GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)
Semester-V

Course Title: Web based Java Programming
(Course Code: 4350708)

Diploma programme in which this course is offered	Semester in which offered
Computer Engineering	5th Semester

1. RATIONALE

This course is designed to teach web based java programming concepts, techniques, and applications like JDBC, Hibernate, server side technologies, web services etc. Web based Java Programming is a set of technologies and frameworks used for developing enterprise-level Java applications. It emphasis on the fundamentals of the client service architecture for web based applications. The reason behind the development of advanced Java technology is to provide a solution to the limitations of basic Java. JDBC (Java Database Connectivity) and Hibernate are technologies used for interacting with databases in Java applications. Servlets and JavaServer Pages (JSPs) are technologies used for building dynamic web applications in Java. They are often used together to provide a complete solution for handling web requests and generating dynamic web pages. Web socket programming is a technology used for real-time communication between web clients and servers which provides more efficient and scalable alternative to traditional HTTP-based communication. Web services are to provide a standardized, platform-independent, and language-independent mechanism for applications to communicate with each other over the internet.

2. COMPETENCY

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

- Develop java web based applications using Servlet, JSP and Hibernate.

3. 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:

The practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned competency:

Course Outcomes:

a) Implement basic database operations using JDBC.
b) Develop database-driven Java applications using Hibernate ORM framework.
c) Develop server side programs using Servlets.

d) Develop Java Server Pages application using JSP tags.
e) Develop networked applications in java using using network protocols, socket programming, and related technologies.
f) Develop of simple web service applications using Java technologies.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (CI+T/2+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
C	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: CI-Class Room Instructions; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit, CA - Continuous Assessment; ESE - End Semester Examination.

5. SUGGESTED PRACTICAL EXERCISES

The following practical outcomes (PrOs) that are the sub-components of the COs. Some of the **PrOs** marked **'*'** are compulsory, as they are crucial for that particular CO. These PrOs need to be attained at least at the 'Precision Level' of Dave's Taxonomy related to 'Psychomotor Domain'.

Sr. No	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Req
1	Develop a database application that uses any JDBC driver	I	2
2	Write a program to present a set of choice for user to select a product &display the price of produc Develop a program to present a set of choice for user to select a product and display the price of product.	I	2
3	Develop a simple hibernate Web Application that displays all records stored in a student table having attributes student_id, student_name and student_branch.	II	2
4	Develop a simple hibernate Web Application that displays total number of employees in an organization with its maximum,	II	2

	minimum, total and average salary of employees.		
5	Write an HTML code to create login form having one submit button, two textboxes labeled as Login name and Password as respectively. Write a Servlet class named as ReadParameter to read these two parameters and display entered parameters values on the page using doGet() or doPost() method when user clicked on submit button.	III	2
6	Create a java application to call one servlet from another servlet.	III	2
7	Create a web form which processes servlet and demonstrates use of cookies and sessions.	III	2
8	Develop a simple JSP program for user registration and then control will be transfer it into second page.	IV	2
9	Develop a JSP program to display the grade of a student by accepting the marks of five subjects.	IV	2
10	Develop a JSP application to insert, update and display record in MySQL database. (Assume suitable database)	IV	2
11	Develop a student login application using MVC architecture. Create StudentLogin.jsp, StudentLoginController, StudentLoginDAO and StudentLoginModel and display whether student gets successfully logged in or not.	IV	2
12	Write a client server program where client sends two numbers and server responds with square of them.	V	2
13	Develop chat application using socket programming.	V	2
14	Develop a SOAP web service that prints your name using eclipse.	VI	2

Note

i. More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list**.**

ii. The following are some **sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above listed **Practical Exercises** of this course required which are embedded in the COs and ultimately the competency.

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
1	Understanding of problem statement.	20
2	Design/Develop/Implement Program/application.	20

3	Execution of the program/application and answer to the sample questions.	20
4	Correctness of the program/application.	20
5	Readability and documentation of the program/application.	20
Total		**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS AND SOFTWARE REQUIRED

These major equipment/instruments and Software required to develop PrOs are given below with broad specifications to facilitate procurement of them by the administrators/management of the institutes. This will ensure conduction of practical in all institutions across the state in proper way so that the desired skills are developed in students.

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	Computer with latest configuration with Windows/Linux/Unix Operating System.	All
2	JDK (Java Development Kit) Version 8 or above	All
3	Apache Tomcat Version 8 or above	All
4	Any editor - Notepad++, Visual Studio Code, Eclipse IDE, NetBeans IDE	All

7. AFFECTIVE DOMAIN OUTCOMES

The following **sample** Affective Domain Outcomes (ADOs) are embedded in many of the above-mentioned COs and PrOs. More could be added to fulfil the development of this competency.

a) Motivation and Attitude towards learning
b) Learning Methodology and Communication styles
c) Use of technology
d) Work as a leader/a team member.
e) Follow ethical practices.

The ADOs are best developed through the laboratory/field-based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

i. 'Valuing Level' in 1st year
ii. 'Organization Level' in 2nd year.
iii. 'Characterization Level' in 3rd year.

8. UNDERPINNING THEORY

The major Underpinning Theory is formulated as given below and only higher level UOs of *Revised Bloom's taxonomy* are mentioned for development of the COs and competency in the students by the teachers. (Higher level UOs automatically includes lower level UOs in them). If required, more such higher level UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	**Major Learning Outcomes (in cognitive domain)**	**Topics and Sub-topics**
Unit 1 **Java Data Base Connectivity (JDBC)**	1a Describe the basics of JDBC and its connectivity 1b Develop program using JDBC to query a database and modify it 1c Explain different types of JDBC drivers and their advantages and disadvantages	1.1 Introduction, JDBC Architecture – 2 tier, 3 tier, JDBC Components 1.2 JDBC API : The Statement Interface, PreparedStatement, CallableStatement The ResultSet Interface, Transaction processing – commit, rollback, savepoint. Creating simple JDBC Application – (CRUD operations) 1.3 JDBC drivers, Advantages and Disadvantages of JDBC
Unit 2 **Hibernate**	2a Illustrate architecture of Hibernate 2b Setting up environment for Hibernate 2c. Implementing O/R Mapping in Hibernate	2.1 Introduction to Hibernate, Exploring the Hibernate Architecture. 2.2 Downloading, installing and setting up development environment for hibernate, Exploring HQL. 2.3 Understanding O/R Mapping in Hibernate, Working with Hibernate O/R Mapping – Developing Hibernate configuration file, Hibernate mapping file and Java Beans
Unit 3 **Servlets**	3a Implementing and deploying servlets on Tomcat server. 3b Develop applications at various scopes of Servlet programming. 3c Illustrate session tracking mechanisms using servlet	4.1 Introduction to Servlets, Life Cycle of Servlet.Creating, configuring and deploying echo servlet on Tomcat Server 4.2 Parameters and Attributes – HttpServletRequest Interface, ServletContext and ServletConfig Interface, Request Delegation – RequestDispatcher Interface. 4.3 Exploring Session Tracking Mechanisms. 4.4 Connecting and reading database/table

	3d Reading database records using Servlet API	records and displaying them using servlet , Advantages and Disadvantages of Servlet
Unit 4 **Java Server Pages**	4a Overview of JSP Technology 4b Implementing JSP Elements in JSP Page 4c Retrieving data from database using JSP	4.1 Introduction to JSP, Architecture of JSP, JSP Lifecycle. 4.2 JSP Elements – Directives, Scripting Elements (Declarations, Expressions and Scriptlets), Action Tags. 4.3 Simple JSP program to fetch database records, Compare JSP and Servlets
Unit 5 **Network Programming with Java**	5a Describe Networking Fundamentals in Java 5b Develop applications for client server communication.	5.1 Network Programming With java.net Package- InetAddress class, URL class, URLConnection class. 5.2 Establishing two way communication between Server and Client - TCP/IP client sockets, TCP/IP server sockets .
Unit 6 **Java Web Services**	6a Overview of Web Services 6b Implementing web services using eclipse IDE	6.1 Introduction to web services, Webservice architecture, functions of webservice 6.2 Components of Web Service – SOAP, UDDI, WSDL 6.3 Implement HelloWorld SOAP webservice using eclipse.

Note: The UOs need to be formulated at the 'Application Level' and above of Revised Bloom's Taxonomy' to accelerate the attainment of the COs and the competency.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Java Data Base Connectivity (JDBC)	7	4	4	4	12
II	Hibernate	8	3	4	5	12
III	Servlets	10	4	4	6	14
IV	Java Server Pages	9	4	4	6	14
V	Network Programming with Java	4	2	3	5	10
VI	Java Web Services	4	2	3	3	8
Total		**42**	**19**	**22**	**29**	**70**

Legends: R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)

Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions assess the attainment of the UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co- curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare small reports (of 1 to 5 pages for each activity). For micro project report should be as per suggested format, for other activities students and teachers together can decide the format of the report. Students should also collect/record physical evidences such as photographs/videos of the activities for their (student's) portfolio which will be useful for their placement interviews:

a) Undertake micro-project web development in teams.

b) Discover various advancement in technologies of java with their new features

c) Prepare charts to explain use/process of the identified topic.

d) Students are encouraged to register themselves in various MOOCs such as: Swayam, edX, Coursera, Udemy etc. to further enhance their learning.

e) Encourage students to form a coding club at institute level and can help the slow learners.

f) Encourage students to interact with the industry person to discuss and gather information of current trends, models, documentation, testing methods and different tools used in industry.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.

b) Guide student(s) in undertaking micro-projects.

c) Managing Learning Environment

d) Diagnosing Essential Missed Learning concepts that will help for students.

e) Guide Students to do Personalized learning so that students can understand the course material at his or her pace.

f) Encourage students to do Group learning by sharing so that teaching can easily be enhanced.

g) ***'CI" in section No. 4*** means different types of teaching methods that are to be employed by teachers to develop the outcomes.

h) About ***20% of the topics/sub-topics*** which are relatively simpler or descriptive in nature is to be given to the students for ***self-learning***, but to be assessed using different assessment methods.

i) With respect to ***section No.10***, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.

j) Guide students on how to address issues on environment and sustainability using the knowledge of this course

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group- based (group of 3 to 5). However, **in the fifth and sixth semesters**, the number of students in the group should **not exceed *three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total work load on each student due to the micro-project should be about **16 (sixteen) student engagement hours** (i.e., about one hour per week) during the course. The students ought to submit micro-project by the end of the semester (so that they develop the industry-oriented COs).

A suggestive list of micro-projects is given here. This should relate highly with competency of the course and the COs. Similar micro-projects could be added by the concerned course teacher:

1. Online Chatbot for Customer Support
2. Car Rental System
3. Online Doctor Appointment System
4. Online Food Ordering System
5. Social Networking System
6. Library Management System

7. Online Pharmacy System
8. Online Art Gallery System
9. Online Plant Nursery System
10. Online Crime Reporting System
11. Chat Application
12. Online Weather Forecasting System
13. Online Hospital Management System
14. Online Legal Services Platform
15. Online Personalized Nutrition System

13. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	JAVA SERVER PROGRAMMING Java EE 7 (J2EE 1.7), Black Book	DREAMTECH PRESS	DREAMTECH PRESS
2	J2EE: The complete Reference	James Edward Keogh	McGraw Hill Education
3	THE COMPLETE REFERENCE JSP 2.0	PHIL HANNA	BPB
4	Complete Reference Java 2	Herbert Schildt	McGraw Hill Education

14. SUGGESTED LEARNING WEBSITES

i) Hibernate
https://www.tutorialspoint.com/hibernate/index.htm
https://www.javacodegeeks.com/hibernate-tutorials
ii) JDBC Database Access
https://docs.oracle.com/javase/tutorial/jdbc/

https://www.javacodegeeks.com/jdbc-tutorials
iii) Servlet Technologies
http://www.oracle.com/technetwork/java/index-jsp-135475.html
https://www.javacodegeeks.com/java-servlet-tutorials
iv) Java Server Pages
http://www.oracle.com/technetwork/java/javaee/jsp/index.html
https://www.javacodegeeks.com/jsp-tutorials
v) Networking with java
https://www.geeksforgeeks.org/socket-programming-in-java/
https://examples.javacodegeeks.com/java-socket-programming/
vi)Web services
https://www.geeksforgeeks.org/what-are-web-services/
https://java2blog.com/soap-web-service-example-in-java-using/
vii)The Java EE 6 Tutorial
https://docs.oracle.com/javaee/6/tutorial/doc/bnafd.html

15. PO-COMPETENCY-CO MAPPING

Semester V	Web based Java Programming (Course Code:)									
	POs and PSOs									
Competency & Course Outcomes	**PO 1 Basic & Discipline specific knowledge**	**PO 2 Problem Analysis**	**PO 3 Design/ development of solutiOns**	**PO 4 Engineering Tools, Experimentation &Testing**	**PO 5 Engineering practices for society, sustainability & environment**	**PO 6 Project Management**	**PO 7 Life-long learning**	**PSO 1**	**PSO 2**	**PSO 3 (If needed)**
Competency Develop java web based applications using Servlet, JSP and Hibernate.										
Course Outcomes CO a) Implement basic database operations using JDBC	3	2	2	3	-	2	2			
CO b) Develop database-driven Java applications using Hibernate ORM framework	3	2	2	3	-	2	2			
CO c) Develop server side programs using Servlets.	3	3	2	3	-	2	2			
CO d) Develop Java Server Pages application using JSP tags	3	3	2	3	-	2	2			
CO e) Develop networked applications in java using using network protocols, socket programming, and related technologies.	3	2	2	2	-	2	2			
CO f) Develop of simple web service applications using Java technologies	3	3	2	3	-	2	2			

Legend: '**3'** for high, '**2**' for medium, **'1'** for low or **'-'** for the relevant correlation of each competency, CO, with PO/ PSO

16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons

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