

BIDAR UNIVERSITY BIDAR



SYLLABUS FOR UNDERGRADUATE BACHELOR OF COMPUTER APPLICATIONS (BCA) STATE EDUCATION POLICY (SEP-2024)

(SYLLABUS WITH EFFECT FROM ACADEMIC YEAR 2024-25 & ONWARDS)

Submitted by
Chairman
Board of Studies (UG)
Bidar University Bidar

Approved the Syllabus by BOS (UG) on dated 09-09-2025

Prof. 9/9/25

Curriculum Structure for B.C.A w. e. f 2024-25

Category	Course Code	Title of the Paper	Marks			Hour/ Week	Credits	Duration of Exams (Hrs.)
			IA	Semester End Exam (SEE)	Total			
SEMESTER III								
DSC03	THEORY							
	SEPBCAT07	Data Structures Using C++	20	80	100	4	4	3
	SEPBCAT08	C# and Dot Net Framework	20	80	100	4	4	3
	SEPBCAT09	Operating System	20	80	100	4	4	3
	SEPBCAE-01	a) Big data Analytics b) Cyber Security	10	40	50	2	2	2
	PRACTICALS							
	SEPBCAP07	Data Structures Using C++ Lab	10	40	50	4	2	3
	SEPBCAP08	C# and Dot Net Framework Lab	10	40	50	4	2	3
	SEPBCAP09	Operating System Lab	10	40	50	4	2	3
	TOTAL : HOURS/CREDIT					500	26	20
SEMESTER IV								
DSC04	THEORY							
	Skill-1	Software Testing	10	40	50	2	2	2
	SEPBCAT10	Java Programming	20	80	100	4	4	3
	SEPBCAT11	Multimedia and Animation	20	80	100	4	4	3
	SEPBCAT12	Data Communication and Networks	20	80	100	4	4	3
	SEPBCAE-02	a) IoT b) Cloud Computing	10	40	50	2	2	2
	PRACTICALS							
	SEPBCAP10	Java Programming Lab	10	40	50	4	2	3
	SEPBCAP11	Multimedia and Animation Lab	10	40	50	4	2	3
	SEPBCAP12	Data Communication and Networks Lab	10	40	50	4	2	3
TOTAL : HOURS/CREDIT					550	28	22	


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Year	II	Course Code : SEPBCAT07		Credits	4
Semester	III	Course Title : Data Structures Using C++		Hours	60
Course Pre-requisites, if any		NA			
Formative Assessment Marks : 20		Summative Assessment Marks : 80	Duration of SEE: 3 hrs.		
Course Objectives	After completing this course satisfactorily, a student will be able to: • Understand basic and data structures dealing with algorithm development using C++. • Apply search and sort techniques on with real-time computational problems. • Analyse data structures dealing with algorithm development viz. stacks, queues, lists, trees and graphs. • Construct algorithmic approaches in real time computational environment. • Analyse non-linear data structure tree. • Understand representation, operations and traversal mechanisms to implement the concept of a graph.				
Unit No.	Course Content			Hours	
UNIT I	Data Structure: Definition, Classification-(Primitive and Non-Primitive), Operations. Arrays: Definition, Array Operation- Multidimensional Arrays. Strings: Basic Terminology, Operations and Pattern Matching algorithm.			10	
UNIT II	Recursion: Definition, Types of recursions, Recursion Technique. Searching and Sorting: Linear Search, Binary Search, Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, and Quick Sort.			15	
UNIT III	Linked List: Definition, Representation of Linked Lists in Memory, Memory Allocation, Linked List Operation-Insertion, Deletion, Searching, Types of Linked Lists-Doubly Linked List and Circular Linked List.			10	
UNIT IV	Stacks: Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications- Infix, postfix and prefix expression conversion of expression. Queue: Definition, Array Representation, Queue Operations, Types of Queue-Simple Queue, Circular Queue, Priority Queue, De-queue.			15	
UNIT V	Trees: Definition, Terminologies, Binary Trees, Binary Tree Traversals-In-order, Pre-order, Post-order. Graph: Definition, Terminologies, Matrix and Adjacency List Representation of Graphs, Traversal Methods: Breadth First Search and Depth First Search.			10	
Recommended Learning Resources					
Text Books:					
1. Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures".					

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Reference Books:

1. M. T. Goodrich, R. Tamassia and D. Mount, "Data Structures and Algorithms in C++", John Wiley and Sons
2. Robert L. Kruse and A.J. Ryba, "Data Structures and Program Design in C++", Prentice Hall, Inc., NJ, 1998
3. B. Stroustrup, "The C++ Programming Language", Addison Wesley, 2004.

E-Resources:

1. **Geeks for Geeks:** Geeks for Geeks is a fantastic starting point. It offers a vast array of articles, coding problems, and step-by-step guides. The explanations are clear, and the community support is great for beginners and intermediate learners.
2. **Hacker Rank:** Hacker Rank provides a hands-on approach with coding challenges that range from easy to difficult. Their tutorials and problem sets help in understanding the practical application of algorithms and data structures.

3. YouTube Channels:

- **Abdul Bari:** His YouTube channel has some of the best explanations for algorithms and data structures. The content is easy to follow and highly recommended for beginners.
- **CS50 by Harvard:** The CS50 series is excellent for those looking for a more academic approach.
- 4. **Coursera (Audit for Free):** Courses like "Data Structures and Algorithm Specialization" by UC San Diego are available for free auditing. These are comprehensive and well-structured.

Paid Resources

1. **Coursera and edX:** Paid certificates on these platforms provide a structured learning path and often come with additional resources and support. Courses like "Algorithms, Part I & II" by Princeton University on Coursera are excellent.
2. **Udemy:** Courses like "Mastering Data Structures & Algorithms using C and C++" by Abdul Bari are well-regarded. The lifetime access to materials can be very beneficial.
3. **Tutort Academy:** During my journey, I found Tutort Academy to be a game-changer. Their DSA with System Design course offers:
 - **Structured Learning Path:** Takes you from beginner to advanced levels in a logical sequence.
 - **Interactive Sessions:** Live classes, Q&A sessions, and 1-on-1 mentorship.
 - **Practical Assignments:** Over 10 hands-on projects and case studies.
 - **Mock Interviews:** Practice with industry professionals to get a feel of real-world scenarios.
 - **2-Year Flexible Pass:** Access your course material for a full two years.
 - **Placement Assistance:** Resume and LinkedIn profile checks by professionals, with over 1250+ students already placed.
 - **2-Step Counseling:** A thorough process to help you select the most suitable course based on your career goals.

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Year	II	Course Code : SEPBCAT08		Credits	4
Semester	III	Course Title : C# and Dot Net Framework		Hours	60
Course Pre-requisites, if any		NA			
Formative Assessment Marks : 20		Summative Assessment Marks : 80	Duration of SEE: 3 hrs.		
Course Objectives	After completing this course satisfactorily, a student will be able to: - Learn fundamental concepts such as data types, control structures, object-oriented programming (OOP), and exception handling. - Gain hands-on experience in building desktop, web, and console applications using Visual Studio and the .NET environment. - Explore the rich set of libraries available in .NET for tasks like data manipulation, file I/O, threading, and networking. - Learn and apply the concepts of encapsulation, inheritance, polymorphism, and abstraction in C#. - Explore advanced topics such as events and exception handling.				
Unit No.	Course Content			Hours	
UNIT I	Introduction: What is C#, Characteristics of C#, Application of C#, The Origin of .NET Technology, Common Language Runtime (CLR), .NET Languages, C# and .NET. Overview of C#: A Simple C# Program, Namespaces, Adding Comments. Literals, Variables, Data types.			10	
UNIT II	Operators and Expressions, Control Structures-Branching and Looping Statements. Arrays-One Dimensional Array, Two-Dimensional Arrays, and Variable Size Array, Methods: Pass by value, Pass by Reference, Variable Argument List, and Methods Overloading.			10	
UNIT III	Classes and Objects: Defining a Class, Adding Variable, Adding Methods, Member Access Modifiers, Creating Objects and Accessing Class Members, Constructor and Destructors .Inheritance-Types of Inheritance, Interfaces, Managing Console I/O Operations- Console Class, Console Input, Console Output, and Formatted Output.			15	
UNIT IV	Managing Errors and Exception: Debugging, Types of Error, Exception, Syntax of Exception Handling Code, Multiple Catch Exception, Using Finally Statement, Nested Try Blocks, Throwing our Own Exception. Threading: Introduction, Creating and Starting Thread, Multithreading, Scheduling a Thread, Synchronizing a Thread. Thread Pooling.			10	
UNIT V	Windows Forms: Introduction, Creating Windows Forms and Run Windows Form. Label, Textbox, Button, Checkbox, Radio Button, Group Box, Panel, Date and Time, ADO.NET-Introduction, Connection, Command, Reader, Dataset, Data Adapter.			15	
Recommended Learning Resources					

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Reference Books:

1. E Balagurusamy, "Programming in C#*(4th Edition)", Tata McGraw-Hill, 2017
2. Arthur Gittleman, "Computing with C# and the .NET Framework (2nd Edition), Jones & Bartlett Publishers, 2011"

E-Resources:

Online Courses

1. **Microsoft Learn:** The official Microsoft documentation offers a comprehensive set of modules for learning C# and .NET. It's interactive and free.
- Microsoft Learn - C#
2. **Coursera:** Provides courses from universities and institutions, including C# specialization programs. Look for courses from the University of California, Davis, or other reputable institutions.
3. **Udemy:** Offers a wide range of C# and .NET courses, often at a discount. Look for highly rated courses with good reviews, such as "C# Basics for Beginners" or ".NET Core 3.1 Web API".

Books

1. **"C# in Depth" by Jon Skeet:** A deep dive into C#, suitable for intermediate to advanced programmers.
2. **"Pro ASP.NET Core MVC" by Adam Freeman:** Great for learning web development with .NET.
3. **"Head First C#" by Andrew Stellman and Jennifer Greene:** A beginner-friendly book that uses a visual approach to learning.

Documentation and Community

1. **Official .NET Documentation:** Provides extensive resources, including tutorials, guides, and API references.
- Microsoft .NET Documentation
2. **Stack Overflow:** A great place to ask questions and see solutions to common problems encountered while programming in C# and .NET.
3. **GitHub:** Explore open-source projects written in C# and .NET to see real-world applications of the language.

YouTube Channels

1. **The Net Ninja:** Offers a range of tutorials on C# and .NET.
2. **Traversy Media:** Features comprehensive tutorials on various programming topics, including .NET.

Practice Platforms

1. **LeetCode** and **HackerRank:** Good for practicing C# coding problems and challenges.
2. **Codewars:** Offers coding challenges in C# to improve your skills in a fun way.

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Year	II	Course Code : SEPBCAT09		Credits	4
Semester	III	Course Title : Operating System		Hours	60
Course Pre-requisites, if any		NA			
Formative Assessment Marks : 20		Summative Assessment Marks : 80	Duration of SEE: 3 hrs.		
Course Objectives	After completing this course satisfactorily, a student will be able to:				
	- To deliver a detailed knowledge of integral software in a computer system – Operating System. - To understand the working of operating system as a resource manager. - To familiarize the students with Process and Memory management. - To describe the problem of process synchronization and its solution. - Ability to apply CPU scheduling algorithms to manage tasks. - Initiation into the process of applying memory management methods and allocation policies. - Knowledge of methods of prevention and recovery from a system deadlock.				
Unit No.	Course Content			Hours	
UNIT-I	Introduction to Operating System: Definition , History and Examples of Operating System, Operating System Services, Types of Operating System-Batch processing ,Multi-programming OS, Multiprocessing OS, Multitasking OS, Time sharing OS , Distributed OS, Network OS ,Real Time OS.			10	
UNIT-II	Process Management: Process Concept, Process Definition, Process State, Process Control Block, Operations on Processes – Creation and Termination of Processes .Inter Process Communication – Definition and Need for inter process communication. IPC Implementation methods – shared memory and Message Passing.			10	
UNIT-III	CPU Scheduling: Basic Concepts, Scheduling criteria, Scheduling algorithm-First Come First Serve, Shortest Job First, Shortest Remaining Time, Priority Scheduling, Round Robin, Multilevel Queue schedules, Multilevel Feedback Queue scheduling.			10	
UNIT-IV	Process Synchronization: Introduction, Race condition, Critical Section problem, Synchronization Hardware, Semaphores, classic problems of synchronization,-Producer-Consumer problem, Dining Philosopher’s problem Deadlock: Deadlock characterization, Methods of handling Deadlock, Deadlock prevention, Deadlock avoidance, Deadlock detection and Recovery from deadlock.			15	
UNIT-V	Memory Management: Partitioning, paging, segmentation, virtual memory, Demand Paging, Swapping, page replacement algorithm –FIFO page replacement, Optimal Page replacement Algorithm, Least Recently Used page replacement algorithm. File Management: File organization, Directories, File operations, File sharing.			15	
Recommended Learning Resources					
Reference Books:					
1. A Silberschatz, P.B. Galvin, G. Gange, ”Operating system Concepts(8 th Edition)”, John Wiley Publications 2008					
2. S. Tanenbaum, “Modern Operating Systems (3 rd Edition”, Pearson Education 2007.					

3. G. Nutt, "Operating Systems: A Modern Perspective" (2nd Edition)", Pearson Education 1997.
4. W. Stallings, "Operating Systems, Internals & Design Principles (5th Edition)" Prentice Hall of India, 2008.
5. M. Milenkovic, "Operating Systems-Concepts and Design", Tata McGraw Hill 1992.

E-Resources:

Online Courses

1. **Coursera: Operating Systems and You: Becoming a Power User**
 - Offered by Google, this course covers the basics of operating systems, including Linux and Windows.
2. **edX: Operating Systems by Georgia Tech**
 - A more technical course that dives into the details of OS design and implementation.
3. **Udacity: Intro to Operating Systems**
 - This course offers practical experience with concepts such as threading, concurrency, and memory management.

Online Resources

1. **GeeksforGeeks**
 - Provides tutorials and explanations on various operating system concepts, algorithms, and interview questions.
2. **TutorialsPoint**
 - Offers a structured overview of operating system topics, including definitions, examples, and explanations.
3. **YouTube Channels**
 - Channels like Computerphile and The Coding Train have videos explaining various OS concepts.

Practice and Hands-On Learning

1. **Linux**
 - Install a Linux distribution (like Ubuntu or CentOS) and practice using the command line, managing processes, and configuring the system.
2. **Projects**
 - Work on small projects, such as writing shell scripts, creating a simple file system, or implementing basic scheduling algorithms.
3. **Interview Preparation Platforms**
 - Websites like LeetCode, HackerRank, and Pramp offer coding challenges and mock interviews that can help you prepare for technical questions related to operating systems.

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Year	II	Course Code : SEPBCAE--1(a)		Credits	2
Semester	III	Course Title : Big Data Analytics		Hours	30
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of SEE: 2 hrs.		
Course Objectives		After completing this course satisfactorily, a student will be able to: • Understand the Big Data Platform and its Use cases. • Identify Big Data and its Business Implications. • List the components of Hadoop and Hadoop Eco-System.			
Unit No.		Course Content			Hours
UNIT I		Big data definition, History of big data, Applications of big data, Challenges of big data, Importance of big data, Types of big data.			15
UNIT II		Hadoop: What is Hadoop, Hadoop Ecosystem and components, Hadoop Architecture, Features of Hadoop, Hadoop Applications.			15
Recommended Learning Resources					
Text Books:					
1. Tom White “Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012.					
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.					

Reference Books:
1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007. 2. Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRC press (2013)
E-Resources:
1. Online Courses and Platforms: Massive Open Online Courses (MOOCs): Platforms like edX, Coursera, and Udacity offer comprehensive courses on big data analytics, covering topics from introductory concepts to advanced techniques. Specialized Training Programs: Many online learning platforms provide focused training programs on specific big data technologies and tools, such as Apache Hadoop, Apache Spark, and data visualization. Academic Institutions: Universities and colleges offer online degree and certificate programs in big data analytics, providing a structured and in-depth learning experience. Computers, according to Tableau. 2. Big Data Tools and Technologies: Apache Hadoop: An open-source framework for storing and processing large datasets across clusters of Data Visualization Tools: Tools like Tableau, Power BI, and Qlik Sense help users visualize and explore big data to gain insights. 3. Data Science Tools and Libraries: Python and R: Programming languages widely used for big data analysis, with numerous libraries and packages available for data manipulation, analysis, and machine learning. Jupyter Notebooks: An interactive environment for creating and sharing documents that contain live code, equations, visualizations, and narrative text.

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Year	II	Course Code : SEPBCAE--01(b)		Credits	2
Semester	III	Course Title : Cyber Security		Hours	30
Course Pre-requisites, if any		NA			
Formative Assessment Marks : 10		Summative Assessment Marks : 40	Duration of SEE: 2 hrs.		
Course Objectives		After completing this course satisfactorily, a student will be able to: - Understanding the basic concepts of Cyber Security. - Understand the various attacks in web interface. - Analyse and evaluate the cyber security needs of an organization.			
Unit No.	Course Content			Hours	
UNIT I	What is Cyber Security, Applications of Cyber Security, OSI Security Architecture, Security attacks [active and passive], and Types of Security Mechanism.			15	
UNIT II	Cyber Ethics, Ethical Hacking, IT Act, Intellectual Property in Cyberspace, Cyber Crimes, Cyber Criminal Types, Social Engineering, Cyber-Terrorism.			15	
Recommended Learning Resources					
Reference Books:					
1. R. C Mishra, “Cyber Crime Impact in the New Millennium”, Auther Press. Edition 2010.					
2. Sumit Belapure and Nina Godbole,” Cyber Security Understanding Cyber Crimes”, Computer Forensics and Legal Perspectives by, Wiley India Pvt. Ltd. (First Edition, 2011)					
E-Resources:					
E-learning Platforms and Courses:					
Cybrary: Offers free online security courses and a wide range of learning materials.					
eLearn Security: Provides paid online security courses.					
PortSwigger: Offers free, online web security training with hands-on labs.					
Coursera: Features various cyber security courses from Google, IBM, and other institutions.					
Simplilearn: Offers a Cyber security Expert Master’s Program aligned with certification exams.					
Cyber security Bootcamps: Intensive, short-term programs focused on practical cyber security skills.					
Free Resources and Tools:					
Webcasts, White Papers, Blogs, Posters, Cheat Sheets, Security Policy Templates: SANS Institute provides free resources such as webcasts, white papers, and downloadable templates.					
Internet Storm Centre: A resource from SANS Institute that provides real-time information on internet security threats.					
Hacker101: Offers free, open-source video lessons on web security.					
Open Security Training: Provides free, open-source materials for computer security classes.					
Cyber security for Everyone (University of Maryland, College Park): A free introductory course on Coursera.					
Organizations and Communities:					

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SANS Institute: Offers professional information security training and a variety of free resources.

National Cyber security Alliance: An organization dedicated to promoting cyber security awareness.

CyBOK – The Cyber Security Body of Knowledge: A project providing a structured framework for cyber security knowledge.

Carnegie Mellon University (CMU) LibGuides: A resource with a comprehensive list of cyber security resources.

CyberDegrees.org: Provides resources and information on cyber security education and career paths.

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Year	II	Course Code : SEPBCAP07	Credits	2
Semester	III	Course Title : Data Structures Using C++ Lab	Hours	50
Course Pre-requisites, if any		NA		
Formative Assessment Marks :10		Summative Assessment Marks : 40	Duration of SEE: 3 hrs.	

PART-A :

1. Write a C++ program to search an element using linear search in 1-d array.
2. Write a C++ program to search an element using linear search in 2-d array.
3. Write a C++ program to search an element using binary search in 1-d array.
4. Write a C++ program to search an element using binary search in 2-d array.
5. Write a C++ program to sort the elements using bubble sort.
6. Write a C++ program to sort the elements using selection sort.
7. Write a C++ program to sort the elements using insertion sort.
8. Write a C++ program to implement stack operation using array.

PART-B:

1. Write a C++ program to convert infix to Postfix.
2. Write a C++ program to convert infix to Prefix.
3. Write a C++ program to Convert Postfix to infix.
4. Write a C++ program to implement Linear Queue using an Array
5. Write a C++ Program to generate n Fibonacci numbers using recursive function
6. Write a C++ program to implement single linked list.
7. Write a C++ program to implement Binary tree traversal (in-order, pre-order, post-order).
8. Write a C++ program to implement DFS and BFS

Instructions:

1. A certified journal is mandatory for every student to appear for the practical examination.
2. The student has to execute a minimum of eight programs from each part to complete the lab course.

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Year	II	Course Code : SEPBCAP08	Credits	2
Semester	III	Course Title : C# Programming Lab	Hours	50
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks : 40	Duration of SEE: 3 hrs.	

PART-A:

1. Write a C# Program to Convert Celsius to Fahrenheit.
2. Write a C# program to check whether a given number is even or odd.
3. Write a C# program to find sum of all the multiples of 3 and 5.
4. Write a C# program to find minimum and maximum range of given data
5. Write a C# program to demonstrate the use of conditional logical operator.
6. Write a C# program to generate register number automatically for 10 students using static constructor.
7. Write a C# program to generate the mark sheet of the students.
8. Write a C# program to check if a given year is a leap year.
9. Write a C# program to search an element in an array.
10. Write a C# program to print the Lower Bound and Upper Bound of an array.
11. Write a C# program to check given number is Armstrong or not

PART-B:

1. Write a C# program to convert character of a string to opposite case.
2. Write a C# program to demonstrate class and object creation.
3. Write a C# program to demonstrate “this” reference with an example.
4. Write a C# program to demonstrate Multilevel Inheritance.
5. Write a C# program to demonstrate multiple exceptions.
6. Write a C# program to demonstrate Null Reference exceptions.
7. Write a C# program to create a Simple Thread.
8. Write a C# program to create thread pools.
9. Write a C# program to design to validate login form.
10. Write a C# program to design To-Do-List.
11. Write a C# program to design simple calculator.

Instructions:

1. A certified journal is mandatory for every student to appear for the practical examination.
2. The student has to execute a minimum of eight programs from each part to complete the lab course.

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Year	II	Course Code : SEPBCAP09	Credits	2
Semester	III	Course Title : Operating System Lab	Hours	50
Course Pre-requisites, if any		NA		
Formative Assessment Marks : 10		Summative Assessment Marks : 40	Duration of SEE: 3 hrs.	

Note: Implement the following programs in C++

1. Inter-process Communication (IPC)
2. Scheduling Algorithms
 - a. First-Come, First-Served (FCFS): Processes are scheduled in the order they arrive.
 - b. Shortest Job First (SJF): The process with the smallest execution time is scheduled next.
 - c. Round Robin (RR): Each process is assigned a fixed time slice (quantum) and is cycled through in a circular fashion.
 - d. Priority Scheduling: Processes are scheduled based on priority levels, where higher priority processes are executed first.
3. Producer-Consumer Problem (Synchronization using Semaphores).
4. Internal fragmentation.
5. MVT
6. Segmentation.
7. Simulating a virtual memory system with page replacement algorithms (e.g., FIFO or LRU)
8. Simulating Deadlock.

Instructions:

1. A certified journal is mandatory for every student to appear for the practical examination.

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Year	II	Course Code : Skill-1		Credits	2
Semester	IV	Course Title : Software Testing		Hours	30
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of SEE: 2 hrs.		
Course Objectives		After completing this course satisfactorily, a student will be able to: - To study the testing fundamentals and testing design strategies. - To expose the criteria for test cases. - To learn the levels of testing and test planning concepts.			
Unit No.	Course Content			Hours	
UNIT I	Definitions of Errors, Defects, Failures, Test cases, Tester’s Role in a software Development organization, V Shaped Software Life Cycle model, Verification and Validation, Levels of testing.			15	
UNIT II	Functional Testing/Black-Box Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, White Box Testing Techniques, Cyclomatic Complexity, Graph Matrices, Control Flow Graph.			15	
Recommended Learning Resources					
Reference Books:					
1. Roger S. Pressman, "Software Engineering A Practitioner’s Approach", MC Graw Hill (Seventh Edition).					
2. Yogesh Singh, "Software Testing", Cambridge University Press 2011.					
3. Renu Rajani, "Software Testing Effective Methods, Tools and Techniques".					
E-Resources:					
1. Online Courses and Tutorials:					
Platforms like Coursera, Udemy, edX:					
Offer structured courses covering various aspects of software testing, from foundational concepts to advanced topics like test automation, performance testing, and security testing.					
Specialized Testing Platforms:					
Websites like uTest University provide courses specifically tailored to different testing domains and levels of expertise.					
YouTube Channels:					
Many channels, such as those by Ministry of Testing or edureka!, offer free video tutorials and explanations on software testing concepts and tools.					
2. Blogs and Articles:					
Software Testing Blogs:					
Websites like Software Testing Help, Ministry of Testing Articles, and DevelopSense provide in-depth articles, guides, and insights on best practices, emerging trends, and practical tips in software testing.					

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Community-Driven Platforms:

DZone and similar platforms feature articles and tutorials contributed by a community of software testing professionals.

3. Communities and Forums:

Online Forums and Discussion Boards:

Platforms like The Club by Ministry of Testing, Testing Tech News, and various Slack channels (e.g., Ministry of Testing, Women in Testing) facilitate discussions, knowledge sharing, and networking among testers.

Social Media Groups:

LinkedIn groups and other social media communities dedicated to software testing offer opportunities to connect with peers and stay updated on industry news.

4. Tools and Templates:

Software Testing Tool Websites:

Resources like Ranorex and others provide information and tutorials on using specific test automation tools.

Software Testing Templates:

Websites often offer downloadable templates for test plans, test cases, bug reports, and other testing documentation.

5. Certification and Study Guides:

ISTQB Study Guides: Resources for preparing for industry-recognized certifications like ISTQB Certified Tester Foundation Level (CTFL).

Certification-Specific Study Materials: Guides and practice exams for other certifications like CSTE and CSQA.

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Year	II	Course Code : SEPBCAT10		Credits	4
Semester	IV	Course Title : Java Programming		Hours	60
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of SEE: 3 hrs.		
Course Objectives	After completing this course satisfactorily, a student will be able to: - To learn the syntax and semantics to write Java programs. - To understand the fundamentals of object-oriented programming in Java. - To familiarize with the concept of inheritance, polymorphism packages and interfaces. - Skill to write Java application programs using OOP principles and proper program structuring. - Ability to create packages and interfaces. - Ability to implement error handling techniques using exception handling.				
Unit No.	Course Content			Hours	
UNIT-I	Introduction to Java: Features of Java- Object Oriented Concepts – Data Types – Variables – Arrays – Operators – Control Statements, Input and output- Scanner and System class – print(), and println() methods.			10	
UNIT-II	Classes- Objects: Overloading methods – Access Control – Static and fixed methods Inner Classes –String Class – Overriding methods- Using Super –Abstract Class – Type Wrapper Classes for primitive types- Auto boxing and auto Unboxing-Recursion.			10	
UNIT-III	Packages: Access Protection- Importing packages- Interfaces- Exception Handling- Throw and Throws Thread- Synchronization -Runnable Interface- Inter thread Communication- Multithreading-file streams- Sequential file, Random file.			10	
UNIT-IV	GUI Components: Common GUI Event type and Listener Interfaces – JoptionPane - JLabel, Jtextfield, JButton, JCheckBox, JTextarea, JcomboBox, JList, Jpanel. Mouse Event Handling- Adapter Classes – Key Event Handling. Layout Manager- Flow Layout, Border Layout, Grid Layout, Graphics contexts and graphics objects color control- Font control-			15	
UNIT-V	Applet: Applet Life Cycle, Graphics in Applet, Drawing lines, rectangles and ovals- jslider-using menus with frames Event Handling in Applet, JDBC Drivers, DB Connectivity Steps for MS-Access.			15	
Recommended Learning Resources					
Reference Books:					
1. M.T. Somashekara, D.S. Guru, K.S. Manjunatha, "Object Oriented Programming with JAVA", PHI Publication.					
2. E Balagurusamy, "Programming with Java", Mc Graw Hill Publication (7 th Edition).					
3. Herber Schildt, "The Complete Reference", Indian Publication.					

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E-Resources:

Beginner-Friendly Resources

- **Official Java Documentation:** Oracle's Java tutorials are the best starting point for learning the basics. (Visit [Java Tutorials](#))
- **Codecademy:** Offers interactive lessons for beginner-level Java. Their hands-on approach makes it easier to grasp concepts. (Codecademy Java)
- **YouTube Channels:** Look for free tutorials on channels like "Programming with Mosh" and "Derek Banas."

Intermediate to Advanced Learning

- **Head First Java** by Kathy Sierra & Bert Bates: A fantastic book for learners who want a more engaging, story-driven approach.
- **Java Design Patterns:** For mastering design principles and patterns in Java.
- **Geeks for Geeks & Tutorialspoint:** Great platforms for exploring advanced topics and understanding Java frameworks.

Practice Platforms

- **Hacker Rank & Leet Code:** Put your coding skills to the test with these competitive programming sites.
- **CodeGym:** A gamified way to learn Java by completing tasks and building projects.
- **JetBrains Academy:** Offers hands-on projects to develop your Java skills.

Communities and Forums

- **Stack Overflow:** A fantastic resource for troubleshooting and sharing knowledge.
- **Reddit:** Subreddits like [r/learnjava](#) and [r/javahelp](#) have active members ready to assist.

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Year	II	Course Code : SEPBCAT11		Credits	4
Semester	IV	Course Title : Multimedia and Animation		Hours	60
Course Pre-requisites, if any		NA			
Formative Assessment Marks : 20		Summative Assessment Marks : 80	Duration of SEE: 3 hrs.		
Course Objectives	After completing this course satisfactorily, a student will be able to: - Write a well-designed interactive Web site with respect to current standards and practices - Demonstrate in-depth knowledge of an industry-standard multimedia development tool and its associated scripting languages - Determine the appropriate use of interactive versus standard web application				
Unit No.	Course Content			Hours	
UNIT-I	Introduction to hypertext markup language (HTML).Document Type Definition. Creating web pages graphical elements, lists, tables Hyperlinks, web forms, inserting images.Frames, Divisions, Cascading Style Sheet, CSS Types. JavaScript: Introduction and Data Types. Operators, Functions, Control Structures, Screen output & keyboard input.			15	
UNIT-II	Animation, CSS animation, Creating a Simple animation, Animation Property, Key frames, Multiple Animation, Wrap-up.CSS-Transition, Longhand Properties, Shorthand Properties, Working with Multiple Transitions.			10	
UNIT-III	HTML5 - SVG: Viewing SVG Files, Embedding SVG in HTML5, SVG Circle, HTML5-SVG-Rectangle, SVG-Line, SVG-Ellipse, SVG-polygon, SVG-PolyLine, SVG-Gradients, SVG-Star.			10	
UNIT-IV	Introduction to Canvas , Rendering context , Browser support Canvas-Drawing Rectangle, Drawing Paths, Drawing Lines, Drawing Bezier curves, Drawing Quadratic Curves , Canvas-Using Images, Canvas-Create Gradients.			12	
UNIT-V	HTML5-Style & Colours, Canvas-Text & Fonts, Canvas-Pattern & Shadow, and Canvas-Save & Restore states, Canvas-Translation Canvas-Rotation, Canvas-Scaling, Canvas-Transforms, Canvas-Composition, Canvas-Animations.			13	
Recommended Learning Resources					
Reference Books:					
1. Thomas A. Powell, ”The Complete Reference HTML & CSS”, Mc Graw Hill Publication (5 th Edition).					
2. Kirupa Chinnathambi, “Animation in HTML, CSS & JavaScript”, 1 st Edition.					

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E-Resources:

1. Learning Resources:

- **Coursera** (coursera.org) – Offers animation and multimedia courses from universities.
- **Udemy** (udemy.com) – Various courses on 2D and 3D animation, VFX, and multimedia design.
- **Skillshare** (skillshare.com) – Short and creative courses on animation and multimedia.
- **LinkedIn Learning** (linkedin.com/learning) – Courses on digital design, animation, and video production.
- **Khan Academy** (khanacademy.org) – Basic digital storytelling and animation concepts.

2. Software and Tools:

2D Animation:

- **Adobe Animate** (adobe.com) – Professional 2D animation software.
- **Toon Boom Harmony** (toonboom.com) – Industry-standard software for 2D animation.
- **OpenToonz** (opentoonz.github.io) – Free and open-source animation software.
- **Synfig Studio** (synfig.org) – Free 2D animation tool with vector-based animation.

3D Animation:

- **Blender** (blender.org) – Free, open-source 3D animation software.
- **Autodesk Maya** (autodesk.com) – Industry-standard 3D animation and modeling software.
- **Cinema 4D** (maxon.net) – Great for motion graphics and 3D animation.
- **Houdini** (sidefx.com) – Powerful 3D animation and VFX software.

Video Editing & Motion Graphics:

- **Adobe After Effects** (adobe.com) – Motion graphics and VFX.
- **DaVinci Resolve** (blackmagicdesign.com) – Free professional video editing software with advanced color correction.
- **HitFilm Express** (fxhome.com) – Free software for video editing and visual effects.

Game Animation:

- **Unity** (unity.com) – Real-time animation and game development.
- **Unreal Engine** (unrealengine.com) – High-quality game and real-time 3D animation.

3. Stock Resources for Animation:

- **Freepik** (freepik.com) – Free and premium vector graphics.
- **Pexels Videos** (pexels.com/videos) – Free stock videos for animation projects.
- **Pixabay** (pixabay.com) – Free images, videos, and vector assets.
- **Mixamo** (mixamo.com) – Free 3D character animation and rigging.

4. Online Animation Tools:

- **Animaker** (animaker.com) – Cloud-based animation tool for beginners.
- **Vyond** (vyond.com) – Online animation software for businesses and education.
- **Powtoon** (powtoon.com) – Easy-to-use animation tool for presentations.

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Year	II	Course Code : SEPBCAT12		Credits	4
Semester	IV	Course Title :Data Communication and Networks		Hours	60
Course Pre-requisites, if any		NA			
Formative Assessment Marks : 20		Summative Assessment Marks : 80	Duration of SEE: 3 hrs.		
Course Objectives		After completing this course satisfactorily, a student will be able to: - To deliver comprehensive view of Computer Network. - To enable the students to understand the Network Architecture, Network type and topologies. - To understand the design issues and working of each layer of OSI model. - To familiarize with the benefits and issues regarding Network Security.			
Unit No.	Course Content			Hours	
UNIT-I	Computer Networks and its application, Network Structure, Network architecture Topologies, its types (Bus, Ring, Star, Mesh, Tree, Hybrid), LAN, WAN, MAN OSI reference model, TCP/IP model,			15	
UNIT-II	Transmission Media-Twisted Pair, Coaxial Cable, Optical fiber, radio transmission, Microwaves and infrared transmission, Switching-Message Switching, Multiplexing.			10	
UNIT-III	Data Link Layer design issues, Error detection-Single Parity Checking, Checksum, Polynomial codes-CRC, Error Correction-Hamming Code, Data link Protocols, Sliding window protocol.			10	
UNIT-IV	Network layer design issues, Routing algorithms- Flooding, Distance Vector routing, Hierarchical routing, Link state routing, Congestion Control Algorithms-Leaky bucket, token bucket algorithm, Admission Control, Hop by Hop choke packets.			15	
UNIT-V	Elements of Transport service, Elements of Transport Protocols, Internet transport protocols(TCP & UDP), DNS, Electronic Mailing and World Wide Web			10	
Recommended Learning Resources					
Reference Books:					
1. Andrew S. Tanenbaum, ”Computer Networks”, Pearson Education (5 th Edition). 2. William Stallings, ”Data and Computer Communication”, Pearson Education (10 th Edition). 3. Achyut s. Godbole,”Data Communications and Networks”, Tata Mc-Graw Hill Publication.					

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E-Resources:

1. Online Courses & Tutorials:

- **Coursera** (coursera.org) – Courses from universities like Stanford, MIT, and University of Illinois.
 - Computer Networking (Stanford University)
 - The Bits and Bytes of Computer Networking (Google IT Support)
- **edX** (edx.org) – Free and paid courses on networking.
 - Computer Networking (Harvard, MIT, etc.)
- **Udemy** (udemy.com) – Affordable courses with hands-on projects.
 - Complete Networking Fundamentals Course
- **Cisco Networking Academy** (netacad.com) – Free networking courses from Cisco.
- **MIT OpenCourseWare** (ocw.mit.edu) – Free MIT courses on networking concepts.
- **NPTEL** (nptel.ac.in) – Indian government's open online courses on networking.

2. Books & PDFs:

- **Computer Networking: A Top-Down Approach** – Kurose & Ross
- **Data Communications and Networking** – Behrouz A. Forouzan
- **Computer Networks** – Andrew S. Tanenbaum
- **TCP/IP Illustrated** – W. Richard Stevens
- **Networking All-in-One For Dummies** – Doug Lowe (Beginner-friendly)
- **Cisco CCNA Study Guide** – Todd Lammle

Free PDFs can be found on platforms like:

- [Library Genesis](#)
- [OpenStax](#)
- [ResearchGate](#)

3. Networking Simulators & Hands-on Practice:

- **Cisco Packet Tracer** (netacad.com) – Free tool for network simulation.
- **GNS3** (gns3.com) – Advanced network simulation tool.
- **Wireshark** (wireshark.org) – Network protocol analyzer.
- **NS-3 (Network Simulator 3)** (nsnam.org) – Research-based network simulation tool.
- **Eve-NG** (eve-ng.net) – Emulation platform for networking.

4. Research Papers & Journals:

- **IEEE Xplore** (ieeexplore.org) – Research papers on networking.
- **ACM Digital Library** (dl.acm.org) – Computer science and networking papers.
- **ScienceDirect** (sciencedirect.com) – Networking and data communication research.
- **arXiv** (arxiv.org) – Open-access research papers.

5. Networking Blogs & Websites:

- **Cisco Blog** (blogs.cisco.com) – Latest trends in networking.
- **Networking World** (networkworld.com) – News and trends.
- **GeeksforGeeks** (geeksforgeeks.org) – Networking tutorials.
- **TutorialsPoint** (tutorialspoint.com) – Simple networking concepts.

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6. YouTube Channels:

- **NetworkChuck** ([YouTube](#)) – Fun and engaging networking tutorials.
- **Eli The Computer Guy** ([YouTube](#)) – In-depth networking lectures.
- **Cisco Networking Academy** ([YouTube](#)) – Cisco training videos.
- **Practical Networking** ([YouTube](#)) – Explains networking in simple terms.

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Year	II	Course Code : SEPBCAE--2(a)		Credits	2
Semester	IV	Course Title : IOT		Hours	30
Course Pre-requisites, if any		NA			
Formative Assessment Marks : 10		Summative Assessment Marks : 40	Duration of SEE: 2 hrs.		
Course Objectives		After completing this course satisfactorily, a student will be able to: • Able to understand the application areas of IOT . • Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks . • Able to understand building blocks of Internet of Things and characteristics.			
Unit No.	Course Content			Hours	
UNIT I	IOT Definition, IOT Key Features, IOT Advantages, IOT Disadvantages, Applications of IOT, IOT Categories, Baseline Technologies-M2M, Cyber Physical systems, Sensor- Characteristics of Sensors, Classification of Sensors, Actuator-Types of Actuators.			15	
UNIT II	IOT Components, Service Oriented Architecture of IOT, Challenges of IOT, IOT Networking-Connectivity Terminologies, Multihoming, IOT protocols-IPV4, IPV6, MQTT, SMQTT, COAP.			15	
Recommended Learning Resources					
Reference Books:					
1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743).					
2. Srinivasa KG, "Internet of Things", CENGAGE Leaning India, 2017.					
E-Resources:					
Online Courses and Platforms:					
Coursera, edX, Udemy, Udacity: These platforms offer a wide range of IoT courses, from introductory to specialization levels, covering topics like IoT fundamentals, sensor technology, cloud platforms, and data analytics.					
NPTEL: Offers introductory courses on Industry 4.0 and the Industrial Internet of Things.					
Future Learn: Provides a course on the rise of connected devices in IoT.					
Plural sight: Offers a course focused on IoT security.					
Things Board: An open-source platform that provides a comprehensive environment for developing and deploying IoT solutions, including dashboards, data visualization, and device management.					
IIT Delhi Central Library: Provides access to various e-resources related to IoT, including bibliographic databases, full-text resources, standards, and e-journals.					
DigiKey: Features an IoT resource centre with information on various aspects of IoT, including gateways, sensors, wireless modules, and connectivity solutions.					

Year	II	Course Code : SEPBCAE--2(b)		Credits	2
Semester	IV	Course Title : Cloud Computing		Hours	30
Course Pre-requisites, if any		NA			
Formative Assessment Marks : 10		Summative Assessment Marks : 40	Duration of SEE: 2 hrs.		
Course Objectives		After completing this course satisfactorily, a student will be able to: - To learn the basics of cloud computing, its models and Services. - To compare and contrast programming for cloud and their applications - To explain Cloud Resource Virtualization.			
Unit No.	Course Content			Hours	
UNIT I	Definition of Cloud Computing, History of Cloud Computing, Characteristics of Cloud Computing, Advantages of and Disadvantages of Cloud Computing, Types of Cloud-Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud, Architecture of Cloud Computing.			15	
UNIT II	Cloud Computing Services - Infrastructure as a Service (IaaS), Platform as a Service (Paas), Software as a Service (SaaS), Function as a Service (Faas), Cloud Security, Cloud and Dynamic Infrastructure, Cloud adoption, Data Storage and Backup.			15	
Recommended Learning Resources					
Reference Books:					
1. Dan C Marinescu, "Cloud Computing Theory and Practice", Elsevier (MK) 2013. 2. Rajkumar Buyya, James Broberg, Andrzej Goscinski, "Cloud Computing Principles and Paradigms", Willey 2014. 3. John W Rittinghouse, James F Ransome,"Cloud Computing Implementation, Management and Security", CRC Press 2013					
E-Resources:					
Types of Cloud Computing E-Resources: Educational Platforms: Online courses, tutorials, and certifications offered by platforms like Coursera, edX, and Simplilearn provide structured learning paths on cloud computing concepts, technologies, and best practices. Cloud Provider Resources: Cloud providers like AWS, Azure, and Google Cloud offer extensive documentation, tutorials, and tools for their specific cloud services. These resources are essential for learning how to use their platforms effectively. Open-Source Tools and Repositories: Projects like Kubernetes, Docker, and various cloud-native tools provide open-source resources for developing, deploying, and managing cloud applications.					

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E-books and Articles:

Numerous websites and publishers offer e-books, white papers, and articles on various cloud computing topics, ranging from introductory overviews to in-depth technical guides.

Community Forums and Blogs:

Online communities and blogs dedicated to cloud computing provide a platform for knowledge sharing, discussions, and problem-solving.

Library-Specific Resources:

Libraries utilize cloud computing for various purposes, such as hosting e-resources, providing access to databases, and facilitating collaboration. Resources related to cloud computing in libraries include articles, case studies, and best practices for adopting cloud-based solutions.

Examples of Cloud Computing E-Resources:**AWS Training and Certification:**

Amazon Web Services (AWS) offers a wide range of training courses and certifications to help individuals gain expertise in their cloud platform.

Microsoft Azure Tutorials:

Microsoft Azure provides comprehensive tutorials and documentation for its cloud services.

Google Cloud Learning Center:

Google Cloud offers a learning center with various resources for its cloud platform.

Open Source Cloud Tools:

Platforms like GitHub host various open-source projects related to cloud computing, including Kubernetes, Docker, and other cloud-native technologies.

Academic Libraries' Cloud Resources:

Libraries are increasingly adopting cloud computing for hosting e-resources and facilitating collaboration. Resources on cloud computing in libraries can be found on platforms like Research Gate and UNL Digital Commons.

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Year	II	Course Code : SEPBCAP10	Credits	2
Semester	IV	Course Title : Java Programming Lab	Hours	50
Course Pre-requisites, if any		Knowledge of Java Programming.		
Formative Assessment Marks : 10		Summative Assessment Marks : 40	Duration of SEE: 3 hrs.	

PART - A:

1. Java program to perform arithmetic operations
2. Java program to read n Subject marks and display maximum and average marks
3. Java program to find largest of three numbers
4. Java program to print first n terms of Fibonacci sequence
5. Java program to swap two numbers without using third variable.
6. Java program to find sum of first n even numbers divisible by 3.
7. Java program to check given number is Armstrong or not
8. Java program to read and display student information using class.
9. Java program on constructor.
10. Java program on method overloading.

PART - B:

1. Java program to calculate area and volume of room using single inheritance.
2. Java program on method overriding.
3. Java program on multiple inheritances using interface.
4. Java program on mouse event handling.
5. Java program to show the use of some GUI components.
6. Java program on multithreading.
7. Java program on exception handling.
8. Java program to create and throw user defined exception.
9. Java program to write bytes to a file.
10. Java program to write and read data with random access

Instructions:

1. A certified journal is mandatory for every student to appear for the practical examination.
2. The student has to execute a minimum of eight programs from each part to complete the lab course.

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Year	II	Course Code : SEPBCAP11	Credits	2
Semester	IV	Course Title: Multimedia and Animation Lab	Hours	50
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of SEE: 3 hrs.	

Part - A:

1. Program to describe various text formatting commands.
2. Program to create an Unordered list and Ordered List.
3. Program to create a Table.
4. Program to create a simple form.
5. Program to create a Hyper link.
6. Program to insert an image to Web page.
7. Program to insert scrolling text using Marquee tag.
8. Program to divide a page into Frames.
9. Program to create a simple layout of Webpage.
10. Program to draw rectangle, line, polygon, polyline using SVG.

Part - B:

1. JavaScript Program to turn on/off a light bulb using make use of .gif images and button
2. JavaScript Program to swap two strings.
3. JavaScript Program to check whether person is eligible for voting or not.
4. JavaScript Program to change style of a text at runtime.
5. JavaScript Program to create a scrolling banner.
6. JavaScript Program to change colour of the text box if empty string submitted.
7. JavaScript Program to Display Digital clock.
8. Program to create canvas and add a red square onto the game area with up/down/left/right controller buttons
9. Program to demonstrate translation , rotation , scaling and transform using canvas.

Instructions:

1. A certified journal is mandatory for every student to appear for the practical examination.
2. The student has to execute a minimum of eight programs from each part to complete the lab course.

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Year	II	Course Code : SEPBCAP12	Credits	2
Semester	IV	Course Title : Data Communication and Networks Lab	Hours	50
Course Pre-requisites, if any		Knowledge of C++ Programming		
Formative Assessment Marks : 10		Summative Assessment Marks : 40	Duration of SEE: 3 hrs.	

Implement the following programs in C++:

1. To find the given dotted decimal IP address is valid or NOT.
2. To find a class in a given dotted decimal IP address.
3. To implement Bit Stuffing.....
4. To implement Character Stuffing.....
5. To implement Parity Check.
6. To implement Check Sum.
7. To implement Stop and Wait ARQ protocol.....
8. To implement Go-back-N ARQ protocol.....
9. To implement Selective- Repeat ARQ protocol.
10. To implement Public-Key Encryption.....
11. To implement CRC (Cyclic Redundancy Check)
12. To implement VRC (Vertical Redundancy Check)
13. To implement Dijkstra's Algorithm.
14. To implement Bellman-Ford Algorithm.
15. To find all pair shortest path.

Instructions:

1. A certified journal is mandatory for every student to appear for the practical examination.

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Instructions:

CIA(Continuous Internal Assessment) for Theory	
Assessment Type	Marks
1. Test 1	15
2. Assignment	05
1. Test 2	15
2. Seminar	05
Maximum Marks to be awarded	20

Award maximum 20 marks based on the average of two theories CIA.

Theory Examination Question Paper Pattern for Major Subjects of B. Sc. / BCA**Time: 3 Hours****Max Marks: 80**

Instructions to Candidates:

1. All Sections are Compulsory.
2. Draw neat and labeled diagrams wherever necessary.

Section-A		
Answer ALL the following Questions.		10 x 2 = 20
Q1	a	Question to be asked from Unit-I
	b	Question to be asked from Unit-I
	c	Question to be asked from Unit-II
	d	Question to be asked from Unit-II
	e	Question to be asked from Unit-III
	f	Question to be asked from Unit-III
	g	Question to be asked from Unit-IV
	h	Question to be asked from Unit-IV
	i	Question to be asked from Unit-V
	j	Question to be asked from Unit-V
Section-B		
Answer any SIX of the following Questions.		6 x 5 = 30
Q2	Question to be asked from Unit-I	
Q3	Question to be asked from Unit-I	
Q4	Question to be asked from Unit-II	
Q5	Question to be asked from Unit-II	
Q6	Question to be asked from Unit-III	
Q7	Question to be asked from Unit-III	
Q8	Question to be asked from Unit-IV	
Q9	Question to be asked from Unit-V	
Section-C		
Answer any THREE of the following Questions.		3 x 10 = 30
Q10	Question to be asked from Unit-I	
Q11	Question to be asked from Unit-II	
Q12	Question to be asked from Unit-III	
Q13	Question to be asked from Unit-IV	
Q14	Question to be asked from Unit-V	

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Instructions:

Continuous Internal Assessment for Practical	
Assessment Type	Marks
Test 1 on PART A	10
Test 2 on PART B	10
Maximum Marks to be awarded	10

Instructions:

1. A Certified Journal is mandatory for appearing the examination.
2. Students shall be given two programming assignments taking in to consideration of duration of the time allotted to students for writing, typing and executing the programs.
3. Award maximum 10 marks based on the average of two practical CIA.

Note: Guidelines given by the university from time-to-time shall be followed for I. A.

Semester End Examination (SEE) Scheme of Evaluation for Lab Examination

Assessment Criteria	Marks
Writing of 2 Programs(Each from Part A & Part B)	15
Execution (Includes program code modification and execution result)	15
Journal	05
Viva-Voice	05
Total	40

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Instructions:

CIA (Continuous Internal Assessment) for Elective / Skill Papers of B.Sc. / BCA	
Assessment Type	Marks
1. Test 1	10
2. Test 2	10
Maximum Marks to be awarded	10

Award maximum 10 marks based on the average of two theories CIA.

Theory Examination Question Paper Pattern for Elective / Skill Papers of B.Sc. / BCA**Time: 2 Hours****Max Marks: 40**

Instructions to Candidates:

1. All Sections are Compulsory.
2. Draw neat and labeled diagrams wherever necessary.

Section-A		
Answer ALL the following Questions.		5 x 2 = 10
Q1	a	Question to be asked from Unit-I
	b	Question to be asked from Unit-I
	c	Question to be asked from Unit-I
	d	Question to be asked from Unit-II
	e	Question to be asked from Unit-II
Section-B		
Answer any SIX of the following Questions.		6 x 5 = 30
Q2	Question to be asked from Unit-I	
Q3	Question to be asked from Unit-I	
Q4	Question to be asked from Unit-I	
Q5	Question to be asked from Unit-I	
Q6	Question to be asked from Unit-II	
Q7	Question to be asked from Unit-II	
Q8	Question to be asked from Unit-II	
Q9	Question to be asked from Unit-II	

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