

Bachelor of Computer Applications
(Cloud Technology and Information Security)
Semester–II

Course Code	Course Title	L	T	P	Credits
BCA-102A	Operating System (Pre-requisite: None)	3	0	0	3
		CIE	SEE		Total
		40	60		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-102A.1	Understand the fundamental concepts of operating systems.
BCA-102A.2	Apply process scheduling algorithms to solve process management problems
BCA-102A.3	Interpret memory management techniques and virtual memory.
BCA-102A.4	Implement file systems and disk scheduling algorithms.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-102A.1	3	-	-	-	-	-	-	2
BCA-102A.2	3	2	3	-	-	-	-	2
BCA-102A.3	3	3	3	2	-	-	-	2
BCA-102A.4	3	2	3	-	-	-	-	2

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I

Contact Hours: 11

Fundamentals of Operating System and Processes

Introduction of Operating System: Definition, Functions & Characteristics; Operating System Services; Operating System Architecture; Types of Operating system: Batch, Multiprogramming, Multi Processing, Time-sharing, Real-time, Distributed; System Programs and System calls.

Processes: Definition, Process states, Process Control Block, Operations on Processes, inter process Communication, Threading and Multithreading.

UNIT-II

Contact Hours: 12

Process Scheduling, Synchronization and Deadlocks

Process Scheduling: Definition, Types of Schedulers, Scheduling Criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time (Definition only), Scheduling algorithms: Preemptive and Non - Preemptive, FCFS, SJF, Priority, RR, and Multi-level Queue (with and without Feedback) Scheduling. Synchronization: Critical Section Problem, Semaphores, Classical Problem of Synchronization.

Deadlocks: Definition, Necessary conditions for Deadlock, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery.

UNIT-III

Contact Hours: 12

Memory Management

Memory Concepts: Logical and Physical Address Space, Swapping, Internal and External Fragmentation.

Memory Allocation Techniques: Contiguous Memory Allocation- Single and Multi-Partitioned, Non-Contiguous Memory Allocation – Paging and Segmentation.

Virtual Memory Management: Demand Paging, Page-Replacement Algorithms: FIFO, LRU, Optimal, Thrashing.

UNIT-IV

Contact Hours: 10

File and Directory management, Disk Scheduling algorithms

File Concept: File System and its Functions, Different types of Files and their access methods.

Directory: Directory Structures, Directory Operations, Directory Allocation Methods.

Disk Scheduling: Disk Structure, Disk Scheduling Algorithms: First come First Serve (FCFS), Shortest Seek Time First (SSTF), SCAN, C-SCAN, LOOK, C- LOOK.

Text Books:

1. Silberschatz A., Galvin P.B., and Gagne G., *Operating System Concepts*, John Wiley & Sons.
2. Godbole, A.S., *Operating Systems*, Tata McGrawHill Publishing Company, New Delhi.

Reference Books:

1. William Stallings, *Operating Systems: Internals and Design Principles*, Prentice Hall
2. William S. Davis and T. M. Rajkumar, *Operating Systems: A Systematic View*, Pearson.

Course Code	Course Title	L	T	P	Credits
BCA-112A	Data Structures using C++ (Pre-requisite: C Programming)	3	0	0	3
		CIE	SEE		Total
		40	60		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-112A.1	Understand the fundamentals of Object-Oriented Programming (OOP) in C++
BCA-112A.2	Explore the Data Structures concepts and operations of Arrays and Strings
BCA-112A.3	Examine the features and operations of Stack and Queue data structure.
BCA-112A.4	Explore the implementation and operations of linked lists applying searching and sorting algorithms.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-112A.1	3	-	-	-	-	-	-	2
BCA-112A.2	3	2	-	2	-	-	-	3
BCA-112A.3	3	3	2	2	-	-	-	3
BCA-112A.4	3	3	2	2	-	-	-	3

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I

Contact Hours: 10

Object-Oriented Programming concepts

Object-Oriented Programming: Object-Oriented programming features and benefits. Object-Oriented features of C++, Class and Objects, Data Hiding & Encapsulation, Structures, Data members and Member functions, Scope resolution operator and its significance, Accessing Members of Class and Structure, Passing and Returning Objects to Functions.

UNIT-II

Contact Hours: 11

Introduction to Data Structures and Arrays

Basic data Structure: Introduction to Data Structures, algorithms and Pseudo code, Types of Data Structures, Relationship among data, data structures, and algorithms, Abstract Data Types, Analysis of Algorithms, asymptotic notations, asymptotic analysis.

Arrays, Representation of Arrays in Memory, Operations on Array (Traversing, Insertion, Deletion), Strings and its Representation in Memory, Operations on Strings (length, reverse).

UNIT-III

Contact Hours: 12

Stacks and Queues

Stacks: Introduction, Representation of Stacks Using Sequential Organization (Arrays), Applications of Stack, Expression Evaluation and Conversion, Polish notation and expression conversion, Processing of Function Calls, Reversing a String with a Stack, Recursion. Stack Abstract Data Type

Queues: Concept of Queues, Realization of Queues Using Arrays, Circular Queue, Multi-queues, Dequeue, Priority Queue, Applications of Queues, Queue as Abstract Data Type

UNIT-IV

Contact Hours: 12

Linked Lists, Searching and Sorting techniques

Linked Lists: Introduction, Types (singly, double, circular, circular double) and Operations (Insertion, Deletion, Traversal, Searching, Sorting), Applications.

Searching and Sorting: Search Techniques-Linear Search, Binary Search, Sorting Techniques- Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, Quick Sort, Comparison of Sorting Methods

Text Books:

1. Michael T. Goodrich, R. Tamassia and Mount, *Data structures and Algorithms in C++*, John Wiley and Sons.
2. Mark Allen Weiss, *Data structures and Algorithm Analysis in C++*, Pearson Education.
3. Robert L. Kruse and A.J. Ryba, *Data Structures and Program Design in C++*, Prentice Hall, Inc., NJ
4. Herbert Schildt, *C++ The Complete Reference*, Tata McGraw-Hill

Reference Books:

1. Narasimha Karamanchi, *Data Structures and Algorithms Made Easy*, CareerMonk Publications
2. Adam Drozdek, *Data Structures and Algorithms in C++*, Course Technology.
3. Balaguruswami, E., *Object Oriented Programming In C++*, Tata McGraw-Hill.

Course Code	Course Title	L	T	P	Credits
BCA-182A	Data Structures Lab (Pre-requisite: C++)	0	0	4	2
		CIE	SEE		Total
		50	50		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-182A.1	Write programs in C++ implementing various operations on Array
BCA-182A.2	Implement various operations on Linked lists.
BCA-182A.3	Write programs implementing various operations on Stack and Queue
BCA-182A.4	Implement various Searching and Sorting techniques in C++.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-182A.1	3	-	2	-	-	-	-	2
BCA-182A.2	3	2	2	2	-	-	-	3
BCA-182A.3	3	3	2	2	-	-	-	3
BCA-182A.4	3	3	2	2	-	-	-	3

List of Experiments	
No.	Experiment Detail
1.	Write a program to remove the duplicates from an array.
2.	Write a program that prints a table indicating the number of occurrences of each alphabet in the text entered.
3.	Write a program that uses functions to perform the following operations on an array (a) Creation (b) Insertion (c) Deletion (d) Traversal.
4.	Write a program to implement simple Stack using array to perform the following operations: (a) Create (b) Peek (c) Push (d) Pop (e) Traverse
5.	Write a menu driven program that implements singly linked list for the following operations: (b) Creation (b) Insertion (c) Deletion (d) Traversal.
6.	Write a menu driven program that implements doubly linked list for the following operations: Create, Display, Insert, Delete, Search,
7.	Write a program to implement simple Stack using Link list to perform the following operations: (a) Create (b) Peek (c) Push (d) Pop (e) Traverse
8.	Write a program to implement simple Queue using array to perform the following operations: (a) Create (b) Enqueue (c) Dequeue (d) Traverse
9.	Write a program to implement circular Queue using array to perform the following operations: (a) Create (b) Enqueue (c) Dequeue (d) Traverse
10.	Write a program to search an elements in an array using linear search technique.
11.	Write a program to search an elements in an array using binary search technique.
12.	Write a program to sort the elements using Insertion Sort algorithm.

13.	Write a program to sort the elements using Bubble Sort algorithm.
14.	Write a program to sort the elements using Quick Sort algorithm.
15.	Write a program to sort the elements using Merge Sort algorithm.
16.	Write a program to sort the elements using Selection Sort algorithm.

Text Books:

1. Michael T. Goodrich, R. Tamassia and Mount, *Data structures and Algorithms in C++*, John Wiley and Sons.
2. Mark Allen Weiss, *Data structures and Algorithm Analysis in C++*, Pearson Education.
3. Robert L. Kruse and A.J. Ryba, *Data Structures and Program Design in C++*, Prentice Hall, Inc., NJ
4. Herbert Schildt, *C++ The Complete Reference*, Tata McGraw-Hill

Reference Books:

1. Narasimha Karamanchi, *Data Structures and Algorithms Made Easy*, CareerMonk Publications
2. Adam Drozdek, *Data Structures and Algorithms in C++*, Course Technology.
3. Balaguruswami, E., *Object Oriented Programming In C++*, Tata McGraw-Hill.

Course Code	Course Title					L	T	P	Credits
BCA-114A	Introduction to Cloud Computing (Pre-requisite: None)					2	0	0	2
						CIE		SEE	Total
						40	60	100	
Course Outcomes (COs): At the end of this course, students will be able to									
BCA-114A.1	Understand the fundamentals, evolution, characteristics, and architectures of cloud computing								
BCA-114A.2	Explain the service and deployment models, and SLA management.								
BCA-114A.3	Learn cloud resource virtualization, including hypervisors, instances, and VM provisioning.								
BCA-114A.4	Understand various cloud applications, security issues, and tools used in cloud computing.								
Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	
BCA-114A.1	3	-	-	-	-	-	-	2	
BCA-114A.2	3	-	2	-	-	3	-	3	
BCA-114A.3	3	-	-	2	-	-	-	3	
BCA-114A.4	3	2	2	2	-	2	-	3	

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I

Contact Hours: 7

Introduction to cloud computing

Introduction to cloud computing: Introduction to cloud, Evolution, Characteristics, Business Benefits, Challenges, Fundamental Cloud Architectures, Applications.

UNIT-II

Contact Hours: 8

Service and Deployment Models and Service level agreements

Service Models (XaaS): Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS)

Deployment Models: Types of cloud - Public cloud - Private cloud - Hybrid cloud

Service Level Agreements: Types of SLA, Lifecycle of SLA, SLA Management.

UNIT-III

Contact Hours: 8

Virtualization and Instances

Virtualization as Foundation of Cloud, Understanding Hypervisors, Understanding Machine, Image and Instances,

Managing Instances: Virtual Machine Provisioning and Service Migrations, VirtualBox.

UNIT-IV

Contact Hours: 7

Clouds, Security and Tools

Media Clouds, Security Clouds, Computing Clouds, Mobile Clouds, Federated Clouds, Hybrid Clouds.
Cloud Computing and Security: Risks in Cloud Computing, Data Security in Cloud, Cloud Security Services
Cloud Computing Tools: Tools and Technologies for Cloud.

Text Books:

1. A. Srinivasan and J. Suresh, *Cloud Computing –A Practical Approach for Learning and Implementation*, Pearson India Publications.
2. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski, *Cloud Computing: Principles and Paradigms*, Wiley

Reference Books:

1. Arshdeep Bahga and Vijay Madisetti, *Cloud Computing –A Hands on Approach*, Universities Press (India) Pvt Ltd.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, *Cloud Computing: A Practical Approach*, Mc Graw Hill Education

Course Code	Course Title	L	T	P	Credits
BCA-106A	Introduction to Web Technology (Pre-requisite: None)	3	0	0	3
		CIE	SEE		Total
		40	60		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-106A.1	Understand the evolution and components of the Internet.
BCA-106A.2	Explore the basic and advance elements of HTML in designing web pages.
BCA-106A.3	Apply CSS for Web Page Styling and Layout.
BCA-106A.4	Analyze Dynamic Web Functionality Using JavaScript.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-106A.1	3	-	-	-	-	-	-	-
BCA-106A.2	3	-	-	-	-	-	-	3
BCA-106A.3	3	2	2	3	-	-	-	3
BCA-106A.4	3	3	2	3	-	2	-	3

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I

Contact Hours: 12

Introduction to Internet and Web Publishing

Introduction to Internet and its Components: Evolution and History of World Wide Web, Web Pages and Contents, Web Clients, Web Servers, Web Browsers, Hypertext Transfer Protocol, HTTP Request Message, Response Message, URLs, Searching, Dynamic and Static Website, Search Engines and Search Tools.

Web Publishing: Hosting website, Internet service provider, Planning and designing website, Steps for developing website.

UNIT-II

Contact Hours: 11

Basics of Hyper Text Mark-up Language (HTML)

Introduction, History of HTML, Introduction to DHTML, Structure of HTML Page, HTML tags versus HTML elements, HTML Basic Formatting Tags and attributes of tag, Paragraph Tag, Comments in HTML, Heading Tag, Div Tag, Span Tag, Different types of List Tag- Unordered Lists, Ordered Lists, Definition list, Image Tag, Hyperlink-Internal and External, Table tag and its attributes, iFrame, Forms in HTML, Post and Get method

UNIT-III

Contact Hours: 12

Introduction to Cascading Style Sheet (CSS)

Basic Concepts, CSS Syntax, Features of CSS3, Style Rule: Cascading and Inheritance, Creating Style Sheets,

CSS Selectors, CSS Comments, CSS Text Properties, CSS Colour Methods, Background Properties, Cursor Properties, CSS Table and List Properties, CSS Box Model, CSS Positioning, CSS Display Properties, CSS Float Properties.

UNIT-IV

Contact Hours: 10

Java Script and Document Object Model (DOM)

Introduction to JavaScript: History of JavaScript, Features of JavaScript, JavaScript basic programming: Variables, Operators, String manipulation, Control statements, Functions, Callback, JavaScript OOPs, Object, and Inheritance.

Working with HTML DOM: Finding HTML Elements, Changing HTML Elements, Adding and Deleting Elements, Adding Events Handlers.

Text Books:

1. Jon Duckett, *HTML and CSS: Design and Build Webs*, Wiley
2. Julie Meloni, *HTML, CSS and JavaScript All in One*, Sams Teach Yourself: Covering HTML5, CSS3, and jQuery, Sams Publishing.

Reference Books:

1. Raj Kamal, *Internet and Web Technologies*, Tata McGrawHill.
2. Ramesh Bangia, *Multimedia and Web Technology*, Firewall Media.

Course Code	Course Title	L	T	P	Credits
BCA-174A	Web Technology Lab (Pre-requisite: HTML, CSS, JavaScript)	0	0	4	2
		CIE	SEE		Total
		50	50		100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-174A.1	Apply basic and advanced HTML elements to design web pages
BCA-174A.2	Implement CSS properties to enhance the functionality of HTML page
BCA-174A.3	Utilize JavaScript basic concepts to create dynamic web pages
BCA-174A.4	Implement event handling features of JavaScript in designing dynamic web pages

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-174A.1	3	-	-	-	-	-	-	-
BCA-174A.2	3	-	2	-	-	-	-	3
BCA-174A.3	3	2	2	3	-	-	-	3
BCA-174A.4	3	3	2	3	-	2	-	3

List of Experiments

No.	Experiment Detail
1.	Design a web page to demonstrate various text formatting HTML tags.
2.	Create ordered and unordered lists to display items, such as a list of favorite movies or a to-do list.
3.	Design a simple resume page with sections for personal information, education, experience, and skills.
4.	Create a simple image gallery with captions using the tag
5.	Create a webpage with different section and demonstrate internal link.
6.	Create a table where some cells span multiple columns (using colspan) and rows (using rowspan).
7.	Develop a web page to demonstrate the use of the <iframe> tag to embed an external webpage within another HTML page
8.	Create registration form include different input types, radio buttons, checkboxes, and dropdown menus.
9.	Create a webpage and styling HTML Elements with CSS.
10.	Implement a CSS file and attach it to any 3 HTML webpages.
11.	Design a static website with HTML and CSS for a organization include pages like Home, About, Services, and Contact.
12.	Design a webpage with a form. Upon submission, a new page opens displaying "Message has been sent" in an alert box, ensuring user feedback and interaction.
13.	Create a Basic Calculator having add, subtract, multiply and division operators.
14.	Implement a JavaScript function to verify if a string reads the same forwards and backwards, ensuring efficient string manipulation.

15.	Create a ‘to do’ list (add and remove HTML Elements) with JavaScript by click event.
16.	Design an interactive image slider using JavaScript. Users can click buttons to navigate through images. JavaScript handles image changes dynamically, enhancing user engagement and showcasing practical DOM manipulation skills in web development.

Text Books:

1. Jon Duckett, *HTML and CSS: Design and Build Webs*, Wiley
2. Julie Meloni, *HTML, CSS and JavaScript All in One*, Sams Teach Yourself: Covering HTML5, CSS3, and jQuery, Sams Publishing.

Reference Books:

1. Raj Kamal, *Internet and Web Technologies*, Tata McGrawHill.
2. Ramesh Bangia, *Multimedia and Web Technology*, Firewall Media.

Course Code	Course Title	L	T	P	Credits			
BCA-377A	Industrial Internship (Pre-requisite: None)	0	0	0	4			
		CIE	SEE	Total				
		50	50	100				
Course Outcomes (COs): At the end of this course, students will be able to								
BCA-377A.1	Examine and evaluate problems given by industry.							
BCA-377A.2	Learn professional skills such as teamwork, communication, and project management in an industry setting.							
BCA-377A.3	Employ industry-standard tools and technologies to successfully complete assigned tasks and projects.							
BCA-377A.4	Develop comprehensive documentation summarizing project outcomes, and detailing the skills acquired during the internship.							
Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
BCA-377A.1	2	2	-	–	–	1	–	–
BCA-377A.2	2	–	–	3	2	3	–	3
BCA-377A.3	3	3	3	3	2	2	-	2
BCA-277A.4	2	–	3	3	2	–	2	3

Guidelines for Industrial Training/ Internship: This course requires students to participate in professional employment-related activity or work experience or co-operative education activity with an entity external to the educational institution, normally under the supervision of an employee of an organization or an individual professional. A key aspect of the internship is induction into actual, formal, and organized work situation. Internship involves working with government or private industry, training or high-end educational organizations (such as IITs, etc.), business establishments, etc. to provide opportunities for students to actively engage in on-site experiential learning.

- The candidate shall be required to undergo industrial trainings /internships of the specified duration, provided in the Scheme of Studies and Examinations, in an industry/ business enterprise/ organization approved by the Head of the Department.
- If the concerned Department perceives any limitations from the industry to accommodate all the enrolled students, a student may be permitted to complete a skill-oriented e-content course (of sufficient duration) relevant to the industry or undertake a project-based / research project under the supervision of a faculty of a premier Institute (such as I.I.T., I.I.Sc.) with prior approval from the competent authority.
- The Training will be completed under the supervision of the officer (herein called Co. Training Supervisor) of the Company/ Organization under whose guidance and supervision the training was allotted to the candidate.
- A student can do industrial training/internship of 45-60 days duration during summer vacation after the 2nd or 4th semester before taking an exit or completing the degree programme in the respective discipline. It will be of 4 credits.
- If a student pursues 3 years UG Programme in respective discipline without taking Exit option, this internship (either done after 2nd or 4th semester) will be taken into account in 5th semester.
- If a student takes Exit after 2 years in UG Programme, this internship (either done after 2nd or 4th semester) will be taken into account in 4th semester.

- g) If a student takes Exit after 1 year in UG Programme, the mandatory internship done after 2nd semester will be taken into account in 2nd semester.
- h) However, for those students who have taken lateral entry into the 3rd semester and have completed internship of 45-60 days duration during first year, the internship is not required after the 4th semester.
- i) The candidates are required to submit a comprehensive report Training Supervisor within two weeks of completion of the training along with Co. Training Supervisor's Certificate in the beginning of the report stating that the report is an outcome of the work done by the candidate during his/her training.
- j) The viva-voce shall be held by Internal Examiner within two weeks after submission of the report.
- k) The Industrial Training/ Internship has only CIE component of 100 marks that shall be conducted as given in Table-1.

Table-1: Relative Weightages of Industrial Training/ Internship

Component	Description of the Component		Relative Weightage (Out of 100)
CIE	i)	Internship Synopsis Evaluation within 10 days of start of Internship	20
	ii)	Mid-Term Internship Evaluation	30
	iii)	Final Presentation and Internship Evaluation	50
CIE Total			100
SEE	NIL		NIL
Grand Total			100