



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

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Experiment 6

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Subject Name: Project based Learning Java

Subject Code: 22CSH-359

Problem :- 1(Easy-Level)

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.

2. Objective:

- Use DriverManager and Connection objects to establish a connection.
- Retrieve and display all records from a table named Employee with columns EmpID, Name, and Salary.

3. Algorithm:

- Define database connection details (URL, username, password).
- Establish a connection using DriverManager.
- Create a statement to execute the SQL query.
- Retrieve data using ResultSet and display it.
- Close the connection.

4. Implementation :

```
import java.sql.*;

public class MySQLDatabaseConnection {

    public static void main(String[] args) {

        // Database credentials
```



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```
String url = "jdbc:mysql://localhost:3306/your_database"; // Replace  
'your_database' with your DB name
```

```
String user = "your_username"; // Replace with your MySQL username
```

```
String password = "your_password"; // Replace with your MySQL password
```

```
// SQL query to fetch data from Employee table
```

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

```
try (
```

```
    // Establishing the connection
```

```
    Connection conn = DriverManager.getConnection(url, user, password);
```

```
    // Creating a statement
```

```
    Statement stmt = conn.createStatement();
```

```
    // Executing the query
```

```
    ResultSet rs = stmt.executeQuery(query)
```

```
) {
```

```
    // Displaying the results
```

```
    System.out.println("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.println(empId + " | " + name + " | " + salary);

    }

} catch (SQLException e) {

    e.printStackTrace();

}

}

}
```

5. Output:

```
EmpID | Name | Salary
-----
101   | John Doe | 50000.0
102   | Jane Smith | 60000.0
103   | Alice Brown | 55000.0
```

Problem:- 2(Medium-level)

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.

2.Objective:

- Implement menu-driven options for each CRUD operation.
- Ensure transaction handling to maintain data integrity.
- Use JDBC to interact with the MySQL database.



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3. Algorithm:

- Establish a database connection.
- Implement methods for inserting, retrieving, updating, and deleting product records.
- Use a loop-driven menu to allow user selection.
- Use transaction handling to ensure data consistency.
- Close resources properly after execution.

4. Implementation/Code:

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

public class ProductCRUD {
    static final String URL = "jdbc:mysql://localhost:3306/your_database";
    static final String USER = "your_username";
    static final String PASSWORD = "your_password";

    public static void main(String[] args) {
        try (Connection conn = DriverManager.getConnection(URL, USER, PASSWORD))
        {
            Scanner scanner = new Scanner(System.in);
            boolean exit = false;
            while (!exit) {
                System.out.println("\n1. Create Product\n2. Read Products\n3. Update Product\n4. Delete Product\n5. Exit\nChoose an option: ");
                int choice = scanner.nextInt();
                scanner.nextLine();
                switch (choice) {
                    case 1: createProduct(conn, scanner); break;
                    case 2: readProducts(conn); break;
```

```
        case 3: updateProduct(conn, scanner); break;
        case 4: deleteProduct(conn, scanner); break;
        case 5: exit = true; break;
        default: System.out.println("Invalid choice, try again.");
    }
}
} catch (SQLException e) {
    e.printStackTrace();
}
}
```

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



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```
        conn.commit();  
        System.out.println("Product added successfully.");  
    } catch (SQLException e) {  
        conn.rollback();  
        e.printStackTrace();  
    }  
}
```

```
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("ProductID | ProductName | Price | Quantity");  
        while (rs.next()) {  
            System.out.println(rs.getInt("ProductID") + " | " + rs.getString("ProductName")  
+ " | " + rs.getDouble("Price") + " | " + rs.getInt("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 Product Name: ");  
    String name = scanner.nextLine();  
    System.out.print("Enter new Price: ");  
    double price = scanner.nextDouble();
```



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```
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);  
    pstmt.executeUpdate();  
    conn.commit();  
    System.out.println("Product updated successfully.");  
} catch (SQLException e) {  
    conn.rollback();  
    e.printStackTrace();  
}  
}
```

```
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);  
pstmt.executeUpdate();  
conn.commit();  
System.out.println("Product deleted successfully.");  
} catch (SQLException e) {  
    conn.rollback();  
    e.printStackTrace();  
}  
}  
}
```

5. Output:

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

Problem:- 3(Hard-level)

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.

2.Objective:



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- Implement the MVC pattern with a Student model, Controller for database operations, and a View for user interaction.
- Use JDBC to interact with a database table storing student information.
- Provide menu-driven options for CRUD operations.
- Ensure data integrity through transaction handling.

3. Algorithm:

- Define the Student class with fields: StudentID, Name, Department, and Marks.
- Create a database connection using JDBC.
- Implement a StudentController class to handle database operations.
- Develop a menu-driven interface in the View class for user interaction.
- Use prepared statements for secure and efficient database operations.
- Execute CRUD operations based on user input.

4. Implementation/Code:

```
import java.sql.*;
import java.util.*;
// Model Class
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;
    }
}
```



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```
this.marks = marks;
}

public int getStudentID() { return studentID; }
public String getName() { return name; }
public String getDepartment() { return department; }
public double getMarks() { return marks; }
}

// Controller Class
class StudentController {
    private static final String URL = "jdbc:mysql://localhost:3306/your_database";
    private static final String USER = "your_username";
    private static final String PASSWORD = "your_password";

    public void addStudent(Student student) throws SQLException {
        String query = "INSERT INTO Student (StudentID, Name, Department, Marks)
VALUES (?, ?, ?, ?)";
        try (Connection conn = DriverManager.getConnection(URL, USER, PASSWORD);
            PreparedStatement pstmt = conn.prepareStatement(query)) {
            conn.setAutoCommit(false);
            pstmt.setInt(1, student.getStudentID());
            pstmt.setString(2, student.getName());
            pstmt.setString(3, student.getDepartment());
            pstmt.setDouble(4, student.getMarks());
            pstmt.executeUpdate();
            conn.commit();
            System.out.println("Student added successfully.");
        }
    }
}
```



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```
    } catch (SQLException e) {  
        e.printStackTrace();  
    }  
}
```

```
public void viewStudents() throws SQLException {  
    String query = "SELECT * FROM Student";  
    try (Connection conn = DriverManager.getConnection(URL, USER, PASSWORD);  
        Statement stmt = conn.createStatement();  
        ResultSet rs = stmt.executeQuery(query)) {  
        System.out.println("StudentID | Name | Department | Marks");  
        while (rs.next()) {  
            System.out.println(rs.getInt("StudentID") + " | " + rs.getString("Name") + " | " +  
rs.getString("Department") + " | " + rs.getDouble("Marks"));  
        }  
    }  
}
```

```
public void updateStudent(int studentID, String name, String department, double  
marks) 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)) {  
        conn.setAutoCommit(false);  
        pstmt.setString(1, name);  
        pstmt.setString(2, department);  
        pstmt.setDouble(3, marks);  
        pstmt.setInt(4, studentID);
```



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```
        pstmt.executeUpdate();
        conn.commit();
        System.out.println("Student updated successfully.");
    } catch (SQLException e) {
        e.printStackTrace();
    }
}
```

```
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)) {
        conn.setAutoCommit(false);
        pstmt.setInt(1, studentID);
        pstmt.executeUpdate();
        conn.commit();
        System.out.println("Student deleted successfully.");
    } catch (SQLException e) {
        e.printStackTrace();
    }
}
}
```

// View Class

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



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```
boolean exit = false;
while (!exit) {
    System.out.println("\n1. Add Student\n2. View Students\n3. Update Student\n4.
Delete Student\n5. Exit\nChoose an option: ");
    int choice = scanner.nextInt();
    scanner.nextLine();
    switch (choice) {
        case 1:
            System.out.print("Enter Student ID: ");
            int id = scanner.nextInt();
            scanner.nextLine();
            System.out.print("Enter Name: ");
            String name = scanner.nextLine();
            System.out.print("Enter Department: ");
            String dept = scanner.nextLine();
            System.out.print("Enter Marks: ");
            double marks = scanner.nextDouble();
            try {
                controller.addStudent(new Student(id, name, dept, marks));
            } catch (SQLException e) {
                e.printStackTrace();
            }
            break;
        case 2:
            try {
                controller.viewStudents();
            } catch (SQLException e) {
                e.printStackTrace();
            }
    }
}
```



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```
}
```

```
break;
```

case 3:

```
System.out.print("Enter Student ID to update: ");
```

```
int updateID = scanner.nextInt();
```

```
scanner.nextLine();
```

```
System.out.print("Enter new Name: ");
```

```
String newName = scanner.nextLine();
```

```
System.out.print("Enter new Department: ");
```

```
String newDept = scanner.nextLine();
```

```
System.out.print("Enter new Marks: ");
```

```
double newMarks = scanner.nextDouble();
```

```
try {
```

```
    controller.updateStudent(updateID, newName, newDept, newMarks);
```

```
} catch (SQLException e) {
```

```
    e.printStackTrace();
```

```
}
```

```
break;
```

case 4:

```
System.out.print("Enter Student ID to delete: ");
```

```
int deleteID = scanner.nextInt();
```

```
try {
```

```
    controller.deleteStudent(deleteID);
```

```
} catch (SQLException e) {
```

```
    e.printStackTrace();
```

```
}
```

```
break;
```

case 5:

```
        exit = true;
        break;
    default:
        System.out.println("Invalid choice, try again.");
    }
}
scanner.close();
}
```

6. Output:

```
1. Add Student
2. View Students
3. Update Student
4. Delete Student
5. Exit
Choose an option:
```

7. Learning Outcomes:

- **JDBC Integration** – Understand how to establish database connections and execute SQL queries using JDBC.
- **MVC Architecture** – Learn to separate concerns using Model (Student class), View (menu-driven UI), and Controller (database operations).
- **CRUD Operations** – Gain hands-on experience in performing Create, Read, Update, and Delete operations on a database.
- **Transaction Handling** – Ensure data integrity using commit, rollback, and auto-commit mechanisms.
- **Security and Exception Handling** – Use **prepared statements** to prevent SQL injection and handle database errors effectively.
- **Scalability and Maintainability** – Develop structured and reusable code, making the application scalable and easy to maintain.