Semester - wise structure for
Four Year
B.C.A. (Honors/Research)
Program

As per NEP 2020,
for Affiliated Colleges
w.e.f.– June 2024.

Bachelor of Computer Application (Honors/Research) program is a four year program as per National Education Policy 2020 with effect from academic year 2024-25. Curriculum designed for BCA includes fundamentals and recent technologies required in IT industries. The Honors program is a lot industry oriented to fill the gap of employment disparity. The BCA research curriculum is aligned to the recent developments in research as well as anchoring the future research trends.

Program Educational Objectives (PEO)	
PEO1	Participate in lifelong learning through the successful completion of advanced degrees, continuing education and certifications and/or other professional developments
PEO2	Be successfully employed in IT as well as multidisciplinary domains in supportive and/or leadership roles
PEO3	Be self-reliant and independent thinkers leading entrepreneurial or social journey

Program Objective (PO)	
PO1	To gain core knowledge and a strong foundation in computer science and application
PO2	To develop applications for various domains by skills acquired in programming languages, computational tools and techniques
PO3	To demonstrate analytical and problem solving skills required in IT industry

Program Specific Outcomes (PSO)		
PSO No	PSO	Cognitive Level
BCA PSO 1	Acquire knowledge of core computer fundamentals as well as programming languages to solve problems computationally	BT Level 1 and 2
BCA PSO 2	Analyze various computational applications and develop a solutions using domain knowledge appropriate for a defined problems	BT Level 3 and 6
BCA PSO 3	Select, adapt and apply appropriate techniques, resources and tools to develop a software	BT Level 4 and 5
BCA PSO4	Communicate effectively with or among other development teams/community by writing reports and effective presentations about computing activities	BT Level 2

BT – Bloom's Taxonomy

Abbreviations:

- **T:** Theory Course
- **P:** Practical course
- **DSC:** Discipline Specific Core Course
- **DSE:** Discipline Specific Elective Course
- **MIN:** Minor subject
- **VSEC:** Vocational skill and Skill enhancement courses
- **VSC:** Vocational Skill Courses
- **SEC:** Skill Enhancement Courses
- **GE/OE:** Generic/open elective
- **CI:** Constitution of India
- **IKS:** Indian Knowledge System
- **CEP:** Community engagement and service
- **OJT**: On Job Training: Internship/ Apprenticeship
- **RP:** Research Project
- **RM:** Research methodology
- **ES:** Environment studies
- **ENG:** English
- **MIL:** Modern Indian language
- **CC:** Co-curricular Course
- **VEC:** Value Education Courses
- **AEC:** Ability Enhancement Courses

Subject Short Name:		
Sr	**Name of Subject**	**Short Name**
1	Physics	PH
2	Mathematics	MT
3	Chemistry	CH
4	Botany	BO
5	Zoology	ZO
6	Electronics	EL
7	Computer Science	CS
8	Statistics	ST
9	Microbiology	MB
10	Biotechnology	BT
11	Information Technology	IT
12	Biochemistry	BC
13	Environmental Science	EV
14	Geography	GG
15	Geology	GE
16	Computer Applications	CA

BCA (Honors/Research) – First Year, SEMESTER – I, Level – 4.5

Course	Course Type	Course Code	Course Title	Credits	Teaching Hours/Week T	P	Total	Internal (CA) T	Internal (CA) P	External (UA) T	External (UA) P
DSC-1	DSC	CA-111	Essential of Computers and Programming	2	2	--	2	20	--	30	--
DSC-2	DSC	CA-112	Programming using C++	2	2	--	2	20	--	30	--
DSC-3	DSC	CA-113	Practical based on Programming using C++	2	--	4	4	--	20	--	30
OE-1	OE	-	BCA students shall opt OE from basket	2	2	--	2	20	--	30	--
OE-2		-	BCA students shall opt OE from basket	2		2	2				
SEC-1	SEC	CA-114	Office Management Tools	2	2	--	2	20	--	30	--
VSC-1	VSE	CA-115	Web Design-I	2	2		2	20		30	
AEC-1	AEC	--	Select One from AEC Basket	2	2	--	2	20	--	30	--
VEC-1	VEC	--	Select One from VEC Basket	2	2	--	2	20	--	30	--
IKS	IKS	--	Select One from IKS Basket	2	2	--	2	20	--	30	--
CC-1	CC	--	Select One from CC Basket	2	2	--	2	50	--		--

BCA (Honors/Research) – First Year, SEMESTER – II, Level – 4.5

Course	Course Type	Course Code	Course Title	Credits	T	P	Total	Internal (CA) T	Internal (CA) P	External (UA) T	External (UA) P
DSC-4	DSC	CA-121	Object Oriented Programming in C++	2	2	--	2	20	--	30	--
DSC-5	DSC	CA-122	Introduction to Operating System	2	2	--	2	20	--	30	--
DSC-6	DSC	CA-123	Practical based on CA-121 & CA-122	2	--	4	4	--	20	--	30
MIN-1	MIN	CA-124 (A)	Basics of Management	2	2	--	2	20	--	30	--
		CA-124 (B)	Basic Mathematics for Computing								
OE-3	OE	--	BCA students shall opt OE from basket	2	2	--	2	20	--	30	--
OE-4	OE	--	BCA students shall opt OE from basket	2	2		2	20		30	
VSC-2	VSC	CA-125	Web Design-II	2	2	--	2	20	--	30	--
SEC-2	SEC	CA-126	Introduction to Graphics Design	2	2	--	2	20	--	30	--
AEC-2	AEC	--	Select One from AEC Basket	2	2	--	2	20	--	30	--
VEC-2	VEC	--	Select One from VEC Basket	2	2	--	2	20	--	30	--
CC-2	CC	--	Select One from CC Basket	2	2	--	2	20	--	30	--

Cumulative Credits f or First Year – 44

Course Code: CA-111	**Course Category: (DSC-1)**
Course Title: Essential of Computer	**Type: Theory**
Total Contact Hours: 30 (2/week)	**Course Credits: 02**
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA): 30 Marks**

Course Objectives:
- This course provides an overview of introductory concepts about computers, number systems and components of computer system.
- This course provides an overview of the fundamental concepts of computer networks, data communication, and network topologies.

Course Outcomes: After completion of the course, the student will be able to	Cognitive Level [Bloom's Taxonomy]
• Acquire the knowledge of fundamentals of Computer and Operating System.	3
• Develop problem solving skill through algorithms and flowcharts.	4
• Understand the basics of computer networking and internet.	2
• Understand the basics of Programming	2

Course Content:

Unit 1: Introduction to Basics of Computer (07 L, 10 M)
- Introductions to computer
- History of Computers
- Block Diagram of Computer
- Types of Computer
- Primary Memory and Secondary Memory
- Introduction and types of Software
- Programming Languages - High level, Middle Level, Low Level
- Introduction to Computer Virus and its types

Unit 2: Introduction to Operating System (08 L, 10M)
- Definition of operating system
- Functions of operating system
- Types of Operating Systems - DOS, Windows, Linux, Android
- Applications of Operating System
- Comparison of various Operating Systems

Unit 3: Introduction to Internet and Concepts of Network (07 L, 15 M)
- Fundamentals Of Internet
- Introduction to the Internet
- Working and Use of the Internet
- Applications of the Internet
- Introduction Computer Network
- Types of Networks
- Network Topology
- Introduction to TCP/IP

Unit 4: Computer Programming Theory (08 L, 15 M)
- Computer Languages, Programming Paradigm and Classification

- Programming Process: Problem Understanding, Planning, Coding, Translation, and Testing
- Algorithm - Introduction of Algorithm, Example of Algorithm
- Flowchart - Introduction of Flowchart, Example of Flowchart
- Data Representation - Conversion in number System, Decimal, binary,
- Character representation: ASCII

Reference Books:

1. V.RajaRaman, "Fundamentals of computer"(PHI Publication) *ISBN*10:8120340116
2. Roger Huntand John Shelley, "Computer and commonsense" (PHI Publication) *ISBN*10:0131646737
3. AndrewS.Tanenbaum, "Computer Networks"–Fourth Edition. *ISBNnumber*0130661023
4. Hurwitz Judith S. and Daniel Kirsch, "Cloud Computing for Dummies". ISBN
5. Godbole Achyut and Kahate Atul, "Web Technologies: TCP/IP, Web/ Java Programming, and Cloud
6. Computing, ", 3e Tata McGraw-Hill Education ISBN: 9332900914, 9789332900912.
7. "Operating System Concepts" by Abraham Silberschatz, Peter B. Galvin, Greg Gagne

Course Code: CA 112
Course Title: Programming using C++

Course Code: CA-112	**Course Category: DSC-2**
Course Title: Programming using C++	**Type: Theory**
Total Contact Hours: 30 (2/week)	**Course Credits: 02**
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA): 30 Marks**

Course Objectives:
1. To implement control structures and loops to create programs that handle repetitive tasks and decision-making processes.
2. To define and use structures and unions to group related data and manage different data types in C++.
3. To demonstrate the use of pointers and preprocessor directives to perform memory management and control code inclusion.

Course Outcomes: After completion of the course, the student will be able to	Cognitive Level [Bloom's Taxonomy]
1. Analyze and compare C++ with older programming languages, identifying key differences and understanding how C++ addresses limitations of previous languages.	4
2. Implement different loop constructs to manage repetitive tasks in C++.	3
3. Analyze and compare the memory allocation and use cases of structures versus unions.	4
4. Apply the concept of pointers and demonstrate their usage in managing memory.	3

Course Content:

Unit 1: Introduction to C++ (07 L, 10 M)
1. History of C++,
2. Advantages of C++,
3. Difference between C++ and old programming Languages,
4. Character set,
5. Tokens, Identifiers, Keywords, Variables,
6. Operators,
7. Operator precedence and associatively

Unit 2: Control Structure and Array (08 L, 15 M)
1. If Statements – if, if..else, if..elseif..else, nested if, Switch
2. Loops- While, For, Do..While, nested loop
3. expressions and qualifiers
4. Arrays, multidimensional array,
5. strings, array of string, string functions

Unit 3: Array, Structures and Union (08 L, 15 M)
1. Structure declaration and definition,
2. use of structure and union,
3. Difference between structure and unions.
4. Function component,
5. parameter passing – pass by value, pass by address, pass by reference,
6. inline function, recursive function, Friend Function

Unit 4: Pointers and Preprocessor directives (07 L, 10 M)
1. Introduction to pointers, uses of pointers, address variable, pointer variable,
2. pointer to function, void pointer,
3. memory management operator, object to pointer(vice versa)

4. #define, defining like macros, #error, #include

Reference Books:

1. Mastering C++, K.R. Venugopal, Rajkumar, T. Ravishankar, TMH.
2. Object Oriented Programming C++, Balguruswamy, TMH
3. The C++ Programming Language, Bjarne Stroustrup, 4th Edition
4. C++ Primer Plus, Stephen Prata, 6th Edition
5. Programming: Principles and Practice Using C++, Bjarne Stroustrup, 2nd Edition

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Course Code: CA 113
Course Title: Practical based on Programming using C++

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Course Code: CA-113	**Course Category: DSC-3**
Course Title: Practical based on Programming using C++	**Type: Practical**
Total Contact Hours: 60 (4/week)	**Course Credits: 04**
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA): 30 Marks**

Course Objectives:
1. To demonstrate the use of arithmetic operators to perform addition, subtraction, multiplication, and division operations.
2. To develop programs those utilize one-dimensional and two-dimensional arrays to perform data storage and retrieval operations.
3. To demonstrate the use of pointers and preprocessor directives to perform memory management and control code inclusion.

Course Outcomes: After completion of the course, the student will be able to	Cognitive Level [Bloom's Taxonomy]
1. Apply arithmetic operators to perform calculations and solve mathematical problems in C++ programs.	3
2. Implement different loop constructs to manage repetitive tasks in C++.	3
3. Analyze and implement the memory allocation and use cases of structures versus unions.	4
4. Apply the concept of pointers and demonstrate their usage in managing memory.	3

Course Content:

Assignments
1. Program using various arithmetic operators
2. Program using control statements (if, if else, nested if, switch)
3. Program using various looping structure (for, while, do while, nested loops)
4. Programs to check given number prime number or not
5. Programs to print Factorial of given number
6. Programs to print Fibonacci series.
7. Program using arrays (One dimension, Two dimensions)
8. Write a program to demonstrate use of function (call by value, call by reference, recursive)
9. Write a program to demonstrate use various string function
10. Write a program to demonstrate use structure and union

Logical Experiment
11. The annual examination results of 10 students are tabulated as follows:

Roll no	Sub1	Subj2	Subj3
2022001	40	87	74
2022002	50	56	62
2022003	65	97	64
2022004	78	45	75
2022005	98	32	85
2022006	45	65	56

2022007	63	45	77
2022008	25	87	64
2022009	72	23	68
2022010	63	69	78

Write a program to read the data and determine the following.
(a) Total marks obtained by each student.
(b) The highest marks in each subject and the roll no of the student who secured it.
(c) The student who obtained the highest total marks.

12. Write a function for finding the average age of a class student. Pass an array of student as a parameter to that function. Assume the default class strength to be 50. Provide default strength as a default argument to the function. Display average age of a class student using a program.

13. Write a program for below given algorithm which accept integer number N from the user and display following series up to N number.
Test Data:
Input Number is 7 then display
Expected output:
1 4 9 16 25 36 49

Course Code:
Course Title: Select any one from Basket of OE1 and OE2 available for UG Programmes

Course Code:	Course Category: OE-1
Course Title: Select any one from Basket of OE	Type:
Total Contact Hours: 30	Course Credits: 02
College Assessment (CA) Marks: 20	University Assessment (UA): 30

Course Content:

Course Code:	Course Category: OE-2
Course Title: Select any one from Basket of OE	Type:
Total Contact Hours: 30	Course Credits: 02
College Assessment (CA) Marks: 20	University Assessment (UA): 30

Course Code: CA-114	**Course Category: (SEC-1)**
Course Title: Office Management Tools	**Type: Theory**
Total Contact Hours: 30 (02/week)	**Course Credits: 02**
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA): 30 Marks**

Course Objectives:
- To provide an in-depth training in use of office automation, internet and internet tools.
- To familiarize the students in preparation of documents, spreadsheets and presentation with office automation tools.

Course Outcomes: After completion of the course, the student will be able to	Cognitive Level [Bloom's Taxonomy]
• Perform documentation and presenting skills.	3
• Design layouts and templates for presentation.	3
• Organize, visualize and restructure data using different formulas of spread sheets.	4

UNIT 1: Elements of ICT   **(04 L, 10 M)**
- Definition of ICT
- Applications of ICT
- Impact of ICT in business
- Communication tools - Email, chatting, Social Networking, video conferencing
- Different ICT Tools

UNIT 2: Word Processing   **(08 L, 13 M)**
- Introduction to Office Automation Suites
- Components of MS-Office
- Features of MS-Office 2010
- Interface of MS-Word 2010
- Text Formatting, Paragraph Formatting, Page Formatting
- Header & Footers,
- Working with Graphics and Pictures, Symbols
- Working with Tables,
- Multicolumn News Letter, Smart Art, Spell Check
- Mail Merge

UNIT 3: Working with Excel 2010   **(10 L, 15 M)**
- Introduction to Worksheets and Workbooks
- Working with Worksheet - Inserting, Deleting, Rename
- Wrap Text, Merge & Center
- Inserting and Deleting Rows and Columns
- Format - Row Height, Column Width, Auto-fit, Hide/Unhide
- Working with Data – Sorting, Filter, Conditional formatting
- Page Formatting – Margin, Orientation, Size, Print Area, Break
- Inbuilt Functions
- Basic functions – SUM, COUNT, AVERAGE, MIN, MAX
- Advanced functions: UPPER, LOWER, TRIM, LEN, IF… condition, Remove duplicates
- Creating and Working with Charts

UNIT 4: Working with PowerPoint Presentation 2010   **(08 L, 12 M)**

- Introduction to Power Point,
- Applying Themes and Layouts
- Working with Objects, Entering, Editing, and Formatting Text
- Inserting Pictures, Graphics, Shapes, Charts and SmartArt
- Adding Sound and Video
- Adding Transitions Effects and Animation,
- Normal view, Slide

- **Note: As the Course Syllabus is aligned with practical experience, Faculty members teaching this course are advised to conduct following assignments.**
- **Assessments (Internal/University) may include questions on following assignment.**

Laboratory Assignment

1. Create a simple document in word using headings, fonts and paragraph formatting

2. Demonstrate style formatting and page formatting in Word

3. Demonstrate creating and using templates in Word

4. Demonstrate working with pictures and tables in Word

5. Create presentations and apply themes and layouts to slides in PowerPoint

6. Demonstrate adding sound, video, transitions, and animation to your PowerPoint presentations.

7. Demonstrate entering data, sorting and formatting data and cells in Excel

8. Demonstrate Formulas in Excel

9. Demonstrate conditional statement in excel

10. Demonstrate SUM, COUNT, AVERAGE, MIN, MAX function in Excel

11. Demonstrate UPPER, LOWER, TRIM, LEN function in Excel

12. Demonstrate types of charts in Excel

References –

1. V. Rajaraman, "Fundamentals of Computers", PHI publication.
2. Roger Hunt and John Shelley, "Computers and Commonsense", PHI publication
3. A. S.Tananbaum, "Computer Network"
4. Vipra Computers, "Microsoft Office 2007", Vipra Printers Pvt. Ltd.
5. Ed Bott and Woody Leonhard, "Special Edition Using Microsoft Office 2007" Misty Vermaat, "Microsoft Office 2013", Shelly Cashman

Course Code: CA -115
Course Title: WEB DESIGN-I

Course Code: CA-115	**Course Category: VSC-1**
Course Title: Web Development using HTML	**Type: Theory**
Total Contact Hours: 30 (2/week)	**Course Credits: 02**
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA): 30 Marks**

Course Objectives:
- To Gain foundational knowledge of web concepts and technologies.
- To identify and define key web technologies and concepts such as HTML, CSS, and URLs.
- To Implement and format HTML tables and forms.
- To design and develop comprehensive web solutions that integrates HTML and CSS effectively to meet specific requirements.

Course Outcomes: After completion of the course, the student will be able to	Cognitive Level [Bloom's Taxonomy]
• Create a basic web page using HTML, demonstrating knowledge of static and dynamic content.	3
• Implement HTML tags to create web content such as lists, images, and multimedia elements.	2
• Create a web page that includes tables, framesets, and forms, using appropriate HTML tags and attributes.	3

Course Content:

Unit 1: Introduction to Web   (07 L, 10 M)
- Introduction to Internet,
- World Wide Web (WWW),
- Hypertext Transfer Protocol (HTTP),
- Universal Resource Locator (URL),
- Introduction to Web Browser and Web server,
- Introduction to Web page, Static and Dynamic Web page Introduction to HTML,

Unit 2: Fundamentals of HTML   (10 L, 15 M)
- Basic structure of HTML document,
- Formatting Text,
- Font Tags and Attributes
- Headings Tags,
- Image Tag and Attributes,
- Background Color and Background Images,
- Inserting Audio and Video Files,
- Marquee Tag and Attributes
- List Tag – Types of List
- Introduction to Hyperlink, Internal and External Hyperlink,

Unit 3: Form Designing Tag and Attributes   (06 L, 15 M)
- Table Tags & Attributes,
- Frame, Frameset, Creating Framesets, Target Frameset,
- Form Tag and Attributes,
- Form Elements - Textbox, Text Area, List Box, Radio Button, Checkbox, Submit and Reset Button

Unit 4: CSS in HTML   (07 L, 10 M)
- Basic of CSS,

- Advantages of CSS,
- Role of CSS in Web Designing,
- CSS Structure and Syntax,
- Internal CSS,
- Inline CSS,
- External CSS,
- Font Properties of CSS
- Introduction to CSS Selectors
- Types of Selector - Class, ID, Group, Universal

Note: As the Course Syllabus is aligned with practical experience, Faculty members teaching this course are advised to conduct following assignments.
Assessments (Internal/University) may include questions on following assignment.

Laboratory Assignments

1. Create web page using basic HTML tags.

2. Create web page using Different Formatting tag.

3. Create Web page with different Images.

4. Create web page using Marquee Tag

5. Create a web page using different List tag.

6. Create web page using Anchor Tag (Internal Link and External Link)

7. Create web page to design timetable of your college using Table tag.

8. Create web page inserting audio and video files.

9. Design a web page using Frames and Frameset Tag.

10. Design webpage of College Admission Form.

11. Design a web page using Inline and Internal CSS

Reference Books:

1. Textbook of Web Designing By Joel Sklar, Cengage Learning Publication 2009
2. Web designing in Nut Shell (Desktop Quick Reference) by Jennifer Niederst Publication – O'Reilly publication
3. Designing web navigation by James Kalbach Publication – O'Reilly publication Textbook of Web Designing By Joel Sklar

AEC-1 Course will be selected from the AEC Basket available for UG Programmes.

Course Code: AEC-XXX Course Title:	
Course Code: AEC-	Course Category: Ability Enhancement Courses (AEC)
Course Title:	Type: Theory
Total Contact Hours: 30 (2/week)	Course Credits: 02
College Assessment (CA) Marks: 20 Marks	University Assessment (UA): 30 Marks

VEC-1 Course will be selected from the VEC Basket available for UG Programmes.

<table>
<tr><td colspan="2" align="center">**Course Code: VEC-XXX**
Course Title:</td></tr>
<tr><td>**Course Code: VEC-**</td><td>**Course Category: (VEC-1)**</td></tr>
<tr><td>**Course Title:**</td><td>**Type: Theory**</td></tr>
<tr><td>**Total Contact Hours: 30 (02/week)**</td><td>**Course Credits: 02**</td></tr>
<tr><td>**College Assessment (CA) Marks: 20 Marks**</td><td>**University Assessment (UA): 30 Marks**</td></tr>
<tr><td colspan="2" align="center">**Course Objectives**:</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2" align="center">**Course Outcomes:**</td></tr>
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IKS Course will be selected from the IKS Basket available for UG Programmes.

<table>
<tr><td colspan="2" align="center">**Course Code: IKS-XXX**
Course Title:</td></tr>
<tr><td>**Course Code: IKS-XXX**</td><td>**Course Category: (IKS)**</td></tr>
<tr><td>**Course Title:**</td><td>**Type: Theory**</td></tr>
<tr><td>**Total Contact Hours: 30 (02/week)**</td><td>**Course Credits: 02**</td></tr>
<tr><td>**College Assessment (CA) Marks: 20 Marks**</td><td>**University Assessment (UA): 30 Marks**</td></tr>
<tr><td colspan="2">**Course Objectives**:

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<table>
<tr><td>**Course Outcomes: After completion of the course, the student will be able to**</td><td>**Cognitive Level**
[Bloom's Taxonomy]</td></tr>
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Course Content:

CC-1 Course will be selected from the CC Basket available for UG Programmes.

<table>
<tr><td colspan="2" align="center">**Course Code: CC-XXX**
Course Title: Select any one from Basket of CC</td></tr>
<tr><td>**Course Code: CC-XXX**</td><td>**Course Category: (CC-1)**</td></tr>
<tr><td>**Course Title:**</td><td>**Type: Theory**</td></tr>
<tr><td>**Total Contact Hours: 30 (02/week)**</td><td>**Course Credits: 02**</td></tr>
<tr><td>**College Assessment (CA) Marks: 50 Marks**</td><td>**University Assessment (UA):**</td></tr>
<tr><td colspan="2" align="center">**Course Objectives**:</td></tr>
<tr><td colspan="2" align="center">**Course Outcomes:**</td></tr>
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SEMESTER -II

Course Code: CA-121
Course Title: Object Oriented Programming in C++

Course Code: CA-121	Course Category: DSC-4
Course Title: OOPs in C++	Type: Theory
Total Contact Hours: 30 (2/week)	Course Credits: 02
College Assessment (CA) Marks: 20 Marks	University Assessment (UA): 30 Marks

Course Objectives:
1. To understand the concept of Object-Oriented Programming
2. To understand the concept of implementing Functions, Pointer, and Array in C++
3. To understand the concept of implementing Class, Object, Inheritance and polymorphism
4. To understand the concepts of Exception handling and File management

Course Outcomes: After completion of the course, the student will be able to	Cognitive Level [Bloom's Taxonomy]
• Describe the procedural and object-oriented paradigm with concepts of streams, classes, functions, data and objects.	1
• Understand dynamic memory management techniques using constructors and destructors	2
• Apply polymorphism concepts, including function and operator overloading, to enhance the functionality and flexibility of C++ programs.	3
• Implement file handling operations using stream computations to read from and write to files in C++.	3

Course Content:

Unit 1: OOPs in CPP (08 L, 10 M)
1. OOP's Features-Object, Classes,
2. Data Encapsulation & Abstraction, Delegation, Inheritance, Polymorphism, Message Communication.
3. Class Specification, Defining Members,
4. Object, Access Specifier,
5. Constructors, types of Constructors, destructor,
6. Friend Class and Friend Function

Unit 2: Inheritance (07 L, 15 M)
1. Types of Inheritance,
2. Member Accessibility, Visibility Modes,
3. Virtual Base Class,
4. Benefits of Inheritance,
5. Virtual & Pure Virtual functions,
6. Abstract class.

Unit 3: Polymorphism & Template (07 L, 10 M)
1. Concept of Polymorphism,
2. Types of Polymorphism
3. Function overloading
4. Operator Overloading- unary, binary operators, using friend functions,
5. Without using friend functions,
6. Class template, Function template,

Unit 4: Exception Handling, Stream Computation. (08 L, 15 M)
1. Concept of Exception Handling,
2. Types of Exception,
3. Exception Handling Techniques,

4. Stream Computation with console,
5. Streams Computations with Files,
6. Read and write operations on file.

Reference Books:

1. Mastering C++, K.R. Venugopal, Rajkumar, T. Ravishankar, TMH.
2. Object Oriented Programming C++, Balguruswamy, TMH
3. The C++ Programming Language, Bjarne Stroustrup, 4th Edition
4. C++ Primer Plus, Stephen Prata, 6th Edition
5. Programming: Principles and Practice Using C++, Bjarne Stroustrup, 2nd Edition
6. Exploring C++ by Yashwant Kanetkar

Course Code: CA-122
Course Title: Introduction to Operating System

Course Code: CA-122	**Course Category: (DSC-5)**
Course Title: Introduction to Operating System	**Type: Theory**
Total Contact Hours: 30 (2/week)	**Course Credits: 02**
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA): 30 Marks**

Course Objectives:
- This course provides an overview of introductory concepts about computers operating system.
- To give a comprehensive view of how operating systems work, including their abstract views, services, system calls, and different types of OS architectures.
- To introduce Linux, its architecture, basic commands, file handling, and directory management.

Course Outcomes: After completion of the course, the student will be able to	Cognitive Level [Bloom's Taxonomy]
• Understand the abstract views of an operating system from user and system perspectives.	3
• Gain a basic understanding of Linux and its architecture.	3
• Understand the shell environment and basic commands.	3

Unit-1. Introduction of Operating System
- Introduction of OS.
- Components of Operating System.
- Operating System Operations.
- Protection and Security.
- Computing Environment.

Unit-2. Overview of Operating System
- Abstract View of OS:
  - User view
  - System View
  - Operating System Services
- System Calls: Concept, Types of System Calls.
- Computer System Architecture:
  - Single-Processor Systems,
  - Multiprocessor Systems.
- Types of Operating Systems:
  - Batch Operating System,
  - Multi-Programmed Operating System
  - Time-Shared Operating System
  - Real Time Operating System
  - Distributed Operating Systems.
- Process Management: Process Concept, Operation on Processes.

Unit-3. Basics of Linux.
- Introduction to Linux.
- Architecture of Linux.
- Login, Logout, Shell, Kernel, GPU Commands (cal, date, who etc).
- Directory management (mkdir, cd, rmdir).
- File handling using Linux commands.
- Commands –ls, cat,cp,mv,rm

- Types of files.
- chmod command.
- Basic filter- head, tail,sort,grep.
- Creating files using VI editor,
- Handling command mode, insert mode and ex mode.

Unit-4. Shell Programming
- Shell environment, commands, Concept of Shell scripting.
- Conditional statements-if, if else, case.
- Looping-for, while, until, Continue and break statement.
- Read, echo statement.
- Writing and executing shell script.

References Book-

1. Operating System Concepts – Silberschatz, Galvin and Gagne
2. Operating System By Godbole
3. Linux Bible 9th Edition by Christoper Negus ISBN :978-1-118-99987-5
4. Ball, Using Linux, PHI, 1998. ISBN-10: 0789716232
5. UNIX: Concepts and Applications Das (4th Ed), TMH, 2006 ISBN 13: 9780070635463

Course Code: CA-123	Course Category: (DSE-6)
Course Title: Practical based on CA-121 and CA-122	Type: PRACTICAL
Total Contact Hours: 60 (4/week)	Course Credits: 04
College Assessment (CA) Marks: 20 Marks	University Assessment (UA): 30 Marks

Course Objectives:
- To train students in programming using object oriented concepts with C++.
- To acquired practical oriented skill set using C++
- To Understand the basics Linux command and shell script

Course Outcomes: After completion of the course, the student will be able to	Cognitive Level [Bloom's Taxonomy]
• Creating simple programs using C++	3
• Solve well defined problems using C++	3
• Implement Exception handling and file handling using C++	2
• Implements Linux command and shell scripts	3

Course Content:

Program using OOP's
1. Write a program to print prime numbers in given range.
2. Write a program to print palindrome numbers in given range.
3. Write a program to find given number is perfect or not.
4. Write a program to print factorial of a number.
5. Write a program to demonstrate Array.
6. Write a program to demonstrate the use of class and object
7. Write a program to demonstrate function overloading and Operator Overloading
8. Write a program to demonstrate Class and Object.
9. Write a program to demonstrating the use of constructors and destructor
10. Write a program to demonstrate the Single & multiple inheritances.
11. Write a program to demonstrate multilevel and hierarchical inheritance
12. Write a program to demonstrate the use of virtual function.
13. Write a program to demonstrate Exception Handling.
14. Write a program to demonstrate File handling
15. Write a program to demonstrate the concept of function template & class template.
16. Write a program to demonstrate Friend Class and Friend Function.

Mini Project/ Experimental Assignment

Create a class for Electronic Store, which is having a Refrigerator sale. The class is named Refrigerator, and it contains data fields for a brand, the number of liters that refrigerator contain, and price. Include a constructor that takes arguments for the brand and number of litters. If the liters parameter is less than 165, the constructor sets it to 165. The sale price is set based on number of liters that refrigerator contain any refrigerator with 265 litters or fewer is RS 10000, and all other refrigerators are RS 15000. Also include a method that displays refrigerator details. Create class Test Refrigerator in which you instantiate at least four objects, prompt the user for values for the refrigerator brand and number of liters, and display all the values.

Practical Assignments of Operating System
1. Demonstration of Linux commands with attributes: - pwd, cd, ls, more, less, echo, clear, kill, ps, man, cal, date, who, who am I, wc, mkdir, rmdir, rm, sort.
2. Write a shell script to display first 20 terms of Fibonacci series.
3. Write a shell script to display current time of system and display the message according to the time.
4. Write a shell script to check the user is login or not and say hello.

5. Write a shell script to calculate factorial of a number.
6. Write a shell script to check number is divisible by 7 or not.
7. Write a shell script to check number is prime or not.
8. Write a shell script to check number is palindrome or not.
9. Write a shell script to check number is Armstrong or not.
10. Write a shell script to create result sheet using redirection and filters. (Using Head, tail, cut, paste)

Course Code: CA-124(A)
Course Title: Basics of Management

Course Code: CA-124(A)	Course Category: Minor-1
Course Title: Basics of Management	Type: Theory
Total Contact Hours: 30 (2/week)	Course Credits: 02
College Assessment (CA) Marks: 20 Marks	University Assessment (UA): 30 Marks

Course Objectives:
- Understand the fundamentals of management
- Learn the Functions of Management (Planning ,Organization, staffing, Directing, Controlling)

Course Outcomes: After completion of the course, the student will be able to	Cognitive Level [Bloom's Taxonomy]
• Deeper understanding of basics of Management.	1
• Enable students to apply functions of Managements.	3

Course Content:

Unit 1: Introduction (07 L, 10 M)
- Meaning and Definition of the Management
- Scope and Importance of the Management
- Levels of the Management
- Skills of the Business Manager
- Management is Arts, Science or Profession

Unit 2: Evolution of the Management (05 L, 10 M)
- F.W. Taylor-Principles of Scientific Management.
- Henry Fayol - Principles of Administrative Management, Functions of management
- Management by Objectives (MBO)
- Alton Mayo's Human Relation Theory

Unit 3: Functions of Management-I (08 L, 15 M)
- Planning: Concept, Nature, Importance, Objectives, Process of Decision Making
- Organization: Definition, Forms of organization, Formal and Informal Organization, Depart mentation, Span of Management, Delegation of Authority, Responsibility, Centralization, Decentralization.

Unit 4: Functions of Management-II (10 L, 15 M)
- 4.1 Staffing: Selection, Recruitment, Training, Development and Welfare: Concept & Importance.
- 4.2 Directing: Definition, Importance, Elements, and Principles of Directing.
- 4.3 Controlling: Meaning, Importance, Control Process, Types of Control, Use of Computer and IT in Management Control.

Reference Books:
1. L.M Prasad, Principles and Practices in Management, Sultan Chand & Sons, 2015
2. P.C. Tripathi & P.N. Reddy, Principles of Management, McGraw Publication, 2017
3. S.K. Kataria & Sons, Basics of Management, 2013
4. Harold Koontz, Essentials of Management, McGraw Hill Education Pvt Ltd, 11 edition
5. Dr. K. Alex, S Chand & Company, 2011

<table>
<tr><td colspan="2" align="center">Course Code: CA-124(B)
Course Title: Basic Mathematics for Computing</td></tr>
</table>

Course Code: CA-124(B)	**Course Category: Minor-1**
Course Title: Basic Mathematics for Computing	**Type: Theory**
Total Contact Hours: 30 (2/week)	**Course Credits: 02**
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA): 30 Marks**

Course Objectives:
- Identify and recognize mathematical techniques used in mathematics.
- Develop proficiency in applying the theoretical concepts to solve math problems.
- To familiarize the students with basic mathematical tools and the application of the same to real world and computer application.

Course Outcomes: After completion of the course, the student will be able to	Cognitive Level [Bloom's Taxonomy]
• Understanding of all terms related to mathematical logic.	2
• Understand the types of sets, method of representation, operations, and laws related to it.	2
• Ability to solve problems of determinants	4
• Ability to solve problems of matrices.	4

Course Content:

Unit 1: Mathematical Logic   **(12 L, 06 M)**
- Meaning of Statement
- Primitive and Compound Statements
- Truth Values of a Statement
- Logical Operations
- Truth Tables & Construction of Truth Tables
- Equivalence of Logical Statements
- Tautology and Contradiction

Unit 2: Sets   **(14 L, 08 M)**
- Meaning of a Set
- Methods of Describing a Set -Tabular Form, Set Builder Form,
- Types of a Set: Finite Set, Infinite Set, Empty Set, Subset, Universal Set, Equal Sets, Overlapping Sets, Disjoint Sets, Complementary Set.
- Operations on Sets: Union of Sets, Intersection of Sets , Difference of Sets , Cartesian Product of Two Sets
- Venn Diagrams

Unit 3: Determinants   **(12 L, 08 M)**
- Meaning of Determinant, Properties of Determinants
- Evaluation of Second Order Determinants,
- Minor and Cofactor of an element
- Cramer's rule to solve system of linear equations in two and three variables.

Unit 4: Matrices   **(12 L, 08 M)**
- Meaning and Order of Matrix,
- Types of Matrix
- Algebra of Matrices- Equality of Matrices, Multiplication of Matrix by A Scalar. Addition of Matrices, Subtraction of Matrices, Multiplication of Matrices

Reference Books:
1) Business Mathematics Sancheti & Kapoor Sultan Chand & Co. New Delhi ISBN 10: 8180545385
2) Business Mathematics & Analytics Anand Sharma Himalaya Publishing ISBN 13: 9788180545382
3) Business Mathematics Dr. Ramnath Dixit and Dr. Jinendra Jain Himalaya Publishing

Course Title: Select any one from Basket of OE3 and OE4 available for UG Programmes

Course Code:	Course Category: OE-3
Course Title: Select any one from Basket of OE	Type:
Total Contact Hours: 30	Course Credits: 02
College Assessment (CA) Marks: 20	University Assessment (UA): 30

Course Content:

Course Code:	Course Category: OE-4
Course Title: Select any one from Basket of OE	Type:
Total Contact Hours: 30	Course Credits: 02
College Assessment (CA) Marks: 20	University Assessment (UA): 30

Course Code: CA-125	Course Category: (VSC-2)
Course Title: Web Design-II	Type: Theory
Total Contact Hours: 30 (2/week)	Course Credits: 02
College Assessment (CA) Marks: 20 Marks	University Assessment (UA): 30 Marks

Course Objectives:
- To illustrate how JavaScript integrates into web development and its advantages and limitations.
- To analyze JavaScript code for correct implementation of conditional statements and loops.
- To Implement JavaScript functions and use dialog boxes to interact with users effectively.
- To develop dynamic web pages using JavaScript events and objects to create a rich, interactive user experience.

Course Outcomes: After completion of the course, the student will be able to	Cognitive Level [Bloom's Taxonomy]
• Understand how to use JavaScript within the context of web site development and identify its advantages and limitations.	2
• Identify and recall basic JavaScript syntax elements, such as data types, variables, and operators.	1
• Analyze the behaviour of functions and dialog boxes in different scenarios to understand their impact on user interaction.	4
• Apply JavaScript events and objects to create interactive web elements and manage data effectively.	3

Course Content:

Unit 1: Introduction to Web Site Development & Java Script (07 L, 10 M)
- Web Site Development,
- Web Site Development Phases,
- Web Site Authoring tools,
- Meaning of Scripting Language,
- Types of Scripting Language-JavaScript, VBScript, ASP, PHP,
- Differences between Client-Side &Server-Side Scripting,
- Introduction to Java Script,
- Advantages of JavaScript,
- Limitation of JavaScript

Unit 2: Working with JavaScript (10 L, 15 M)
- Embed JavaScript into HTML,
- Data Types, Creating Variable, JavaScript Comments,
- Operators & Expressions,
- Condition Checking-if-else statement,
- Switch Case Statement,
- Looping Statements – for Loop, While Loop

Unit 3: JavaScript Functions and Dialog Box (06 L, 15 M)
- Introduction to Function,
- Working with Function, Calling function,
- Built-in String function,
- Dialog Boxes - Alert Dialog Box, Confirm Dialog Box, Prompt Dialog Box

Unit 4: JavaScript Events and Objects (07 L, 10 M)

- JavaScript Events - onclick, onmouseover, onmouseout, onkeypress, onkeydown,
- onkeyup, onfocus, onload, onunload, onblur, onsubmit.
- String Methods
- Math Object
- Form Object

Note: As the Course Syllabus is aligned with practical experience, Faculty members teaching this course are advised to conduct following assignments.
Assessments (Internal/University) may include questions on following assignment.

Laboratory Assignments

1. Write a program to embed JavaScript into HTML.
2. Write a JavaScript code to demonstrate Conditional Statements.
3. Write a JavaScript code to demonstrate Looping Statements.
4. Write JavaScript code to demonstrate different string functions.
5. Write JavaScript code to demonstrate dialog boxes.
6. Write JavaScript code to demonstrate onblur, onfocus, onload, onsubmit events.
7. Write JavaScript code to demonstrate onkeypress, onmouseover, and onmouseout events.
8. Write JavaScript code to demonstrate use of Dialog Boxes.
9. Create a HTML page to demonstrate JavaScript Objects.

Reference Books:

- The ABC's of Java Script by Lee Purcell Mary Jane Mara, BPB Publication .ISBN:8170298261.
- The Complete Reference – Web Design, Thomas A. Powell, TMH, ISBN 0-07-041186.
- How to become webmaster in 14 days, James L Mohler, Techmedia ISBN 1575211696.
- HTML, DHTML, JavaScript, Perl & CGI by Ivan Bayross, BPB Publishing ... ISBN: 8176562742
- Web References: www.w3c.org, www.sybex.com ISBN 0-07-041186
- Web Enabled Commercial Application Development using HTML, DHTML, Java Script,PERL ISBN 13: 9788183330084.

Course Code: CA-126
Course Title: Introduction to Computer Graphics

Course Code: CA-126	**Course Category:** Skill Enhancement Courses **(SEC-2)**
Course Title: Introduction to Computer Graphics	**Type: Theory**
Total Contact Hours: 30 (2/week)	**Course Credits: 02**
College Assessment (CA) : 20 Marks	**University Assessment (UA): 30 Marks**

Course Objectives:

- To equip students with the fundamental skills and knowledge necessary to create effective and visually appealing graphic designs.

- To introduce students to the fundamental concepts and theories of computer graphics design.

- To provide students with skills for digital media content development, focusing on graphic design for new media.

- To help students understand the theoretical aspects of graphic design while developing practical abilities in content creation, editing, and visual effects.

Course Outcomes: After completion of the course, the student will be able to	**Cognitive Level** [Bloom's Taxonomy]
- Utilize traditional artwork methods alongside modern graphics technology to create diverse design projects.	3
- Understand the basic concepts of graphic design and effectively apply these concepts to real-world projects.	2
- Develop and present original design projects that demonstrate creative thinking and problem-solving skills, showcasing the ability to integrate design elements into organized visual solutions.	3
- Apply graphic design software to create digital illustrations and layouts.	3

Course Content:

Unit 1 : Introduction   to Graphics Design   (06 L, 6 M)
- Introduction to Graphics Design
- Types of Graphics
- Uses of Graphics
- Applications of graphics designs
- Different Image formats

Unit 2 : Introduction to Animation   (06 L, 6 M)
- What is Animation?
- Principle of Animation
- Types of Animation & Animation Tech.
- Introduction Chroma Shoot
- Use of Animation in advertisements
- Concept of 2D, 3D animation

Unit 3: Working with Photoshop CS3   (08 L, 9 M)
- Photoshop Workspace
- Features of Photoshop
- Use of Photoshop in different sectors
- Save As in different format
- **Basic Tools –**Select tools, Zoom tool, Hand tool, Shape tools, Brush tool, Fill tool, Paint bucket tool.

- **Advanced tools -**Marquee tool, Lasso tool, Magic Wand tool, Inverting Selection, Blur tool, Smudge tool, Sharpen tool, Dodge tool, Sponge tool, Clone stamp tool.
- **Transformation &Retouching :** Free transform, Scaling, Rotation, Skew,Perspective, Wrap, Distort, Crop, Image size, Canvas size.
- **Adjustments :** Levels, Curves, color balance, Exposure, Vibrancy, Photo Filter.
- **Working with Text :** The text tool, editing text, formatting, line & spacing, wrap text, text effects.

Unit 4 : Working with CorelDraw   (09 L, 9 M)
- **Introduction**: An overview, interface, menus and tools, working with new document, page setup.
- **Drawing**: Lines, Shapes, objects, tables, templates
- **Import/Export:** Importing files, Using Corel Connect, Exporting files.
- **Manipulation:** Viewing options, pick tool, selection, moving, sizing, mirroring, rotating, skewing, undo, redo, staking order.
- **Text properties**

> **Note: As the Course Syllabus is aligned with practical experience, Faculty members teaching this course are advised to conduct following assignments.**
> **Assessments (Internal/University) may include questions on following assignment.**

Lab Assignments -
- Create digital advertisement banner for your college.
- Create digital advertisement banner / poster for your college events.
- Create digital banner / poster on research / environmental topic (for example – Avishkar).
- Create digital page / image for your college web site.
- Create digital banner for social awareness programs / campaign.
- Create digital invitation card for your college program.
- Create digital greeting card for your teacher / professor.
- Create digital image gallery of your college / cultural program.

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Reference Books:
- Adobe Photoshop CC for Dummies 2nd Edition.
- Adobe Photoshop CS5: Comprehensive (SAM 2010 Compatible Products) 1st Edition by Gary B. Shelly (Author), Joy L. Starks (Author), Alec Fehl (Author)
- Adobe Lightroom CC and Photoshop CC for Photographers Classroom in a Book 1st Editionby Lesa Snider (Author)
- Photoshop CC: Visual QuickStart Guide (2015 release) 1st Edition by Elaine Weinmann (Author), Peter Lourekas.
- CorelDRAW X5 The Official Guide Paperback – Import, 16 November 2010 by Gary David Bouton
- CorelDRAW X8: The Official Guide (CONSUMER APPL & HARDWARE - OMG) Paperback – 16 February 2017 by Gary David Bouton (Author)

AEC-2 Course will be selected from the AEC Basket available for UG Programmes.

Course Code: AEC-XXX Course Title:	
Course Code: AEC-	Course Category: Ability Enhancement Courses (AEC)
Course Title:	Type: Theory
Total Contact Hours: 30 (2/week)	Course Credits: 02
College Assessment (CA) Marks: 20 Marks	University Assessment (UA): 30 Marks

Course Code: AEC-

VEC-2 Course will be selected from the VEC Basket available for UG Programmes.

Course Code: VEC-XXX
Course Title:

Course Code: VEC-	**Course Category: (VEC-2)**
Course Title:	**Type: Theory**
Total Contact Hours: 30 (02/week)	**Course Credits: 02**
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA): 30 Marks**

Course Objectives:

Course Outcomes:

CC-2 Course will be selected from the CC Basket available for UG Programmes.

<table>
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Course Title: Select any one from Basket of CC</td></tr>
<tr><td>**Course Code: CC-XXX**</td><td>**Course Category: (CC-2)**</td></tr>
<tr><td>**Course Title:**</td><td>**Type: Theory**</td></tr>
<tr><td>**Total Contact Hours: 30 (02/week)**</td><td>**Course Credits: 02**</td></tr>
<tr><td>**College Assessment (CA) Marks: 50 Marks**</td><td>**University Assessment (UA):**</td></tr>
<tr><td colspan="2" align="center">**Course Objectives**:</td></tr>
<tr><td colspan="2" align="center">**Course Outcomes:**</td></tr>
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