


# Web API Design with Spring Boot Week 4 Coding Assignment

Points possible: 70

Category	Criteria	% of Grade
Functionality	Does the code work?	25
Organization	Is the code clean and organized? Proper use of white space, syntax, and consistency are utilized. Names and comments are concise and clear.	25
Creativity	Student solved the problems presented in the assignment using creativity and out of the box thinking.	25
Completeness	All requirements of the assignment are complete.	25

**Instructions:** In Eclipse, or an IDE of your choice, write the code that accomplishes the objectives listed below. Ensure that the code compiles and runs as directed. Take screenshots of the code and of the running program (make sure to get screenshots of all required functionality) and paste them in this document where instructed below. Create a new repository on GitHub for this week's assignments and push this document, with your Java project code, to the repository. Add the URL for this week's repository to this document where instructed and submit this document to your instructor when complete.

**Here's a friendly tip:** as you watch the videos, code along with the videos. This will help you with the homework. When a screenshot is required, look for the icon:  You will keep adding to this project throughout this part of the course. When it comes time for the final project, use this project as a starter.

**Project Resources:** <https://github.com/promineotech/Spring-Boot-Course-Student-Resources>

## Coding Steps:

For this week's homework you need to copy source code from the supplied resources.


For this week's homework you need to copy source code from the Source folder in the supplied resources. Wait until the instructions tell you to copy the resources or you will get errors.

- 1) Select some options for a Jeep order:
  - a) Use the `data.sql` file or the jeep database tables to select options for a Jeep order. Select any one of each of the following for the order:

- i) color
  - ii) customer
  - iii) engine
  - iv) model
  - v) tire(s)
- b) Select one or more options from the options table as well. Keep in mind that some options may work better than others – but if you want to put 37-inch tires on your Jeep Renegade, so be it!
- 2) Create a new integration test class to test a Jeep order named `CreateOrderTest.java`. Create this class in `src/test/java` in the `com.promineotech.jeepp.controller` package.
- a) Add the Spring Boot Test annotations: `@SpringBootTest`, `@ActiveProfiles`, and `@Sql`. They should have the same parameters as the test created in weeks 1 and 2.
  - b) Create a test method (annotated with `@Test`) named `testCreateOrderReturnsSuccess201`.
  - c) In the test class, create a method named `createOrderBody`. This method returns a type of `String`. In this method, return a JSON object with the IDs that you picked in Step 1a and b. For example:

```
{
  "customer": "MORISON_LINA",
  "model": "WRANGLER",
  "trim": "Sport Altitude",
  "doors": 4,
  "color": "EXT_NACHO",
  "engine": "2_0_TURBO",
  "tire": "35_TOYO",
  "options": [
    "DOOR_QUAD_4",
    "EXT_AEV_LIFT",
    "EXT_WARN_WINCH",
    "EXT_WARN BUMPER_FRONT",
    "EXT_WARN BUMPER_REAR",
    "EXT_ARB_COMPRESSOR"
  ]
}
```

Make sure that the JSON is correct! If necessary, use a JSON formatter/validator like the one here: <https://jsonformatter.curiousconcept.com/>.

Produce a screenshot of the `createOrderBody()` method. 

In the test method, assign the return value of the `createOrderBody()` method to a variable named `body`.

- d) In the test class, add an instance variable named `serverPort` to hold the port that Tomcat is listening on in the test. Annotate the variable with `@LocalServerPort`.

- e) Add another instance variable for an injected `TestRestTemplate` named `restTemplate`.
- f) In the test method, assign a value to a local variable named `uri` as follows:

```
String uri = String.format("http://localhost:%d/orders", serverPort);
```

- g) In the test method, create an `HttpHeaders` object and set the content type to "application/json" like this:

```
HttpHeaders headers = new HttpHeaders();  
headers.setContentType(MediaType.APPLICATION_JSON);
```

Make sure to import the package `org.springframework.http.HttpHeaders`.

- h) Create an `HttpEntity` object and set the request body and headers:

```
HttpEntity<String> bodyEntity = new HttpEntity<>(body, headers);
```

- i) Send the request body and headers to the server. The `Order` class should have been copied earlier from the supplied resources. Ensure that you import `com.promineotech.jeepp.entity.Order` and not some other `Order` class.



```
ResponseEntity<Order> response = restTemplate.exchange(uri,  
    HttpMethod.POST, bodyEntity, Order.class);
```

- j) Add the `AssertJ` assertions to ensure that the response is correct. Replace the expected values to match the JSON in step 2c.


```
assertThat(response.getStatusCode()).isEqualTo(HttpStatus.CREATED);  
assertThat(response.getBody()).isNotNull();  
  
Order order = response.getBody();  
assertThat(order.getCustomer().getCustomerId()).isEqualTo("MORISON_LINA");  
assertThat(order.getModel().getModelId()).isEqualTo(JeepModel.WRANGLER);  
assertThat(order.getModel().getTrimLevel()).isEqualTo("Sport Altitude");  
assertThat(order.getModel().getNumDoors()).isEqualTo(4);  
assertThat(order.getColor().getColorId()).isEqualTo("EXT_NACHO");  
assertThat(order.getEngine().getEngineId()).isEqualTo("2_0_TURBO");  
assertThat(order.getTire().getTireId()).isEqualTo("35_TOYO");  
assertThat(order.getOptions()).hasSize(6);
```

- k) Produce a screenshot of the test method. 

- 3) In the controller sub-package in `src/main/java`, create an interface named `JeepOrderController`. Add `@RequestMapping("/orders")` as a class-level annotation.
  - a) Create a method in the interface to create an order (`createOrder`). It should return an object of type `Order` (see below). It should accept a single parameter of type `OrderRequest` as described in the video. Make sure it accepts an HTTP POST request and returns a status code of 201 (created).
  - b) Add the `@RequestBody` annotation to the `orderRequest` parameter. Make sure to add the `RequestBody` annotation from the `org.springframework.web.bind.annotation` package.


- c) Produce a screenshot of the finished `JeepOrderController` interface showing no compile errors. 
- 4) Create a class that implements `JeepOrderController` named `DefaultJeepOrderController`.
  - a) Add `@RestController` as a class-level annotation.
  - b) Add a log line to the implementing controller method showing the input request body (`orderRequest`)
  - c) Run the test to show a red status bar. Produce a screenshot that shows the test method, the log line, and the red JUnit status bar. 
- 5) Find the Maven dependency `spring-boot-starter-validation` by looking it up at <https://mvnrepository.com/>. Add this repository to the project POM file (`pom.xml`).
- 6) Add the class-level annotation `@Validated` to the `JeepOrderController` interface.
- 7) Add Bean Validation annotations to the `OrderRequest` class as shown in the video.
  - a) Use these annotations for String types:
    - i) `@NotNull`
    - ii) `@Length(max = 30)`
    - iii) `@Pattern(regexp = "[\\w\\s]*")`
  - b) Use these annotations for integer types:
    - i) `@Positive`
    - ii) `@Min(2)`
    - iii) `@Max(4)`
  - c) Add `@NotNull` to the enum type.
  - d) Add validation to the list element (type String) by adding the validation annotations *inside* the generic definition. So, to add the String validation to the options, you would do this:

```
private List<@NotNull @Length(max = 30) @Pattern(regexp = "[\\w\\s]*") String> options;
```

Do not apply a `@NotNull` annotation to the `List` because if you have no options the `List` may be null.
  - e) Produce a screenshot of this class with the annotations. 
- 8) In the `jeep.service` sub-package, create the empty (no methods yet) order service interface (named `JeepOrderService`) and implementation (named `DefaultJeepOrderService`).
  - a) Inject the interface into the order controller implementation class.
  - b) Add the `@Service` annotation to the service implementation class.

- c) Create the `createOrder` method in the interface and implementing service. The method signature should look like this:

```
Order createOrder(OrderRequest orderRequest);
```

- d) Call the `createOrder` method from the controller and return the value returned by the service.
  - e) Add a log line in the `createOrder` method and log the `orderRequest` parameter.
  - f) Run the test `CreateOrderTest` again. Produce a screenshot showing that the service layer `createOrder` method correctly prints the log line in the console. (e.g. prints out the `OrderRequest` in the console from within the Service Layer). 
- 9) In the `jeep.dao` sub-package, create the empty (no methods yet) DAO interface (named `JeepOrderDao`) and implementation (named `DefaultJeepOrderDao`).
- a) Inject the DAO interface into the order service implementation class.
  - b) Add the `@Component` annotation to the DAO implementation class.
- 10) Replace the entire content of `JeepOrderDao.java` with the source found in `JeepOrderDao.source`. The source file is found in the Source folder of the supplied project resources.

**11) \*\*\* The next steps require you to copy source code from the Source directory in the supplied resources. Please follow the instructions EXACTLY. Some steps require you to replace ALL the source in a file. Some steps require you to ADD source to a file.**

- 12) Copy the *contents* of the file `DefaultJeepOrderDao.source` into `DefaultJeepOrderDao.java`. The source file is found in the Source folder of the supplied project resources.

In Eclipse, click the "Source" menu and select "Organize Imports". Pick packages from your project where applicable. Make sure you pick the import `java.util.Optional`, `java.util.List`, and `org.springframework.jdbc.core.RowMapper`.


- 13) Copy the *contents* of the file `DefaultJeepOrderService.source` into `DefaultJeepOrderService.java`. Add the source after the `createOrder()` method, but *inside* the class body. The source file is found in the Source folder of the supplied project resources.

In Eclipse, click the "Source" menu and select "Organize Imports". Pick packages from your project where applicable.

- 14) In `DefaultJeepOrderService.java`, work with the method `createOrder`.
- a) Add the `@Transactional` annotation to the `createOrder` method.
  - b) In the `createOrder` method call the copied methods: `getCustomer`, `getModel`, `getColor`, `getEngine`, `getTire` and `getOption`, assigning the return values of these methods to variables of the appropriate types.
  - c) Calculate the price, including all options.

15) In `JeepOrderDao.java` and `DefaultJeepOrderDao.java`, add the method:

```
Order saveOrder(Customer customer, Jeep jeep, Color color, Engine engine, Tire
                tire, BigDecimal price, List<Option> options);
```

a) Call the `jeepOrder.Dao.saveOrder` method from the `jeepOrderSalesService.createOrder` service. Produce a screenshot of the `jeepOrderSalesService.createOrder` method. 

b) Write the implementation of the `saveOrder` method in the DAO.

i) Call the supplied `generateInsertSql` method, passing in the customer, jeep, color, engine, tire and price. Assign the return value of the method to a `SqlParams` object.

ii) Call the `update` method on the `NamedParameterJdbcTemplate` object, passing in a `KeyHolder` object as shown in the video. Create the `KeyHolder` like this:

```
KeyHolder keyHolder = new GeneratedKeyHolder();
```


Be sure to extract the order primary key from the `KeyHolder` object into a variable of type `Long` named `orderPK`.


iii) Write a method named `saveOptions` as shown in the video. This method should have the following method signature:

```
private void saveOptions(List<Option> options, Long orderPK)
```

For each option in the `Options` list, call the supplied `generateInsertSql` method passing the parameters option and order primary key (`orderPK`). Call the `update` method on the `NamedParameterJdbcTemplate` object.

iv) In the `saveOrder` method in the DAO implementation, return an `Order` object using the `Order.builder`. The `Order` should include `orderPK`, customer, jeep (model), color, engine, tire, options and price.

v) Produce a screenshot of the `saveOrder` method. 

c) Run the integration test in `CreateOrderTest`. Produce a screenshot of the test method that shows the green JUnit status bar, the console output, and the test class. 

### Screenshots of Code:

```

package com.promineotech.jeepp.controller;

import org.junit.jupiter.api.Test;

@SpringBootTest(webEnvironment = WebEnvironment.RANDOM_PORT)
@ActiveProfiles("test")
@Sql(scripts = {
    "classpath:flyway/migrations/V1.0__Jeep_Schema.sql",
    "classpath:flyway/migrations/V1.1__Jeep_Data.sql"},
    config = @SqlConfig(encoding = "utf-8"))

class CreateOrderTest extends CreateOrderTestSupport {

    @Test
    void testCreateOrderReturnsSuccess201() {
        String body = createOrderBody();
    }

    protected String createOrderBody() {
        return "{\n"
            + "  \"customer\": \"MORISON_LINA\", \n"
            + "  \"model\": \"WRANGLER\", \n"
            + "  \"trim\": \"Sport Altitude\", \n"
            + "  \"doors\": 4, \n"
            + "  \"color\": \"EXT_NACHO\", \n"
            + "  \"engine\": \"2_0_TURBO\", \n"
            + "  \"tire\": \"35_TOYO\", \n"
            + "  \"options\": [\n"
            + "    \"DOOR_QUAD_4\", \n"
            + "    \"EXT_AEV_LIFT\", \n"
            + "    \"EXT_WARN_WINCH\", \n"
            + "    \"EXT_WARN BUMPER_FRONT\", \n"
            + "    \"EXT_WARN BUMPER_REAR\", \n"
            + "    \"EXT_ARB_COMPRESSOR\" \n"
            + "  ] \n"
            + "} \n";
    }
}

```

```

@Test
void testCreateOrderReturnsSuccess201() {

    //Given: an order as JSON
    String body = createOrderBody();

    String uri = String.format("http://localhost:%d/orders", serverPort);

    HttpHeaders headers = new HttpHeaders();
    headers.setContentType(MediaType.APPLICATION_JSON);

    HttpEntity<String> bodyEntity = new HttpEntity<>(body, headers);

    //When: the order is sent
    ResponseEntity<Order> response = restTemplate.exchange(uri, HttpMethod.POST, bodyEntity, Order.class);

    //Then: a 201 status is returned
    assertThat(response.getStatusCode()).isEqualTo(HttpStatus.CREATED);
    assertThat(response.getBody()).isNotNull();

    Order order = response.getBody();
    assertThat(order.getCustomer().getCustomerId()).isEqualTo("MORISON LINA");
    assertThat(order.getModel().getModelId()).isEqualTo(JeepModel.WRANGLER);
    assertThat(order.getModel().getTrimLevel()).isEqualTo("Sport Altitude");
    assertThat(order.getModel().getNumDoors()).isEqualTo(4);
    assertThat(order.getColor().getColorId()).isEqualTo("EXT_NACHO");
    assertThat(order.getEngine().getEngineId()).isEqualTo("2_0_TURBO");
    assertThat(order.getTire().getTireId()).isEqualTo("35_TOYO");
    assertThat(order.getOptions()).hasSize(6);

    //And: the returned order is correct
}

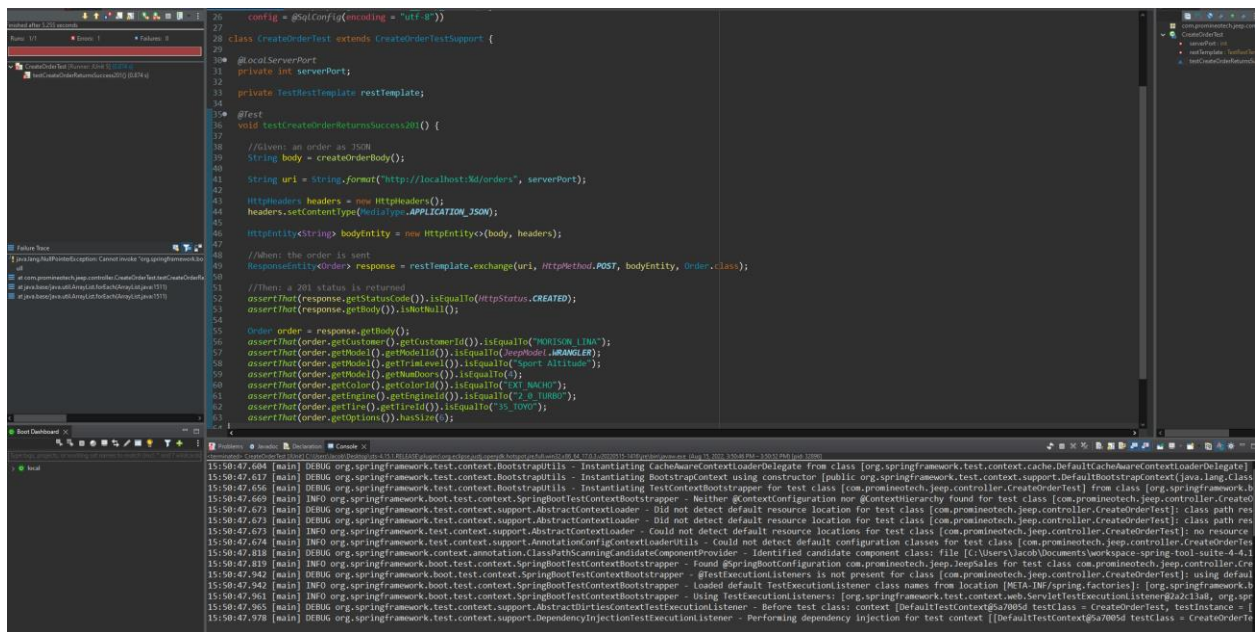
```

```

1 package com.promineotech.jeeptest.controller;
2
3 import org.springframework.http.HttpStatus;
4
5 @RequestMapping("/orders")
6 public interface JeepOrderController {
7
8     @Operation(
9         summary = "Creates an order for a Jeep",
10        description = "Returns the created Jeep given an optional model or trim",
11        responses = {
12            @ApiResponse(responseCode = "201", description = "The created Jeep is returned", content = @Content(mediaType = "application/json", schema = @Schema(implementation = Order.class))),
13            @ApiResponse(responseCode = "400", description = "The request parameters are invalid", content = @Content(mediaType = "application/json")),
14            @ApiResponse(responseCode = "404", description = "A Jeep component was not found with the input criteria", content = @Content(mediaType = "application/json")),
15            @ApiResponse(responseCode = "500", description = "An unplanned error occurred", content = @Content(mediaType = "application/json"))
16        },
17        parameters = {
18            @Parameter(name = "orderRequest", required = true, description = "The order as JSON"),
19        }
20    )
21    @PostMapping
22    @ResponseStatus(code = HttpStatus.CREATED)
23    Order createOrder(@RequestBody OrderRequest orderRequest);
24
25 }

```





```

1 package com.promineotech.jeepp.entity;
2
3 import java.util.List;
4
11
12 @Data
13 public class OrderRequest {
14
15     @NotNull
16     @Length (max = 30)
17     @Pattern (regexp = "[\\w\\s]*")
18     private String customer;
19
20     @NotNull
21     @Length (max = 30)
22     @Pattern (regexp = "[\\w\\s]*")
23     private JeepModel model;
24
25     @NotNull
26     @Length (max = 30)
27     @Pattern (regexp = "[\\w\\s]*")
28     private String trim;
29
30     @Positive
31     @Min (2)
32     @Max (4)
33     private int doors;
34
35     @NotNull
36     @Length (max = 30)
37     @Pattern (regexp = "[\\w\\s]*")
38     private String color;
39
40     @NotNull
41     @Length (max = 30)
42     @Pattern (regexp = "[\\w\\s]*")
43     private String engine;
44
45     @NotNull
46     @Length (max = 30)
47     @Pattern (regexp = "[\\w\\s]*")
48     private String tire;
49
50
51     private List<@NotNull @Length (max = 30) @Pattern (regexp = "[\\w\\s]*") String> options;
52
53 }
54

```

```

2022-08-15 17:14:34.475 INFO 34752 --- [main] c.p.jeepp.controller.CreateOrderTest : Starting CreateOrderTest using Java 17.0.3 on Jacob-PC with PID 34752 (started by Jacob in C:\Users\Jacob\Documents)
2022-08-15 17:14:34.476 INFO 34752 --- [main] c.p.jeepp.controller.CreateOrderTest : The following 1 profile is active: "test"

```

```

@Transactional
@Override
public Order createOrder(OrderRequest orderRequest) {
    Customer customer = jeepOrderDao.fetchCustomer(orderRequest.getCustomer()).orElseThrow(() -> new NoSuchElementException("Customer with ID=" + orderRequest.getCustomer() + " was not found"));

    Jeep jeep = jeepOrderDao.fetchModel(orderRequest.getModel(), orderRequest.getTrim(), orderRequest.getDoors()).orElseThrow(() -> new NoSuchElementException("Model with ID=" + orderRequest.getModel()
    Color color = jeepOrderDao.fetchColor(orderRequest.getColor()).orElseThrow(() -> new NoSuchElementException("Color with ID=" + orderRequest.getColor() + " was not found"));

    Engine engine = jeepOrderDao.fetchEngine(orderRequest.getEngine()).orElseThrow(() -> new NoSuchElementException("Engine with ID=" + orderRequest.getEngine() + " was not found"));

    Tire tire = jeepOrderDao.fetchTire(orderRequest.getTire()).orElseThrow(() -> new NoSuchElementException("Tire with ID=" + orderRequest.getTire() + " was not found"));

    List<Option> option = jeepOrderDao.fetchOptions(orderRequest.getOptions());

    BigDecimal price = jeep.getOrderBasePrice().add(color.getPrice()).add(engine.getPrice()).add(tire.getPrice());

    return jeepOrderDao.saveOrder(customer, jeep, color, engine, tire, price, option);
}

```

```

@Override
public Order saveOrder(Customer customer, Jeep jeep, Color color, Engine engine, Tire tire,
    BigDecimal price, List<Option> options) {
    SqlParams params = generateInsertSql(customer, jeep, color, engine, tire, price);

    KeyHolder keyHolder = new GeneratedKeyHolder();
    jdbcTemplate.update(params.sql, params.source, keyHolder);

    Long orderPK = keyHolder.getKey().longValue();

    saveOptions(options, orderPK);

    return Order.builder()
        .orderPK(orderPK)
        .customer(customer)
        .model(jeep)
        .color(color)
        .engine(engine)
        .tire(tire)
        .options(options)
        .price(price)
        .build();
}

```

The screenshot shows an IDE with a REST client test file and its execution logs. The test file, `CreateOrderTest.java`, is located in the `src/test/java` directory. It uses `RestTemplate` to send a `POST` request to `http://localhost:8080/orders` with a `Content-Type` of `application/json`. The test asserts that the response status is `201` and that the response body is not null.

The logs show the execution of the test, including the initialization of the `RestTemplate`, the sending of the `POST` request, and the successful completion of the test. The logs also show the initialization of the `Spring` framework and the `Hikari` database connection pool.

```

2022-08-23 10:26:00.923 INFO 23972 --- [main] c.p.jee... CreateOrderTest : Starting CreateOrderTest using Java 17.0.3 on Jacob-PC with PID 23972 (started by Jacob in C:\Users\Jacob\Documents\...)
2022-08-23 10:26:00.924 INFO 23972 --- [main] c.p.jee... CreateOrderTest : The following 1 profile is active: "test"
2022-08-23 10:26:02.338 INFO 23972 --- [main] o.s.b.w.e.t.c.t.TomcatWebServer : Tomcat initialized with port(s): 0 (http)
2022-08-23 10:26:02.350 INFO 23972 --- [main] o.apache.catalina.core.StandardService : Starting service [Tomcat]
2022-08-23 10:26:02.350 INFO 23972 --- [main] org.apache.catalina.core.StandardEngine : Starting Servlet engine: [Apache Tomcat/9.0.65]
2022-08-23 10:26:02.487 INFO 23972 --- [main] o.a.c.c.f.Tomcat.[localhost].[/] : Initializing Spring embedded WebApplicationContext
2022-08-23 10:26:02.488 INFO 23972 --- [main] w.s.c.s.ServletWebServerApplicationContext : Root WebApplicationContext: initialization completed in 1539 ms
2022-08-23 10:26:04.358 INFO 23972 --- [main] o.s.b.w.e.t.c.t.TomcatWebServer : Tomcat started on port(s): 28549 (http) with context path ""
2022-08-23 10:26:04.372 INFO 23972 --- [main] c.p.jee... CreateOrderTest : Started CreateOrderTest in 3.857 seconds (JVM running for 5.03)
2022-08-23 10:26:04.406 INFO 23972 --- [main] com.zaxxer.hikari.HikariDataSource : HikariPool-1 - Starting...
2022-08-23 10:26:04.678 INFO 23972 --- [main] com.zaxxer.hikari.HikariDataSource : HikariPool-1 - Start completed.
2022-08-23 10:26:05.415 INFO 23972 --- [o-auto-1-exec-1] o.a.c.c.f.Tomcat.[localhost].[/] : Initializing Spring DispatcherServlet 'dispatcherServlet'
2022-08-23 10:26:05.416 INFO 23972 --- [o-auto-1-exec-1] o.s.web.servlet.DispatcherServlet : Initializing Servlet 'dispatcherServlet'
2022-08-23 10:26:05.416 INFO 23972 --- [o-auto-1-exec-1] o.s.web.servlet.DispatcherServlet : Completed initialization in 0 ms
2022-08-23 10:26:05.719 INFO 23972 --- [onShutdownHook] com.zaxxer.hikari.HikariDataSource : HikariPool-1 - Shutdown initiated...
2022-08-23 10:26:05.721 INFO 23972 --- [onShutdownHook] com.zaxxer.hikari.HikariDataSource : HikariPool-1 - Shutdown completed.

```

**Screenshots of Running Application:**

**URL to GitHub Repository:** <https://github.com/Faudeth/Week-16-Assignment>