie             55000.00

Connection closed.
(base) PS C:\Users\virat\OneDrive\Desktop\java exp7>
```

7.2.1 Aim: Build a program to perform CRUD operations (Create, Read, Update, Delete) on a database table Product with columns: ProductID, ProductName, Price, and Quantity. The program should include: Menu-driven options for each operation. Transaction handling to ensure data integrity.

7.2.2 Objective: To develop a Java program that connects to a MySQL database and performs CRUD operations (Create, Read, Update, Delete) on the Product table. The program ensures data integrity by using transaction handling and provides a menu-driven interface for user-friendly interaction.

7.2.3 Code:

```
import java.sql.*; import  
java.util.Scanner;
```

```
public class ProductCRUD {
```

```
    private static final String URL = "jdbc:mysql://localhost:3306/ProductDB"; private  
    static final String USER = "root";  
    private static final String PASSWORD = "password";
```

```
    public static void main(String[] args) { Scanner  
        scanner = new Scanner(System.in);
```

```
        try (Connection conn = DriverManager.getConnection(URL, USER, PASSWORD)) {  
            Class.forName("com.mysql.cj.jdbc.Driver");
```

```
            System.out.println("Connected to the database!");
```

```
            boolean exit = false;
```

```
            while (!exit) {
```

```
                System.out.println("\n=== Product CRUD Operations ===");
```

```
                System.out.println("1. Create Product");
```

```
                System.out.println("2. Read Products");
```

```
                System.out.println("3. Update Product");
```

```
                System.out.println("4. Delete Product");
```

```
                System.out.println("5. Exit");
```

```
                System.out.print("Choose an option: "); int
```

```
                choice          =          scanner.nextInt();
```

```
scanner.nextLine(); switch (choice) { case
1 -> createProduct(conn, scanner); case 2 -
> readProducts(conn); case 3 ->
updateProduct(conn, scanner); case 4 ->
deleteProduct(conn, scanner);

case 5 -> exit = true;
default -> System.out.println("Invalid option. Try again.");
}
}

} catch (ClassNotFoundException e) {
System.out.println("MySQL Driver not found: " + e.getMessage());
} catch (SQLException e) {
System.out.println("SQL Error: " + e.getMessage()); }

scanner.close();
}

private static void createProduct(Connection conn, Scanner scanner) throws SQLException {
System.out.print("Enter product name: ");
String name = scanner.nextLine();
System.out.print("Enter price: ");
double price = scanner.nextDouble();
System.out.print("Enter quantity: ");
int quantity = scanner.nextInt();

String query = "INSERT INTO Product (ProductName, Price, Quantity) VALUES (?, ?,
?);";

try (PreparedStatement pstmt = conn.prepareStatement(query)) {
conn.setAutoCommit(false);

pstmt.setString(1, name);
pstmt.setDouble(2,
```

```
        price);        pstmt.setInt(3,
        quantity);

        int rows = pstmt.executeUpdate(); conn.commit();

        System.out.println(rows + " product(s) inserted successfully!");
    } catch (SQLException e) { conn.rollback();
        System.out.println("Transaction rolled back due to error: " + e.getMessage());
    } finally {
        conn.setAutoCommit(true); }
}

private static void readProducts(Connection conn) throws SQLException { String
    query = "SELECT * FROM Product";

    try (Statement stmt = conn.createStatement();
        ResultSet rs = stmt.executeQuery(query)) {

        System.out.println("\nProduct Records:");
        System.out.println(" ----- ");
        System.out.printf("%-10s %-20s %-10s %-10s%n", "ProductID", "ProductName",
"Price", "Quantity");
        System.out.println(" ----- ");

        while (rs.next()) { int id =
            rs.getInt("ProductID");
            String name = rs.getString("ProductName");
            double price = rs.getDouble("Price"); int
            quantity = rs.getInt("Quantity");

            System.out.printf("%-10d %-20s %-10.2f %-10d%n", id, name, price, quantity);
        }
    }
}

private static void updateProduct(Connection conn, Scanner scanner) throws SQLException
{
```

```
System.out.print("Enter product ID to update: "); int  
id = scanner.nextInt();  
scanner.nextLine();
```

```
System.out.print("Enter new name: ");  
String name = scanner.nextLine();  
System.out.print("Enter new price: ");  
double price = scanner.nextDouble();  
System.out.print("Enter new quantity: ");  
int quantity = scanner.nextInt();
```

```
String query = "UPDATE Product SET ProductName = ?, Price = ?, Quantity = ? WHERE  
ProductID = ?";
```

```
try    (PreparedStatement pstmt = conn.prepareStatement(query))    {  
    conn.setAutoCommit(false);  
  
    pstmt.setString(1, name);  
    pstmt.setDouble(2,  
price);    pstmt.setInt(3,  
quantity); pstmt.setInt(4,  
id);  
  
    int rows = pstmt.executeUpdate(); conn.commit();  
  
    System.out.println(rows + " product(s) updated successfully!");  
  
    } catch (SQLException e) { conn.rollback();  
        System.out.println("Transaction rolled back due to error: " + e.getMessage());  
    } finally {  
        conn.setAutoCommit(true); }  
}
```

```
private static void deleteProduct(Connection conn, Scanner scanner) throws SQLException {  
    System.out.print("Enter product ID to delete: "); int  
    id = scanner.nextInt();
```

```
String query = "DELETE FROM Product WHERE ProductID = ?";
```

```

try      (PreparedStatement pstmt = conn.prepareStatement(query)) {
    conn.setAutoCommit(false);

    pstmt.setInt(1, id);
    int rows = pstmt.executeUpdate(); conn.commit();

    System.out.println(rows + " product(s) deleted successfully!");
} catch (SQLException e) { conn.rollback();
    System.out.println("Transaction rolled back due to error: " + e.getMessage());
} finally { conn.setAutoCommit(true);
}
}
}

```

7.2.4 Output:

```

(base) PS C:\Users\virat\OneDrive\Desktop\java exp7> java -cp ".;lib/mysql-connector-j-9.2.0.jar"
" ProductCRUD
>>
Connected to the database!

=== Product CRUD Operations ===
1. Create Product
2. Read Products
3. Update Product
4. Delete Product
5. Exit
Choose an option: 2

Product Records:
-----
ProductID  ProductName      Price      Quantity
-----
1          Laptop          75000.00   10
2          Mobile Phone    30000.00   25
3          Tablet          20000.00   15
4          Headphones      5000.00    50
5          Smartwatch      12000.00   30
6          Camera          45000.00   12

```

7.3.1 Aim: Develop a Java application using JDBC and MVC architecture to manage student data. The application should: Use a Student class as the model with fields like StudentID, Name, Department, and Marks. Include a database table to store student data. Allow the user

to perform CRUD operations through a simple menu-driven view. Implement database operations in a separate controller class.

7.3.2 Objective: The objective of this program is to develop a menu-driven Java application that allows users to add employee details, display all stored employees, and exit the program. Employee details, including ID, name, designation, and salary, are stored persistently in a file using serialization.

7.3.3 Code:

StudentController.java

package controller;

```
import    model.Student;
import java.sql.*; import
java.util.ArrayList;
import java.util.List;
```

```
public class StudentController {
```

```
    private static final String URL = "jdbc:mysql://localhost:3306/StudentDB"; private
    static final String USER = "root";
    private static final String PASSWORD = "rishuraman1@V";
```

```
// Method to create a new student
```

```
public void createStudent(Student student) throws SQLException {
```

```
    String query = "INSERT INTO Student (Name, Department, Marks) VALUES (?, ?, ?)";
```

```
    try (Connection conn = DriverManager.getConnection(URL, USER, PASSWORD);
```

```
        PreparedStatement pstmt = conn.prepareStatement(query)) {
```

```
        pstmt.setString(1,      student.getName());
```

```
        pstmt.setString(2,
```

```
            student.getDepartment());
```

```
        pstmt.setDouble(3, student.getMarks());
```

```
        pstmt.executeUpdate();
```

```
        System.out.println("Student added successfully!");
```

```
    }
```

```
}
```

```
// Method to retrieve all students
```



```
public List<Student> getAllStudents() throws SQLException {
    List<Student> students = new ArrayList<>();
    String query = "SELECT * FROM Student";

    try (Connection conn = DriverManager.getConnection(URL, USER, PASSWORD);
        Statement stmt = conn.createStatement();
        ResultSet rs = stmt.executeQuery(query)) {

        while (rs.next()) {
            students.add(new Student(
                rs.getInt("StudentID"),
                rs.getString("Name"),
                rs.getString("Department"),
                rs.getDouble("Marks")
            ));
        }
    }
    return students;
}

// Method to update student data
public void updateStudent(Student student) throws SQLException {
    String query = "UPDATE Student SET Name = ?, Department = ?, Marks = ? WHERE StudentID = ?";

    try (Connection conn = DriverManager.getConnection(URL, USER, PASSWORD);
        PreparedStatement pstmt = conn.prepareStatement(query)) {

        pstmt.setString(1, student.getName());
        pstmt.setString(2, student.getDepartment());
        pstmt.setDouble(3, student.getMarks());
        pstmt.setInt(4, student.getStudentID());

        int rows = pstmt.executeUpdate();
        if (rows > 0) {
            System.out.println("Student updated successfully!");
        } else {
            System.out.println("Student not found.");
        }
    }
}
```

```
}  
// Method to delete a student  
public void deleteStudent(int studentID) throws SQLException {  
    String query = "DELETE FROM Student WHERE StudentID = ?";  
  
    try (Connection conn = DriverManager.getConnection(URL, USER, PASSWORD);  
        PreparedStatement pstmt = conn.prepareStatement(query)) {  
  
        pstmt.setInt(1, studentID); int  
        rows = pstmt.executeUpdate(); if  
        (rows > 0) {  
            System.out.println("Student deleted successfully!");  
        } else {  
            System.out.println("Student not found."); }  
    }  
}  
}
```

Student.java

```
package model;
```

```
public class Student {  
    private int studentID;  
    private String name;  
    private String department;  
    private double marks;  
  
    public Student(int studentID, String name, String department, double marks) {  
        this.studentID = studentID; this.name = name; this.department = department;  
        this.marks = marks;  
    }  
  
    // Getters and Setters  
    public int getStudentID() {  
        return studentID;  
    }  
}
```

```
public void setStudentID(int studentID) { this.studentID
    = studentID;
}

public String getName() {
    return name;
}

public void setName(String name) {
    this.name = name;
}

public String getDepartment() {
    return department;
}

public void setDepartment(String department) {
    this.department = department;
}

public double getMarks() {
    return marks;
}

public void setMarks(double marks) {
    this.marks = marks;
}

@Override
public String toString() {
    return String.format("ID: %d, Name: %s, Dept: %s, Marks: %.2f",
        studentID, name, department, marks);
}
```

StudentView.java

```
package view;
```

```
import controller.StudentController; import
model.Student;

import java.util.List;
import java.util.Scanner; public

class StudentView {

    private static final Scanner scanner = new Scanner(System.in);
    private static final StudentController controller = new StudentController();

    public void displayMenu() { boolean
        exit = false;

        while (!exit) {
            System.out.println("\n=== Student Management System ===");
            System.out.println("1. Add Student");
            System.out.println("2. View All Students");
            System.out.println("3. Update Student");
            System.out.println("4. Delete Student");
            System.out.println("5. Exit");
            System.out.print("Choose an option: ");

            int choice = scanner.nextInt(); scanner.nextLine();
            // Consume newline

            try { switch (choice) { case 1 -
                > addStudent(); case 2 ->
                viewStudents(); case 3 ->
                updateStudent(); case 4 ->
                deleteStudent(); case 5 ->
                exit = true;
                default -> System.out.println("Invalid option. Try again."); }
            } catch (Exception e) {
                System.out.println("Error: " +
                e.getMessage()); } }
            scanner.close();
        }
    private void addStudent() throws Exception {
        System.out.print("Enter name: ");
```

```
String name = scanner.nextLine();
System.out.print("Enter department: ");
String department = scanner.nextLine();
System.out.print("Enter marks: "); double
marks = scanner.nextDouble();

Student student = new Student(0, name, department, marks);
controller.createStudent(student);
}
private void viewStudents() throws Exception {
    List<Student> students = controller.getAllStudents();
    System.out.println("\nStudents List:");
    for (Student student : students) {
        System.out.println(student);
    }
}
private void updateStudent() throws Exception {
    System.out.print("Enter student ID to update: ");
    int id = scanner.nextInt(); scanner.nextLine();

    System.out.print("Enter new name: ");
    String name = scanner.nextLine();
    System.out.print("Enter new department: ");
    String department = scanner.nextLine(); System.out.print("Enter
new marks: ");
    double marks = scanner.nextDouble();

    Student student = new Student(id, name, department, marks);
    controller.updateStudent(student);
}

private void deleteStudent() throws Exception {
    System.out.print("Enter student ID to delete: ");
    int id = scanner.nextInt();
    controller.deleteStudent(id);
}
}
MainApp.java    import
view.StudentView;
```

```
public class MainApp {  
    public static void main(String[] args) {  
        StudentView view = new StudentView();  
        view.displayMenu();  
    }  
}
```

7.3.4 Output:

```
Student added successfully!  
  
=== Student Management System ===  
1. Add Student  
2. View All Students  
3. Update Student  
4. Delete Student  
5. Exit  
Choose an option: 2  
  
Students List:  
ID: 1, Name: Alice, Dept: Computer Science, Marks: 85.50  
ID: 2, Name: Bob, Dept: Electronics, Marks: 78.00  
ID: 3, Name: Charlie, Dept: Mechanical, Marks: 92.30  
ID: 4, Name: Virat, Dept: CSE, Marks: 70.00
```

Learning Outcomes:

1. Understanding JDBC Integration: Gained practical experience in integrating JDBC with a Java application for database connectivity.
2. MVC Architecture Implementation: Learned how to implement the Model- View- Controller (MVC) architecture in Java for better code organization and separation of concerns.
3. Database CRUD Operations: Acquired the ability to perform CRUD operations (Create, Read, Update, Delete) using SQL queries in Java applications.



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4. Transaction Handling: Understood the importance of transaction handling for maintaining data integrity during database operations.