**GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)**

**Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)**

Semester-V

**Course Title: Advanced Java Programming**

(Course Code: 4XXXXXX)

|  |  |
| --- | --- |
| **Diploma programmer in which this course is offered** | **Semester in which offered** |
| Information and Communication Technology | 5th Semester |

1. **RATIONALE**

This course is designed to teach advanced Java programming concepts and techniques, building upon the foundation established in the Java Programming course. The course covers a wide range of topics, including advanced language features, user interface development, data persistence and access, server-side development, and modern Java frameworks. It also introduces students to Java for IoT applications, enabling them to develop solutions for the growing field of connected devices.

The course aims to equip students with the skills and knowledge required to develop robust, scalable, and secure Java applications using industry-standard frameworks and best practices. By mastering these advanced concepts, students will be well-prepared to tackle complex real-world problems and develop enterprise-level applications.

The course emphasizes hands-on learning through practical exercises and mini-projects, allowing students to apply their knowledge and gain practical experience in developing advanced Java applications. Upon completion of this course, students will have a strong foundation in advanced Java programming, making them competitive in the job market and enabling them to pursue careers in software development, web development, and IoT domains.

1. **COMPETENCY**

The aim of this course is to help the students attain the following industry-identified competency through various teaching-learning experiences:

* **Develop advanced Java applications using modern frameworks and best practices.**

1. **COURSE OUTCOMES (Cos)**

The practical exercises, the underpinning knowledge, and the relevant soft skills associated with this competency are to be developed in the student to display the following COs:

a) Utilize advanced Java language features and develop user interfaces using Java Swing and JavaFX frameworks.  
b) Implement data persistence and access using JDBC, Hibernate, and JPA.  
c) Create server-side applications using Java Servlets, JSP, and RESTful web services.  
d) Apply modern Java frameworks such as Spring and Spring Boot for rapid application development.  
e) Develop Java applications for IoT using Arduino, Raspberry Pi, and IoT protocols.

**4. TEACHING AND EXAMINATION SCHEME**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Teaching Scheme**  **(In Hours)** | | | **Total Credits**  **(L+T+P/2)** | **Examination Scheme** | | | | |
| **Theory Marks** | | **Practical Marks** | | **Total Marks** |
| **L** | **T** | **P** | **C** | **CA** | **ESE** | **CA** | **ESE** |
| 3 | 0 | 2 | 4 | 30 | 70 | 25 | 25 | 150 |

*(\*): Out of 30 marks under the theory CA, 10 marks are for assessment of the micro-project to*

*facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessing the attainment of the cognitive domain UOs required for the attainment of the COs.*

*Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P -Practical; C – Credit, CA -*

*Continuous Assessment; ESE -End Semester Examination.*

1. **SUGGESTED PRACTICAL EXERCISES: NA**

The following practical outcomes (PrOs) are the subcomponents of the COs. These PrOs need to be attained to achieve the COs.

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No.** | **Practical Outcomes (PrOs)** | **UnitNo.** | **Approx. Hrs. required** |
| 1 | Write a Java program using lambda expressions to sort a list of strings. | 1 | 1 |
| 2 | Implement a generic class for a stack data structure. | 1 | 1 |
| 3 | Use the Java Reflection API to dynamically invoke methods of a class. | 1 | 1 |
| 4 | Write a Java program using Streams API to filter and process a large dataset. | 1 | 2 |
| 5 | Create a Swing application with a custom layout and event handling. | 2 | 2 |
| 6 | Develop a JavaFX application using FXML and CSS styling. | 2 | 3 |
| 7 | Implement a JDBC program to perform CRUD operations on a database | 3 | 2 |
| 8 | Create a Hibernate application to map entities and relationships. | 3 | 2 |
| 9 | Develop a JPA application to perform database operations using JPQL | 3 | 2 |
| 10 | Optimize a database query using indexing and query plan analysis. | 3 | 1 |
| 11 | Implement a Java Servlet to handle form submissions. | 4 | 1 |
| 12 | Create a JSP application with Expression Language (EL) and JSTL. | 4 | 2 |
| 13 | Develop a RESTful web service using JAX-RS. | 4 | 2 |
| 14 | Create a Spring MVC application with form validation and data binding. | 5 | 2 |
| 15 | Implement a Spring Boot application with RESTful endpoints. | 5 | 2 |
| 16 | Develop a Java application to interface with Arduino using serial communication. | 5 | 1 |
| 17 | Create a Java application to control Raspberry Pi GPIO pins. | 5 | 1 |

1. **MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED**

| **Sr.No.** | **Equipment Name with Broad Specifications** | **PrO. No.** |
| --- | --- | --- |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |

1. **AFFECTIVE DOMAIN OUTCOMES**
2. **UNDERPINNING THEORY: NA**
3. **SUGGESTED SPECIFICATION TABLE FOR QUESTIONPAPER DESIGN: NA**
4. **SUGGESTED STUDENT ACTIVITIES**
5. **SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)**
6. **SUGGESTED PROJECT LIST**
7. **SUGGESTED LEARNING RESOURCES**
8. **SOFTWARE/LEARNING WEBSITES**
9. **PO-COMPETENCY-CO MAPPING:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Semester V** | **Biomedical Engineering Project-I (Course Code:4350304)** | | | | | | | |
| **POs** | | | | | | | |
| **Competency**  **& Course Outcomes** |  | |  |  |  |  |  |  |
| *Competency* | **Maintain various types of A.C. machines and three -phase transformers safely.** | | | | | | | |
| Course Outcomes  CO1  Describe objectives and problem definition of the identified industry problem as project. |  |  | |  |  |  |  |  |
| CO2  Select proper solution from various possible solutions for selected problem |  |  | |  |  |  |  |  |
| CO3  Analyze the hardware and software of selected solution cohesively & effectively in team |  |  | |  |  |  |  |  |
| CO4  Create project report having organized documentation. |  |  | |  |  |  |  |  |
| CO5  Demonstrate the implemented project hardware and software. |  |  | |  |  |  |  |  |

*Legend: ‘****3’*** *for high, ‘****2****’ for medium,* ***‘1’*** *for low and* ***‘-’*** *for no correlation of each CO with PO.*

1. **COURSE CURRICULUM DEVELOPMENT COMMITTEE**

**GTU Resource Persons**

| **Sr. No.** | **Name and Designation** | **Institute** | **Contact No.** | **Email** |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |