Program Name : Computer Engineering Program Group

Program Code : CO/CM/IF/CW

Semester : Fifth

Course Title : Advanced Java Programming

Course Code : 22517

1. RATIONALE

Java technology is widely used for web applications development. Based on the object oriented concepts and core Java concepts, this course will equip the students with the required knowledge and skill of object oriented programming approach needed for the development of robust, powerful web applications. Through this course studentswill get hands-on experience on GUI Technologies viz. AWT and Swings, event handling mechanisms and network programming. The course also gives coverage to various web applications aspects like Database Interaction, server side components and servlets.

2. COMPETENCY

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

* **Develop web and stand-aloneapplications usingadvanced concepts of Java.**

3. COURSE OUTCOMES (COs)

The theory, 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:

a) Develop programs using GUI Framework (AWT and Swing).
b) Handle events of AWT and Swings components.
c) Develop programs to handle events in Java Programming.
d) Develop Java programs using networking concepts.
e) Develop programs using database.
f) Develop programs using Servlets.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
					Theory						Practical					
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	1	2	6	2	70*#	28	30*	00	100	40	25#	10	25	10	50	20

(*): Under the theory PA; Out of 30 marks, 10 marks of theory PA are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs.
***Legends:** L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** -Practical; **C** – Credit, **ESE** -End Semester Examination; **PA** - Progressive Assessment.*

5. COURSE MAP(with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the

course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

Figure 1 - Course Map

6.   SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs(i.e. sub-components of the COs) to be developed andassessed in the student for the attainment of the competency.

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1.	Write a program to demonstrate the use of AWT components like Label,Textfield, TextArea, Button, Checkbox, RadioButton etc.	I	02*
2.	Write a program to design a form using the components List and Choice.	I	02*
3.	Write a program to design simple calculator with the use of GridLayout	I	02*
4.	Write a program to create a two-level card deck that allows the user to select component of Panel using CardLayout		02*
5.	Write a program using AWT to create a menubar where menubar contains menu items such as File, Edit, View and create a submenu		02*

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
	under the File menu: New and Open.		
6.	Write a program using swing to display a ScrollPane and JcomboBoxin an Japplet with the items – English, Marathi, Hindi, Sanskrit.	II	02*
7.	Write a program to create a Jtree.	II	02*
8.	Write a program to create a JTable.	II	02
9.	Write a program to launch a JProgressBar	II	02
10.	Write a program to demonstrate status of key on Applet window such as KeyPressed, KeyReleased, KeyUp, KeyDown	III	02*
11.	Write a program to demonstrate various mouse events using MouseListener and MouseMotionListener interface	III	02*
12.	Write a program to demonstrate the use of JTextField and JPasswordField using Listener Interface	II	02*
13.	Write a program to demonstrate the use of WindowAdapter class.	III	02
14.	Write a program to demonstrate the use of InetAddress class and its factory methods.	IV	02*
15.	Write a program to demonstrate the use of URL and URLConnection class and its methods	IV	02*
16.	Write a program to implement chat Server using ServerSocket and Socket class.	IV	02
17.	Write a program to demonstrate use of DataGramSocket and DataGram Packet	IV	02
18.	Write a program to insert and retrieve the data from database using JDBC	V	02*
19.	Write a program to demonstrate the use of PreparedStatement and ResultSet interface	V	02
20.	Write a program to update and delete a record from a database table.	V	02
21.	Write a program to demonstrate the use of HttpServlet as a parameterized Servlet	VI	02
22.	Write a Servlet program to send username and password using HTML forms and authenticate the user	VI	02*
23.	Write a program to create Session using HttpSession class	VI	02
24.	Write a program to implement Session tracking using Cookies.	VI	02

Note

i. A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicial mix of minimum 14 or more practical need to be performed, out of which, the practicals marked as '*' are compulsory, so that the student reaches the 'Application Level' of Bloom's Taxonomy' as generally required by the industry.

ii. It is advisable to conduct 50% of the practicals using ASCII text editor and compilation on command prompt so as to enhance fundamental understanding of basic concepts and syntax. The IDEs must be Introduced at later stage.

iii. The 'Process' and 'Product' related skills associated with each PrO are to be assessed according to a suggested sample given below:

Sr. No.	Performance Indicators	Weightage in %
1	Logic Building and Coding	50
2	Testing and Debugging of the Program.	30
3	Correctness of ProgramOutput.	10
4	Submission of practical assignment in time.	10
	Total	**100**

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

    a. Follow safety practices.
    b. Practice good housekeeping.
    c. Work as a leader/a team member.
    d. Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year and
- 'Characterising Level' in 3rd year.

7.   MAJOR EQUIPMENT/ INSTRUMENTSREQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	PrONo.
1	Computer with JDK1.5 or above ,any IDE for Java Programming such as Eclipse, Jcreator, NetBeans.	All
2	Databases like MySQL, Oracle, MS-Access or any other	18,19,20
3	Apache Tomcat web server version 7 orhigher.	21-24

8.   UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Abstract Windowing Toolkit(A WT)	1a. Develop Graphical user interface (GUI) programs using AWT components for the given problem. 1b. Create Frame window with the specified AWT components. 1c. Arrange the GUI components using specified layout manager. 1d. Develop a program using menu and Dialog Boxes for the given problem.	1.1 Component, container, window, frame, panel. 1.2 Creating windowed programs and applets. 1.3 AWT controls and layout managers:use of AWT controls: labels, buttons,checkbox,checkbox group, scroll bars, text field, text area. 1.4 Use of layout managers: flowLayout, borderlayout.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
		gridLayout, cardLayout, gridbagLayout, menubars, menus, dialog boxes, file dialog.
Unit-II Swings	2a. Differentiate between AWT and Swing on the given aspect. 2b. Develop Graphical user interface (GUI) programs using swing components for the given problem. 2c. Use the given type of button in Java based GUI. 2d. Develop Graphical user interface (GUI) programs using advanced swing components for the given problem.	2.1 Introduction to swing:Swing features, Difference between AWT and Swing. 2.2 Swing Components: JApplet,Icons and Labels, Text Fields, Combo Boxes. 2.3 Buttons: The JButton, Check Boxes, Radio Buttons. 2.4 Advanced Swing Components: Tabbed Panes, Scroll Panes, Trees, Tables, Progress bar, tool tips. 2.5 MVC Architecture.
Unit– III Event Handling	3a. Use delegation event model to develop event driven program for the given problem. 3b. Use relevant AWT/ swing component(s) to handle the given event. 3c. Use Adapter classes in Java program to solve the given problem. 3d. Use inner classes in java program to solve the given problem.	3.1 The delegation Event Model:Event sources, Event listeners 3.2 Event classes: The Action Eventclass, the Item Event class, the Key Event class, theMouse Event class, the Text Event class, the Window Event class. 3.3 Adapter classes. 3.4 Inner classes. 3.5 Event listener interfaces:ActionListener Interface, ItemListener Interface, KeyListener Interface, MouseListenerInterface, MouseMotion Interface, TextListener Interface, WindowsListener Interface.
Unit– IV Networking Basics	4a. Use InetAddress class to know the IP address of the given host name. 4b. UseURLConnection classes to read and write data to the specified resource referred by the given URL. 4c. Develop program forClient/Server communicationthrough TCP/IP Server sockets for the given problem. 4d. Write program to illustrate theClient/Server communication using datagram protocol for the given problem.	4.1 Socket Overview:Client/Server , Reserved Sockets , Proxy Servers , Internet Addressing. 4.2 Java and the Net:The Networking Classes and interfaces. 4.3 InetAddress : Factory Methods , Instance Methods. 4.4 TCP/IP Client Sockets : Whois 4.5 URL: Format, The URI Class. 4.6 URLConnection : TCP/IP Server Sockets . 4.7 Datagrams : DatagramPacket , Datagram Server and Client .
Unit –V Interacting with	5a. Choose JDBC or ODBC depending on the given application requirement.	5.1 Introduction to JDBC, ODBC 5.2 JDBC Architecture: Two tier and three tier mode

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Database	5b. Explain function of the given tier of JDBC architecture for two tier/three tier models. 5c. Use relevant type of JDBC Driver for thespecified environment. 5d. Elaborate steps with exampleto establish connectivity with the specifieddatabase.	5.3 Types of JDBC Drivers 5.4 Driver Interfaces and Driver Manager class:Connection InterfacenStatementInterface, Prepared Statement Interface, ResultSet Interface 5.5 The essential JDBC Program
Unit –VI Servlets	6a. Explain function of the given method of Servlet life cycle. 6b. Use relevant Generic servlet to develop given web based application. 6c. Use relevant HTTP servlet to develop specified web based application. 6d. Develop servlet for cookies and session tracking to implement the given problem.	6.1 The Life Cycle of a Servlet 6.2 Creating simpleServlet:The Servlet API, javax.servlet Package, Servlet Interface, ServletConfig Interface , ServletContext Interface, ServletRequest Interface, ServletResponse Interface, GenericServlet Class 6.3 The javax.servlet.httpPackage:HttpServletRequest Interface , HttpServletResponse Interface,HttpSession Interface , Cookie Class. HttpServlet Class. HttpSessionEvent Class . HttpSessionBindingEvent Class. 6.4 Handling HTTP Requests and Responses Handling HTTP GET RequestsHandling HTTP POST Requests. 6.5 Cookies andSession Tracking.

Note:To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.

9.   SUGGESTED SPECIFICATION TABLE FORQUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Abstract Windowing Toolkit(AWT)	08	02	04	06	12
II	Swings	08	02	02	06	10
III	Event Handling	08	02	02	08	12
IV	Networking Basics	06	02	04	04	10
V	Interacting with Database	08	02	04	06	12
VI	Servlets	10	04	04	06	14
	Total	**48**	**14**	**20**	36	

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

Note*: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of LOs. 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 reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a)   Prepare journals based on practical performed in laboratory.
b)   Follow coding standards.
c)   Develop variety of programs to improve the logical skills.
d)   Develop Application oriented real world programs.
e)   Prepare power point presentation depicting differentadvanced concepts in Java.

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/sub topics.
b)   ***'L' in item No. 4*** does not mean only the traditional lecture method. but different types of teaching methods and media that are to be employed to develop the outcomes.
c)   About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).
d)   With respect to item No.10, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
e)   Use different Audio Visual media for Concept understanding.
f)   Guide student(s) in undertaking micro-projects.
g)   Demonstrate students thoroughly before they start doing the practice.
h)   Observe continuously and monitor the performance of students in Lab.

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. 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 dated work diary consisting of individual contribution 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 micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects would be added by the concerned faculty:

a)   Energy Billing System: Expected to develop bill amount module based on usage of energy consumption.
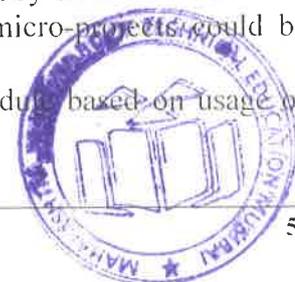
b) Medical Store stock Management System: Expected to develop an Inventory module.
c) Library book issue Management System.
d) Restaurant Management System: Expected to develop a module to place an order and generate bill.
e) Online Bus ReservationSystem: Expected to develop Ticket booking module.

Follow the below given guidelines for micro projects:
i. Must implement concepts of AWT or SWING andEvent Handling.
ii. UseJDBC concepts.
iii. UseServlet.

13.   SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1.	Complete Reference	Schildt, Herbert	Mcgraw Hill Education, New Delhi ISBN:9789339212094
2.	Java 2 Programming Black Book	Holzner, Steven et al.	Dreamtech Press, New Delhi ISBN 10: 817722655X/ ISBN 13: 9788177226553
3.	Java Server Programming Tutorial JAVA EE6 Black Book	Kogent Learning Solutions	Dreamtech Press, New Delhi ISBN :978-81-7722-937-0

14.   SOFTWARE/LEARNING WEBSITES
a) https://www.tutorialspoint.com/java
b) http://nptel.ac.in/courses/106105084/30
c) https://www.javatpoint.com/servlet-tutorial
d) https://www.tutorialspoint.com/servlets
e) https://www.javatpoint.com/free-java-projects
f) http://1000projects.org/java-projects.html