



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING  
FACULTY OF ENGINEERING AND TECHNOLOGY  
UNIVERSITY OF LUCKNOW**

**Course Structure and Syllabus**

**For**

**BACHELOR OF COMPUTER APPLICATION  
(BCA)**

**2<sup>nd</sup> Year**

**as per**

**NEP-2020**

**(To be effective from the session 2024-2025)**

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# BACHELOR OF COMPUTER APPLICATION (BCA)

**YEAR: SECOND, SEMESTER-IV**

(To be effective from the session 2024-2025)

S. No.	Paper Code	Subject	Periods			Evaluation Scheme				Sub Total	Credit
			L	T	P	Sessional Exam			Exam ESE		
						CT	TA	Total			
1.	NBCA-401	Advance Java Technology	3	1	0	20	10	30	70	100	4
2.	NBCA-402	Design and Analysis of Algorithm	3	1	0	20	10	30	70	100	4
3.	NBCA-403	Web Design Concepts	3	1	0	20	10	30	70	100	4
4.	NBCA-404	Computer Graphics	3	1	0	20	10	30	70	100	4
5.	NBCA-405	Managerial Economics	3	0	0	20	10	30	70	100	3
<b>Practical</b>											
6.	NBCA-406P	Advance Java Technology Lab	0	0	3		20	20	30	50	2
7.	NBCA-407P	Web Design Lab	0	0	3		20	20	30	50	2
8.	NBCA-408P	Computer Graphics Lab	0	0	2		20	20	30	50	1
9.	NBCA-GP	General Proficiency	-	-	-		-	--	-	50	
		<b>Total</b>	<b>15</b>	<b>4</b>	<b>8</b>					<b>650</b>	<b>24</b>

**Note:**

1. After Examination of Semester-IV, the Industrial Project based Training (04 to 06 weeks) to be conducted during summer break, and will be assessed during V semester (BCA Degree Programme). The training may be carried out at some industrial unit or under the guidance of faculty member of the institution.
2. If the student leaves the programme after completing Semester-IV successfully, student will be awarded a **Diploma in Computer Application**.

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## ADVANCE JAVA TECHNOLOGY

L	T	P
3	1	0

**Course Outcomes (COs):**

After the successful completion of the course student will be able to:

- Understand Server Side Architecture of Web Applications.
- Connect to Database and do the CRUD Database operations using JDBC.
- Develop Web Application by using Servlets and JSP.
- Manage Session in the web application.

**Unit-I** **08**

**Java Programming Language:** Introduction to Java Programming, Operator, Data type, Variable, Arrays, Control Statements, Methods & Classes, Package and Interface, Polymorphism, Inheritance, Exception Handling, Multithread programming, Input / Output: exploring Java.io, Java Applet, String handling, Networking, Event handling.

**Unit-II** **08**

**Introduction to AWT:** AWT Controls, Graphics, Layout Manager and Menus, Images, Additional packages. **Java Swing:** Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and feel. Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box, Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes.

**Unit-III** **08**

**JDBC:** The connectivity Model, JDBC/ODBC Bridge, Understanding with MySql, JDBC Driver Setup, Create Connection, Write Statement, Create Login/Logout, Insert/Update/Delete. **Java Servlets:** Introduction to Servlets, Servlet life cycle, Servlet containers, Servlet Configurations and Parameters, Initialization parameters, Context parameters, Handling Form Data, GET and POST methods, HTML forms and servlets.

**Unit-IV** **08**

**JavaServer Pages (JSP):** Introduction to JSP, JSP life cycle, JSP expressions and declarations, Directives and Actions, Page directives, JSP actions and implicit objects, JSP Tag Libraries, Standard and Custom Tag Libraries, Expression Language (EL).

**Unit-V** **08**

**Session Management:** HttpSession and Cookies, Managing user sessions, Cookie handling. **Enterprise JavaBeans (EJB):** Introduction to EJB, Session beans, entity beans, and message-driven beans, EJB containers.

**Text Book:**

1. James Rumbaugh et al, "Object Oriented Modeling and Design", PHI
2. Balagurusamy E, "Programming in JAVA", Tata Mcgraw-hill Education Pvt. Ltd.
3. Herbert Schildt, "The Complete Reference: Java" TMH

**Reference Books:**

1. Dustin R. Callway, "Inside Servlets", Addison Wesley.
2. Mark Wutica, "Java Enterprise Edition", QUE.
3. Steven Holzner, "Java2 Black book", Wiley Dreamtech Publication.
4. Liang, "Introduction to Java Programming, Comprehensive Version", Pearson Education.
5. Deitel and Deitel, "Java: How to Program" PHI Learning Private Limited, Delhi India.

## DESIGN AND ANALYSIS OF ALGORITHM

L	T	P
3	1	0

**Course Outcomes (COs):**

After the successful completion of the course student will be able to:

- Implementation of various sorting algorithm and their comparisons.
- Analyse the concept of Divide & Conquer and Greedy techniques.
- Implementation of Dynamic Programming concept in solving various problems.
- Understand the concepts such as NP-completeness and randomized algorithms.

**Unit-I**

08

**Introduction:** Algorithms, analyzing algorithms, complexity of algorithms, growth of functions, performance measurements, sorting and order statistics - shell sort, quick sort, merge sort, heap sort, comparison of sorting algorithms, and sorting in linear time.

**Unit-II**

08

**Advanced Data Structures:** Red-Black trees, B – trees, Binomial Heaps, Fibonacci Heaps.

**Unit-III**

08

**Design and Analysis Technique:** Divide and Conquer Sorting, Greedy methods with examples such as Optimal Reliability Allocation, Knapsack, Single source shortest paths - Dijkstra's and Bellman Ford algorithms.

**Unit-IV**

08

**Dynamic Programming:** Knapsack, all pair shortest paths – Warshal's and Floyd's algorithms, resource allocation problem. Backtracking, branch and bound, graph coloring, n-queen problem, Hamiltonian cycles, and sum of subsets.

**Unit-V**

08

**Selected Topics:** Algebraic computation, fast Fourier transform, string matching, theory of NP completeness, approximation algorithms, and randomized algorithms.

**Text Book:**

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms", Galgotia Press.
3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson

**Reference Books:**

1. Jon Kleinberg and Éva Tardos, "Algorithm Design", Pearson.
2. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis, and Internet Examples", Wiley.
3. Harry R. Lewis and Larry Denenberg, "Data Structures and Their Algorithms", Harper Collins.

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## WEB DESIGN CONCEPTS

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**Course Outcomes (COs):**

After the successful completion of the course student will be able to:

- Understand the knowledge of the internet and related internet concepts that are vital in understanding web application development.
- Analyse and apply the role of markup languages like HTML, DHTML, and XML in the workings of the web and web applications.
- Programming web pages with JavaScript.
- Design and implementation of build dynamic web pages using client side programming JavaScript and also develop the web application using servlet and JSP.

**Unit-I** **08**

**Introduction:** Introduction to web, protocols governing the web, web development strategies, web applications, web project, and web team.

**Unit-II** **08**

**HTML:** List, table, images, frames, forms, and CSS.

**Unit-III** **08**

**XML:** TAGS, DTD, XML schemes, presenting and using XML.

**Unit -IV** **08**

**Java script:** Introduction, documents, forms, statements, functions, objects, event and event handling, introduction to AJAX, VB Script, and CGI

**Unit-V** **08**

**Server Site Programming:** Introduction to active server pages (ASP), ASP.NET, java server pages (JSP), JSP application design, tomcat server, JSP objects, declaring variables and methods, debugging, and sharing data between JSP pages.

**Text Books:**

1. Xavier, C, "Web Technology and Design" , New Age International.
2. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication.

**Reference Books:**

1. Deitel, "Java for programmers", Pearson Education.
2. Ramesh Bangia, "Internet and Web Design", New Age International.
3. Jackson, "Web Technologies" Pearson Education.
4. Patel and Barik,"Introduction to Web Technology & Internet", Acme Learning.

## COMPUTER GRAPHICS

L	T	P
3	1	0

**Course Outcomes (COs):**

After the successful completion of the course student will be able to:

- Work with display systems.
- Execute various Scan Conversion algorithms in laboratory so as to draw Graphics primitives.
- Work with with 2D and 3D graphics.
- Develop creativity to create 2D objects.

**Unit-I** **08**

**Introduction:** Types of computer graphics, graphic displays- random scan displays, raster scan displays, frame buffer and video controller, points and lines, line drawing algorithms, circle generating algorithms, mid-point circle generating algorithm and parallel version of these algorithms.

**Unit-II** **08**

**Transformations:** Basic transformation, matrix representations and homogeneous coordinates, composite transformations, reflections and shearing. **Windowing and clipping:** Viewing pipeline, viewing transformations, 2-D clipping algorithms- line clipping algorithms such as Cohen Sutherland line clipping algorithm.

**Unit-III** **08**

**Three Dimensional:** 3-D geometric primitives, 3-D object representation, 3-D transformation, 3-D viewing, projections and 3-D clipping.

**Unit-IV** **08**

**Curves and Surfaces:** Quadric surfaces, spheres, ellipsoid, blobby objects, polygon meshes parametric and cubic curves, introductory concepts of spline, Bspline, Bezier curves and surfaces.

**Unit-V** **08**

**Hidden Lines and Surfaces:** Back face detection algorithm, depth buffer method, a- buffer method, scan line method, basic illumination models- ambient light, diffuse reflection, specular reflection and Phong model, combined approach, warn model, intensity attenuation, color consideration, transparency and shadows.

**Text Book:**

1. Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson.
2. Foley, Vandam, Feiner, Hughes, "Computer Graphics principle", Pearson.
3. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill

**Reference Books:**

1. W.M.Newman. R.F.Sproull , "Principles of interactive computer graphics", McGraw
2. Amrendra N Sinha and Arun D Udai, " Computer Graphics", Tata MCGraw Hill.
3. M.C. Trivedi. NN Jani, "Computer Graphics & Animations", Jaico Publications.

## ADVANCE JAVA TECHNOLOGY LAB

L	T	P
0	0	3

**Course Outcomes (COs):**

At the end of this course students will be able to:

- Understand the concept of AWT.
- Write JDBC application.
- Make program for Applet.
- Make program for JSP.

**LIST OF PRACTICALS**

- 1). Write a Java program to create an Applet.
- 2). Write a Java program to create an Applet that reads Employee information using parameters and displays name of employee, designation, salary and tax.
- 3). Write a Java program that displays 4 buttons using AWT.
- 4). Write a Java program that displays text Field, Check Box and Radio Button using Swing.
- 5). Write a Java Program to create multiple frames, which create a Frame2 with a back button, such that when a user clicks back button, Frame 2 is closed, and we see the Frame1 only?
- 6). Write a Java Program to create a frame using swing in which create a push button with a label and image. When the button is clicked an image is displayed in the Frame?
- 7). Write a Java Program to execute select Query using JDBC.
- 8). Write a Java Program for basic Arithmetic Function Such as Addition, Subtraction, Multifaction and Division using JSP.
- 9). Write a servlet program to create a simple servlet and test it?
- 10). Write a Java program to create a bean that display employee name, salary, designation and company?

**Note:** The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

## WEB DESIGN LAB

L	T	P
0	0	3

**Course Outcomes (COs):**

At the end of this course students will be able to:

- Create basic level forms using HTML tags to understand a web page.
- Extend the knowledge of HTML by combining CSS tags for updating the existing web page.
- Understand the use of XML for sharing and storing of data using Schema.
- Construct a dynamic web pages using Javascript also utilizing the knowledge of DTD.

**LIST OF PRACTICALS**

1. HTML program to create resume preparation using tables.
2. HTML program for home page creation using frames.
3. HTML program for form creation.
4. Create a web page to embed an image map in a web page using HTML.
5. Create a web page to fix the hot spots and to show all the related information when the hot spots are clicked using HTML.
6. Create a web page to get the coordinates from an image using java script.
7. Create a web page with all types of cascading style sheets.
8. Write HTML/Java scripts to display your CV in navigator, your institute website, Department website and tutorial website for specific subject.
9. Design HTML form for keeping student record and validate it using Java script.
10. Writing program in XML for creation of DTD, which specifies set of rules.
11. Create a style sheet in CSS/ XSL & display the document in internet explorer.

**Note:** The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

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**Course Outcomes (COs):**

At the end of this course students will be able to:

- DDA algorithms for line and circle and Bresenham's algorithms for circle and ellipse drawing.
- Mid-Point Circle algorithm Mid-Point Ellipse algorithm using C.
- Understand the implementation of clipping, rotation, reflection, and shearing.
- Perform basic operations on images using animation software.

**LIST OF PRACTICALS**

**Note:** - At least ten experiments are to be conducted from the following list.

1. To implement DDA algorithms for line and circle.
2. To implement Bresenham's algorithms for line, circle and ellipse drawing
3. To implement Mid-Point Circle algorithm using C.
4. To implement Mid-Point Ellipse algorithm using C.
5. To perform 2D Transformations such as translation, rotation, scaling, reflection and sharing.
6. To implement Cohen-Sutherland 2D clipping and window-viewport mapping.
7. To implement Liang Barsky Line Clipping Algorithm.
8. To perform 3D Transformations such as translation, rotation and scaling.
9. To convert between colour models.
10. To perform animation using any Animation software
11. To perform basic operations on image using any image editing software
12. To draw different shapes such as hut, face, kite, fish etc.

**Note:** The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

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