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
Computer Science and Engineering	5th Semester

1. RATIONALE

This course provides the knowledge necessary to understand java and develop dynamic web pages using java server page (JSP), Servlet. It covers the basic underlying concepts and techniques recently used in the IT industry. After going through this course student will be able to do Web Development and Desktop Application Development.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop required skills in the students so that they are able to acquire following competency:

- **Develop Graphical User Interface applications in JAVA, Servlet and JSP"**

3. COURSE OUTCOMES (COs)

The student will develop underpinning knowledge, adequate programming skills of competency for implementing various applications using java programming language to attain the following course outcomes.

a) Write code for simple java applets for given problem statements
b) Develop applications using Abstract Window Toolkit
c) Develop programs using JDBC to retrieve, insert, update and delete the data to and from the databases
d) Develop server-side programs using Servlets
e) Develop Java Server Pages applications using JSP Tags

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.*

5. SUGGESTED PRACTICAL EXERCISES:

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

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	• Create an applet that display welcome message at the Centre of applet. • Draw five red circles in a vertical column in the center of the applet.	I	2
2	Develop an applet that draws a circle. The dimension of the applet should be 500 x 300 pixels. The circle should be centered in the applet and have a radius of 100 pixels. Display your name centered in a circle.(using drawOval() method)	I	2
3	• Write a program to use TextField control to display your name. • Develop a program that receive two numeric values as inputs from the user and display the addition of these two numbers.	II	2
4	Develop a program that has only one button in the frame, clicking on the button cycles through the colors: red->green->blue and so on. One color changes per click.(use getBackGround() method to get the current color)	II	2
5	Create an application that displays a frame with a menu bar. When a user selects any menu or menu item, display that selection on a text area in the center of the frame	II	2
6	Develop a database application that uses any JDBC driver to display all records.	III	2
7	Develop a Graphical User Interface that performs the following SQL operations: a) Insert b) Delete.	III	2
8	Develop a program to present a set of choice for user to select a product and display the price of product.	III	2
9	Develop a simple servlet program which maintains a counter for the number of times it has been accessed since its loading, initialize the counter using deployment descriptor.	IV	2
10	Create a web form which processes servlet and demonstrates use of cookies and sessions.	IV	4
11	Write the simple JSP program to print “Hello”.	V	1

12	Write the JSP script to determine how many times the visitors has load the page.	V	1
13	Develop a simple JSP program for user registration and then control will be transfer it into second page.	V	2
14	Develop a JSP program for user loin form with MySQL database.	V	2
	Total		**28**

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	Correctness of the program/application	30
2	Readability and documentation of the program/application	10
3	Design/Develop/Implement Program/application – Write code, integrate subsystems	20
4	Debugging ability – Perform unit testing, Test and validate program/application	20
5	Execution of the program/application and answer to the sample questions.	20
Total		**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS 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.

Sr.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, MySQL	
3	Any editor - Notepad++, Visual Studio Code, Eclipse IDE, NetBeans IDE	

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 fulfill the development of this competency.

a) Work as a Java Developer
b) Motivation and Attitude towards learning
c) Learning Methodology and Communication styles
d) 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:

Only the major Underpinning Theory is formulated as higher-level UOs of *Revised Bloom's taxonomy* in order development of the COs and competency is not missed out by the students and teachers. If required, more such higher-level UOs could be included by the course teacher to focus on the attainment of COs and competency.

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Unit – I **Java Applets**	1.1 Explain concept of applet life cycle 1.2 Differentiate applet and application 1.3 Develop code for simple Java applets 1.4 Explain applet tag and its parameter 1.5 Use the methods of the applet and component classes required for a basic applet	1.1.1 Applet Programming • Define Applet • Types of Applets: local and remote applets • Applet life cycle 1.2.1 Difference between applet and application 1.3.1 Developing executable applet code 1.4.1 Web Page Design • Applet tag • adding applet to HTML file • Running the applet • Passing parameter to applet • Various methods and component classes to develop basic applet
Unit – II **Abstract Window Toolkit (AWT)**	2.1 Describe the classes in the AWT package that relate to the applet class 2.2 Describe the AWT graphics explain controls and how to apply them in the container 2.3 Develop simple programs using event class and event listener interface	2.1.1 Abstract Window Toolkit (AWT) • Classes hierarchy • Windows fundamentals 2.1.2 Frame Windows • Creating a frame window in applet canvas • Creating windows program 2.2.1 Graphics-AWT Controls • Labels

		• TextField • Push buttons 2.2.2 Layout Managers • Flow Layout • Border Layout • Grid Layout • Card Layout 2.2.3 Developing Graphical User Interface using Swing • JApplet • JLabel • JTextField • JButton • JcheckBox • JRadioButton • JComboBox • Menus 2.3.1 Event Classes • MouseEvent Class • ActionEvent Class • WindowEvent Class 2.3.2 Event Listner Interface • MouseListener • ActionListener • WindowListener • KeyListner
Unit – III Java Data Base Connectivity (JDBC)	3.1 Describe the basics of JDBC and its connectivity 3.2 Explain different types of JDBC drivers and their advantages and disadvantages 3.3 Develop program using JDBC to query a database and modify it	3.1.1 Two-Tier Database Design 3.1.2 Three-Tier Database Design 3.1.3 The JDBC API • The API components, • Database operations like creating tables, CRUD(Create, Read, Update, Delete) operations using SQL 3.2.1 JDBC drivers 3.2.2 JDBC- advantages and disadvantages 3.3.1 JDBC-ODBC bridge 3.3.2 Develop java program using JDBC
Unit– IV Servlets	4.1 Describe life cycle of servlet 4.2 Develop program using javax.servlet package	4.1.1 The life cycle of a servlet 4.1.2 The Java Servlet Development Kit

		4.1.3 The Simple Servlet • Create and compile servlet source code • Start a web browser and request the servlet • Example of echo servlet and deployment in tomcat server 4.2.1 The javax.servlet Package reading database/table records and displaying them using servlet
Unit– V Java Server Pages (JSP)	5.1 Explain the architecture of JSP and its life cycle 5.2 Develop simple programs using Java Server Pages tags	5.1.1 Relation of Applets and Servlets with JSP 5.1.2 JSP Scripting Elements 5.1.3 JSP Expressions 5.1.4 Difference between JSP and Servlet 5.2.1 JSP Declarations 5.2.2 Simple JSP program to fetch database records

***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 QUESTIONPAPER DESIGN: NA

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Java Applets	09	4	4	4	12
II	Abstract Window Toolkit (AWT)	11	6	8	7	21
III	Java Data Base Connectivity (JDBC)	06	4	4	4	12
IV	Servlets	08	5	5	5	15
V	Java Server Pages (JSP)	08	2	3	5	10
Total		**42**	**21**	**24**	**25**	**70**

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

***Note**: This specification table provides general guidelines to assist students 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 slightly from the 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-projects in teams
b) Explore different application development using java web application technologies/ tools and frameworks.
c) Prepare charts to explain use/process of the identified topic
d) Give a seminar on any relevant topics
e) Students are encouraged to register themselves in various MOOCs such as: Swayam, edX, Coursera, Udemy etc. to further enhance their learning
f) https://java-iitd.vlabs.ac.in/ this website provides virtual lab and gives simulation of java programs
g) https://www.codechef.com this website gives competitive programming problems; students are expected to solve examples and crosscheck with output
h) Encourage students to form a coding club at institute level and can help the slow learners

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

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/subtopics.
b) Guide student(s) in undertaking micro-projects.
c) Encourage students to do Group learning by sharing so that teaching can easily be enhanced.
d) ***'L' in section No. 4***means different types of teaching methods that are to be employed by teachers to develop the outcomes.
e) 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.
f) With respect to ***section No.10***, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
g) Guide students on how to address issues on environment and sustainability using the knowledge of this course

12. SUGGESTED PROJECT LIST

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. However, in the fifth and sixth semesters, it should be preferably be ***individually*** undertaken to build up the skill and confidence in every student to become problem solver so that

s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, 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 a dated work diary consisting of individual contributions in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course. The student ought to submit a micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

1) Hotel management System
2) Super market Billing system
3) Student Record Keeping System
4) Library management system
5) Number Guessing System
6) Stock management system
7) Airline reservation system
8) Inventory Management System
9) Electricity billing system
10) Healthcare management system
11) Bank management system
12) Medical management system
13) Quiz management system
14) Survey System
15) Online Shopping System
16) Chess Game
17) Online Voting System

13. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	Complete Reference Java 2 TMH	Herbert Schildt	TMH
2	Core Java Volume-I Fundamentals	Cay S. Horstmann Gary Cornell	Pearson
3	Introduction to Java Programming	Y. Daniel Liang	Pearson
4	Java Programming Cook Book	Herbert Schildt	MGH
5	Unleashed Java 2 Platform	Jamie Jaworski	Sams Techmedia
6	Java Swing	Obert Eckstein, Marc Loy, Dave Wood	O'Reilly Media

14. SOFTWARE/LEARNING WEBSITES

a) https://www.javatpoint.com/servlet-tutorial
b) https://www.geeksforgeeks.org/introduction-to-java-swing/
c) https://www.tutorialspoint.com/
d) https://nptel.ac.in/
e) https://docs.oracle.com/javase/tutorial/jdbc/
f) https://www.oracle.com/java/technologies/jspt.html
g) https://www.youtube.com/playlist?list=PLbRMhDVUMngcx5xHChJ-f7ofxZI4JzuQR

15. PO-COMPETENCY-CO MAPPING:

Semester II	Advanced Java Programming (Course Code: 4XXXXXX)						
	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
Competency Students acquire the ability to assess and analyze outcomes produced by machine learning algorithms and models, while enhancing their capacity for critical thinking in addressing practical challenges.							
Course Outcomes CO a) Write code for simple java applets for given problem statements	1	-	2	1	-	-	1
CO b) Develop applications using Abstract Window Toolkit	1	2	2	1	-	1	2
CO c) Develop programs using JDBC to retrieve, insert, update and delete the data to and from the databases	1	2	2	1	-	1	2
CO d) Develop server-side programs using Servlets	1	2	2	2	1	1	2
CO e) Develop Java Server Pages applications using JSP Tags	1	2	2	2	1	1	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

Sr. No.	Name and Designation	Institute	Contact No.	Email
1	Ms. Manisha P. Mehta HOD	Government Polytechnic Himatnagar	9879578273	manishamehtain@gmail.com
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