



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

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## Experiment-9

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**Section/Group:** 618-B

**Semester:** 6th

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**Subject Name:** Project Based Learning in Java

**Subject Code:** 22CSH-359

### EASY:

**Aim:** Create a simple Spring application that demonstrates Dependency Injection (DI) using Java-based configuration instead of XML. Define a Student class that depends on a Course class. Use Spring's @Configuration and @Bean annotations to inject dependencies.

**Objective:** To develop a simple Spring application that demonstrates Dependency Injection (DI) using Java-based configuration instead of XML. This experiment helps understand the concepts of Spring IoC (Inversion of Control), annotations (@Configuration and @Bean), and how to inject dependencies between classes using Java code.

### **Implementation/Code:**

```
import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.Configuration;
import org.springframework.context.ApplicationContext;
import
org.springframework.context.annotation.AnnotationConfigApplicationContext;
public class Course {
    private String courseName;
    private int duration;

    public Course(String courseName, int duration) {
```



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```
this.courseName = courseName;
this.duration = duration;
}

public String getCourseName() {
    return courseName;
}

public int getDuration() {
    return duration;
}
}

public class Student {
    private String name;
    private Course course;

    public Student(String name, Course course) {
        this.name = name;
        this.course = course;
    }

    public void displayDetails() {
        System.out.println("Student Name: " + name);
    }
}
```



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```
        System.out.println("Course: " + course.getCourseName() + ", Duration: " +
course.getDuration() + " months");
    }
}
@Configuration
public class AppConfig {

    @Bean
    public Course course() {
        return new Course("Java Development", 6);
    }

    @Bean
    public Student student() {
        return new Student("Aarushi", course());
    }
}

public class MainApp {
    public static void main(String[] args) {
        ApplicationContext context = new
        AnnotationConfigApplicationContext(AppConfig.class);
        Student student = context.getBean(Student.class);
        student.displayDetails();
    }
}
```



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```
}
```

## Output

```
Student Name: Aarushi  
Course: Java Development, Duration: 6 months
```

## MEDIUM:

**Aim:** Develop a Hibernate-based application to perform CRUD (Create, Read, Update, Delete) operations on a Student entity using Hibernate ORM with MySQL.

**Objective:** To create a Hibernate-based application that performs basic CRUD operations (Create, Read, Update, Delete) on a Student entity using Hibernate ORM with MySQL database integration. This experiment aims to give hands-on experience with Hibernate configuration, entity mapping, and using SessionFactory for database transactions.

## Code/Implementation:

```
import javax.persistence.*;  
import org.hibernate.*;  
import org.hibernate.cfg.Configuration;
```

```
@Entity
```

```
@Table(name = "students")
```

```
public class Student {
```

```
    @Id
```



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```
@GeneratedValue(strategy = GenerationType.IDENTITY)
```

```
private int id;
```

```
private String name;
```

```
private int age;
```

```
// Constructors
```

```
public Student() {}
```

```
public Student(String name, int age) {
```

```
    this.name = name;
```

```
    this.age = age;
```

```
}
```

```
// Getters & Setters
```

```
public int getId() { return id; }
```

```
public String getName() { return name; }
```

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

```
public int getAge() { return age; }
```

```
public void setAge(int age) { this.age = age; }
```

```
// Main method for CRUD operations
```

```
public static void main(String[] args) {
```

```
    // Configure SessionFactory
```

```
    SessionFactory factory = new Configuration()
```



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```
.configure("hibernate.cfg.xml")  
.addAnnotatedClass(Student.class)  
.buildSessionFactory();
```

// Create

```
Session session = factory.openSession();  
Transaction tx = session.beginTransaction();  
Student s1 = new Student("Aarushi", 21);  
session.save(s1);  
tx.commit();  
System.out.println("Student saved: " + s1.getName());
```

// Read

```
session = factory.openSession();  
Student fetched = session.get(Student.class, s1.getId());  
System.out.println("Fetched Student: " + fetched.getName() + ", Age: " +  
fetched.getAge());
```

// Update

```
tx = session.beginTransaction();  
fetched.setAge(22);  
session.update(fetched);  
tx.commit();  
System.out.println("Updated Age to: " + fetched.getAge());
```



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```
// Delete

tx = session.beginTransaction();

session.delete(fetched);

tx.commit();

System.out.println("Deleted Student with ID: " + fetched.getId());


session.close();

factory.close();

}

}
```

## HIBERNATE CRUD

```
import javax.persistence.*;

import org.hibernate.*;

import org.hibernate.cfg.Configuration;

@Entity

@Table(name = "students")

public class Student {

    @Id

    @GeneratedValue(strategy = GenerationType.IDENTITY)

    private int id;

    private String name;

    private int age;

    // Constructors
```

```
public Student() {}

public Student(String name, int age) {
    this.name = name;
    this.age = age;
}

// Getters & Setters

public int getId() { return id; }

public String getName() { return name; }

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

public int getAge() { return age; }

public void setAge(int age) { this.age = age; }

// Main method for CRUD operations

public static void main(String[] args) {

    // Configure SessionFactory

    SessionFactory factory = new Configuration()
        .configure("hibernate.cfg.xml")
        .addAnnotatedClass(Student.class)
        .buildSessionFactory();

    // Create

    Session session = factory.openSession();
    Transaction tx = session.beginTransaction();

    Student s1 = new Student("Aarushi", 21);
    session.save(s1);
    tx.commit();
}
```



```
System.out.println("Student saved: " + s1.getName());  
  
// Read  
  
session = factory.openSession();  
  
Student fetched = session.get(Student.class, s1.getId());  
  
System.out.println("Fetched Student: " + fetched.getName() + ", Age: " +  
fetched.getAge());  
  
// Update  
  
tx = session.beginTransaction();  
  
fetched.setAge(22);  
  
session.update(fetched);  
  
tx.commit();  
  
System.out.println("Updated Age to: " + fetched.getAge());  
  
// Delete  
  
tx = session.beginTransaction();  
  
session.delete(fetched);  
  
tx.commit();  
  
System.out.println("Deleted Student with ID: " + fetched.getId());  
  
session.close();  
  
factory.close();  
  
}  
  
}
```

**Output:**

```
into
insert into students
Student saved: ?
Student saved: Aarushi, Age:21

Hibernate
update
    a select - student0_id
        student0_age as age2_0_0_
    from students0_student0_
where student0_id=?
Updated Age to: 22

Hibernate
delete
    a delete students
```

## HARD:

**Aim:** Develop a Spring-based application integrated with Hibernate to manage transactions. Create a banking system where users can transfer money between accounts, ensuring transaction consistency.

**Objective:** To design and implement a Spring-based application integrated with Hibernate ORM that simulates a basic banking system, enabling users to securely transfer money between accounts. The system ensures data consistency and atomicity of transactions using Hibernate Transaction Management, with rollback mechanisms for failed transactions.

## **Code/Implementation:**

```
import org.hibernate.Session;

import org.hibernate.SessionFactory;

import org.hibernate.Transaction;

import org.hibernate.cfg.Configuration;

import javax.persistence.*;

import java.util.Date;
```



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```
// Entity: Account

@Entity

class Account {

    @Id

    @GeneratedValue(strategy = GenerationType.IDENTITY)

    private int id;

    private String holderName;

    private double balance;


    public Account() {}

    public Account(String holderName, double balance) {

        this.holderName = holderName;

        this.balance = balance;

    }


    // Getters and Setters

    public int getId() { return id; }

    public String getHolderName() { return holderName; }

    public void setHolderName(String holderName) { this.holderName = holderName; }

    public double getBalance() { return balance; }

    public void setBalance(double balance) { this.balance = balance; }

}
```



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```
// Entity: Transaction Record
```

```
@Entity
```

```
class TransactionRecord {
```

```
    @Id
```

```
    @GeneratedValue(strategy = GenerationType.IDENTITY)
```

```
    private int id;
```

```
    private int fromAccount;
```

```
    private int toAccount;
```

```
    private double amount;
```

```
    private Date transactionDate;
```

```
    public TransactionRecord() { }
```

```
    public TransactionRecord(int from, int to, double amount) {
```

```
        this.fromAccount = from;
```

```
        this.toAccount = to;
```

```
        this.amount = amount;
```

```
        this.transactionDate = new Date();
```

```
    }
```

```
// Getters
```

```
    public int getId() { return id; }
```

```
    public int getFromAccount() { return fromAccount; }
```



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```
public int getToAccount() { return toAccount; }  
public double getAmount() { return amount; }  
public Date getTransactionDate() { return transactionDate; }  
}  
  
// Main App with Configuration and Service  
public class BankingApp {  
  
    private static SessionFactory sessionFactory;  
  
    public static void main(String[] args) {  
        try {  
            // Configure Hibernate  
            Configuration cfg = new Configuration().configure("hibernate.cfg.xml")  
                .addAnnotatedClass(Account.class)  
                .addAnnotatedClass(TransactionRecord.class);  
            sessionFactory = cfg.buildSessionFactory();  
  
            // Add test data (Optional, only once)  
            //createDummyAccounts();  
  
            // Perform a money transfer  
            transferMoney(1, 2, 500);
```

```
    } catch (Exception e) {  
        e.printStackTrace();  
    } finally {  
        sessionFactory.close();  
    }  
}
```

```
public static void transferMoney(int fromId, int toId, double amount) {  
    Session session = sessionFactory.openSession();  
    Transaction tx = null;  
  
    try {  
        tx = session.beginTransaction();  
  
        Account from = session.get(Account.class, fromId);  
        Account to = session.get(Account.class, toId);  
  
        if (from == null || to == null) {  
            throw new RuntimeException("Account not found.");  
        }  
  
        if (from.getBalance() < amount) {  
            throw new RuntimeException("Insufficient funds.");  
        }  
    }  
}
```



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```
from.setBalance(from.getBalance() - amount);
```

```
to.setBalance(to.getBalance() + amount);
```

```
session.update(from);
```

```
session.update(to);
```

```
TransactionRecord txn = new TransactionRecord(fromId, toId, amount);
```

```
session.save(txn);
```

```
tx.commit();
```

```
System.out.println("Transaction Successful.");
```

```
} catch (Exception e) {
```

```
    if (tx != null) tx.rollback();
```

```
    System.out.println("Transaction Failed. Rolled back. Reason: " +  
e.getMessage());
```

```
} finally {
```

```
    session.close();
```

```
}
```

```
}
```

```
// Optional method to add initial accounts
```

```
public static void createDummyAccounts() {
```

```
    Session session = sessionFactory.openSession();
```



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```
Transaction tx = session.beginTransaction();

session.save(new Account("Aarushi", 1000));
session.save(new Account("Riya", 1000));

tx.commit();
session.close();

System.out.println("Dummy accounts created.");
}
}
```

## HIBERNATE FILE

```
<?xml version="1.0" encoding="utf-8"?>
<!DOCTYPE hibernate-configuration PUBLIC
    "-//Hibernate/Hibernate Configuration DTD 3.0//EN"
    "http://hibernate.sourceforge.net/hibernate-configuration-3.0.dtd">
<hibernate-configuration>
    <session-factory>
        <property
            name="hibernate.connection.driver_class">com.mysql.cj.jdbc.Driver</property>
        <property
            name="hibernate.connection.url">jdbc:mysql://localhost:3306/yourdb</property>
        <property name="hibernate.connection.username">root</property>
```



```
<property name="hibernate.connection.password">yourpassword</property>

<property
name="hibernate.dialect">org.hibernate.dialect.MySQLDialect</property>

<property name="hibernate.show_sql">true</property>

<property name="hibernate.hbm2ddl.auto">update</property>

</session-factory>

</hibernate-configuration>
```

## Output:

```
Hibernate: update Account set balance=? where id=?
Transaction Successful.
```

## Learning Outcome:

1. We will be able to develop Spring and Hibernate applications with form handling and database connectivity.
2. We will learn to implement dynamic web applications for real-time data processing and display.