# Bachelor of Computer Applications

# 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 |

**<u>Instructions for Paper Setter:</u>** 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-104A** | **Object Oriented Programming using C++** (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-104A.1** | Grasp the fundamental principles of Object-Oriented Programming (OOP). |
| **BCA-104A.2** | Understand the application of classes and objects and will be able to use arrays of objects, employ objects as function arguments in application development. |
| **BCA-104A.3** | Comprehend concepts of compile time polymorphism and inheritance. |
| **BCA-104A.4** | Understand run time polymorphism and how to effectively implement exception handling. |

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

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| **BCA-104A.1** | 3 | - | - | - | - | - | - | 2 |
| **BCA-104A.2** | 3 | - | 2 | - | - | - | - | 2 |
| **BCA-104A.3** | 3 | 2 | 2 | 2 | - | - | - | 2 |
| **BCA-104A.4** | 3 | 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: 10**

**Object Oriented Programming concepts and fundamentals of C++**

Object oriented programming (OOP): Principles of OOPs: Class and Objects, Data hiding & encapsulation, abstraction, polymorphism, inheritance and message passing, Comparison of procedural programming and object oriented programming languages.

Introduction to C++: Difference between C and C++, Tokens , Keywords, Identifiers, Constants, Variables, Insertion and Extraction operator, Scope resolution operator and its use, Reference variable, Pointers, Structures, Unions in C++.

**UNIT-II**                                        **Contact Hours: 13**

**Class, Object, Constructors and Destructors**

Class and Object: Declaration, Defining Member functions, Inline member function, Array of objects, Objects as function argument, Returning Objects, Static data member and member function, Friend function and friend class.

Constructors and Destructors: Instantiation of objects, Default constructor, Parameterized constructor, copy constructor and its use, constructor overloading, Destructors.

**Polymorphism and Inheritance concepts**

Polymorphism: Types, Compile time polymorphism: Function overloading and operator overloading, Overloading unary and binary operators, rules of operator overloading

Concept of Inheritance: Inheritance, Derived class and base class, Accessing the base class member, Access Specifiers, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual base class

**Virtual Functions and Exception handling**

Run time Polymorphism: Virtual Functions, Pure virtual functions, Abstract class

Exception handling: Types of Error, Exception handling model, Exception handling constructs - try, throw, catch, Order of catch blocks, catching all exceptions, Nested try blocks, Handling uncaught exceptions

**Text Books:**

1. Bjarne Stroustrup, *The C++ Programming Language*, Pearson Education.
2. KanetkarYashwant, *Let Us C++,* BPB Publications.

**Reference Books:**

1. Herbert Scildt, C++, *The Complete Reference*, Tata McGrawHill.
2. Robert Lafore, *Object Oriented Programming in C++*, SAMS Publishing.
3. Richard Johnson, *An Introduction to Object-Oriented Application Development*, Thomson Learning.
4. Balaguruswami, E., *Object Oriented Programming in C++*, Tata McGrawHill.

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| **BCA-172A** | **Object Oriented Programming Lab**<br>(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-172A.1** | Develop programs in C++ using class and object, functions and constructor and destructor |
| **BCA-172A.2** | Create programs in C++ applying Object oriented concepts like polymorphism and inheritance |
| **BCA-172A.3** | Design programs to handle exceptions in C++ |
| **BCA-172A.4** | Develop object oriented case study applications 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-172A.1** | 3 | - | - | - | - | - | - | 2 |
| **BCA-172A.2** | 3 | 2 | 2 | - | - | - | - | 2 |
| **BCA-172A.3** | 3 | 2 | 3 | 2 | - | - | - | 2 |
| **BCA-172A.4** | 3 | 2 | 3 | 2 | - | - | - | 3 |

| **List of Experiments** | |
|---|---|
| **No.** | **Experiment Detail** |
| 1. | Develop a C++ program to demonstrate the use of insertion (<<) and extraction (>>) operators. |
| 2. | Create a C++ program to declare a class and create objects. Define member functions inside the class. |
| 3. | Design a C++ program to demonstrate the concept of objects as function arguments and returning objects. |
| 4. | Develop a C++ program to demonstrate the use of static data members and static member functions. |
| 5. | Create a C++ program to implement friend functions. |
| 6. | Create a C++ program to implement friend class concept |
| 7. | Create a C++ program to implement constructor overloading including default, parameterized, and copy constructors. |
| 8. | Develop a C++ program to demonstrate the use of destructors. |
| 9. | Create a C++ program to demonstrate unary operator overloading. |
| 10. | Develop a C++ program to perform binary operator overloading to add two complex numbers. |
| 11. | Create a C++ program to demonstrate single inheritance and access base class members using different access specifiers (public, private). |
| 12. | Create a C++ program to implement multilevel inheritance. |
| 13. | Design a C++ program to implement multiple inheritance. |
| 14. | Develop a C++ program to implement hierarchical inheritance. |
| 15. | Create a C++ program to demonstrate virtual base class. |

| 16. | Design a C++ program to demonstrate the use of virtual functions to achieve run-time polymorphism. |
| --- | --- |
| 17. | Create a Program containing a possible exception. Use a Try Block to Throw it and a Catch Block to Handle it Properly. |
| 18. | Develop a Program to Demonstrate the Catching of All Exceptions. |
| 19. | Implement a banking system where you can create and manage bank accounts, including savings and current accounts, using classes and objects. |
| 20. | Implement a student management system that handles student records and grades using object-oriented principles. |

**Text Books:**

1. Bjarne Stroustrup, *The C++ Programming Language*, Pearson Education.
2. KanetkarYashwant, *Let Us C++,* BPB Publications.

**Reference Books:**

1. Herbert Scildt, C++, *The Complete Reference*, Tata McGrawHill.
2. Robert Lafore, *Object Oriented Programming in C++*, SAMS Publishing.
3. Richard Johnson, *An Introduction to Object-Oriented Application Development*, Thomson Learning.
4. Balaguruswami, E., *Object Oriented Programming in C++*, Tata McGrawHill.

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| **BCA-106A** | **Introduction to Web Technology**<br>(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 <img> 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.

a) 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.

b) 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.

c) 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.

d) 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.

e) 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.

f) 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** |