Scheme for 4-Year Bachelor Program in Computer Applications

[Leading to BCA and BCA(Honours)/BCA(Honours) with Research) Degrees]

w.e.f.

Academic Session 2023-24

Semester	Discipline-Specific Courses – Major	Credits	Minor/Minor Vocational (VOC)	Credits	Multidisciplinary Courses (MDC)	Ability Enhancement Courses (AEC)	Skill Enhancement Courses/Internship/Dissertation	Value Added Courses	Total Credits
I	**23BCA401DS01** Mathematical Foundations of Computer Science	**4:0:0**	**23BCA401MI01** Computing Fundamentals & PC Software	**3:0:1**	**One Course @3 Credits** (To be chosen outof the common pool excluding the Multidisciplinary course prepared by the Department)	**One Course @2 Credits** (To be chosen out of common pool)	**23BCA401SE01** Internet & Web Design @ 3 Credits **1:0:2**	**VAC1 @ 2 Credits** (To be chosen out of the common pool)	**22**
	23BCA401DS02 Computer Fundamentals &Problem Solving using C	**3:0:1**							
II	**23BCA402DS01** Digital Logic Design	**4:0:0**	**23BCA402MI01** Programming in C & Data Structure	**3:0:1**	**One Course @3 Credits** (To be chosen out of the common pool excluding the Multidisciplinary course prepared by the Department)	**One course @ 2 Credits** (To be chosen out of common pool)	**23BCA402SE01** Python Programming @ 3 Credits **1:0:2**	**VAC2@ 2 Credits** (To be chosen out of the common pool)	**22**
	23BCA402DS02 Data and File Structures	**3:0:1**							
III	**24BCA403DS01** Operating Systems	**4:0:0**	**24BCA403MI01** Database Management System & SQL	**3:0:1**	**One Course @3 Credits** (To be chosen out of the common pool excluding the Multidisciplinary course prepared by the Department)	**One Course @ 2 Credits** (To be chosen out of common pool)	**24BCA403SE03** Android Programming @ 3 Credits **1:0:2**	-----	**24**
	24BCA403DS02 Object Oriented Programming using C++	**3:0:1**							
	24BCA403DS03 Database Management System	**3:0:1**							
IV	**24BCA404DS01** Computer System Architecture	**4:0:0**	**24BCA404MV01** Object Oriented Programming using	**1:0:3**	-----	**One Course @ 2 Credits**		**VAC3 @ 2 Credits** (To be chosen out of the common pool)	**24**

	24BCA404DS02 DataCommunication & Computer Networks	**4:0:0**	C++			(To be chosen out of common pool)			
	24BCA404DS03 Java Programming	**2:0:2**							
	24BCA404DS04 Computer Graphics	**3:0:1**							
V	**25BCA405DS01** Software Engineering	**4:0:0**	**25BCA405MV01** Web Development	**1:0:3**	-----	-----	**25BCA404IN01** Internship @ 4 Credits 0:0:4		**24**
	25BCA405DS02 Artificial Intelligence& Expert Systems	**4:0:0**							
	25BCA405DS03 Cloud Computing	**3:0:1**							
	25BCA405DS04 Web Application Development	**2:0:2**							
VI	**25BCA406DS01** Internet of Things (IoT)	**3:0:1**	**25BCA406MV01** Object Technology	**1:0:3**	-----	-----		---	**20**
	25BCA406DS02 Computer Security	**3:0:1**							
	25BCA406DS03 Data Warehousing & Mining	**3:0:1**							
	25BCA406DS04 Advanced Database Systems	**2:0:2**							
VII	**26BCA407DS01** Advance Software Engineering	**3:0:1**	**26BCA407MI01** Operating Systems & Shell Programming	**2:0:2**	-----	-----	-----	-----	**24**
	26BCA407DS02 Computational Intelligence	**3:0:1**							

	26BCA407DS03 Advance Java Programming	**2:0:2**							
	26BCA407DS04 Machine Learning using Python	**2:0:2**							
	26BCA407DS05 Theory of Computation	**4:0:0**							
VIII [4 Year BCA(Hons.)]	**26BCA408DS01** BlockchainTechnology and Applications	**3:0:1**	**26BCA408MI01** Computer Networks & Programming	**2:0:2**	-----	-----		-----	**24**
	26BCA408DS02 Artificial Neural Network & Deep Learning	**3:0:1**							
	26BCA408DS03 Data Analytics using R	**2:0:2**							
	26BCA408DS04 Mobile Application Development	**2:0:2**							
	26BCA408DS05 Augmented and Virtual Reality	**3:0:1**							
VIII [4 Year BCA(Hons.) with Research]	**26BCA408DS06** Research Methodology	**4:0:0**	**26BCA408MI01** Research Ethics	**4:0:0**			**26BCA408PD01** Research Project/ Dissertation @ 12 credits 0:0:12		**24**
	26BCA408DS07 Web and Social Media Analytics	**3:0:1**							

Syllabus for
4-Year Bachelor Program in Computer Applications
[Leading to BCA and BCA(Honours)/BCA(Honours) with Research Degrees]
w.e.f.
Academic Session 2023-24
First Semester

Name of the Program	**4-Year Bachelor Program in Computer Applications**	**Program Code**	**-----**
Name of the Course	**Mathematical Foundations of Computer Science**	**Course Code**	**23BCA401DS01**
Hours/Week	**4**	**Credits (L:T:P)**	**4:0:0**
Max. Marks.	**Theory: 100 (70+30)**	**Time of end term examination**	**3 Hours**

Note: The examiner has to set nine questions in all by setting two questions from each Unit and Question No. 1 consisting of 7 parts (short-answer type questions) covering the entire syllabus. Student will be required to attempt five questions in all by selecting one question from each Unit and Question No. 1, which is compulsory.

Course Objectives:

The objective of this course is to inculcate in students the fundamental mathematical background in Computer Science and to provide reasoning, learning and understanding skills. The students get exposure of various concepts of mathematics such as sets, relations, and functions, trigonometry, limit, continuity, derivatives, matrix and determinants.

Course Outcomes:

By the end of the course the students will be able to:
CO1: Understand and solve the problems on set, relation and functions.
CO2 Understand the concepts of trigonometry.
CO3 Solve the problems on limit and continuity.
CO4 Understand the concepts of derivative and solve the problems on derivative.
CO5 Understand the concept of Matrix and Determinants.

Unit – I

Sets: Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Union, Intersection and Complements of Sets, Cartesian Product, Cardinality of Set, Practical applications of set theory.

Relations And Functions: Properties of Relations, Equivalence Relation, Partial Order Relation. Function: Domain and Range, Onto, Into and One to One Functions, Composite and Inverse Functions.

Unit – II

Trigonometry: Introduction, Measurement of angles, trigonometric functions, relation between trigonometric functions, signs of trigonometric functions, trigonometric functions of standard angles. Basic of inverse trigonometry.

Limits & Continuity: Limit at a Point, properties of limit, computation of limits of various types of functions, Continuity of a function at a point, Continuity over an interval.

Unit – III

Differentiation: Derivative of a function, Derivatives of sum, differences, product & quotient of functions, Derivatives of polynomial, trigonometric, exponential, logarithmic, inverse trigonometric and implicit functions, Logarithmic Differentiation, Chain rule and differentiation by substitution.

Unit – IV

Matrices: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices.

Determinants: Definition, Minors, Cofactors, Properties of Determinants, Applications of determinants in finding area of triangle, Adjoint of matrix, Inverse of matrix, solving a system of linear equations using matrix method.

Suggested Readings:

1. C.L.Liu: Elements of Discrete Mathematics, McGraw Hill.
2. Lipschutz, Seymour: Discrete Mathematics, Schaum's Series
3. Babu Ram: Discrete Mathematics, Vinayek Publishers, New Delhi.
4. Trembley, J.P & R. Manohar: Discrete Mathematical Structure with Application to Computer Science, TMH.

5. Kenneth H. Rosen: Discrete Mathematics and its applications, TMH.
6. Doerr Alan &Levasseur Kenneth: Applied Discrete Structures for Computer Science, Galgotia Pub. Pvt. Ltd.
7. Any other book covering the contents of the subject.

Note: Latest and additional good books may be suggested and added from time to time.

Name of the Program	**4-Year Bachelor Program in Computer Applications**	**Program Code**	**-----**
Name of the Course	**Computer Fundamentals & Problem Solving using C**	**Course Code**	**23BCA401DS02**
Hours/Week	**4**	**Credits (L:T:P)**	**3:0:1**
Max. Marks.	**Theory: 75 (50+25)** **Practical: 25 (20+5)**	**Time of end term examination**	**3 Hours**

Note: The examiner has to set nine questions in all by setting two questions from each Unit and Question No. 1 consisting of 5 parts (short-answer type questions) covering the entire syllabus. Student will be required to attempt five questions in all by selecting one question from each Unit and Question No. 1, which is compulsory.

Course Objectives:

This is first course in programming. The objective of this course is to inculcate knowledge about fundamental concepts of computer and logical thinking amongst the young minds and to teach the Programming Language C. However, the process of learning a computer language will also be emphasized. Emphasis is also on semantics and problem solving. Students will be able to develop logics which will help them to create programs, applications in C. By learning the basic programming constructs, they can easily switch over to any other language in future.

Course Outcomes:

By the end of the course the students will be able to:
CO1: Understand the concepts of computer and its applications in various foelds.
CO2: Understand the fundamental concepts of programming in C language.
CO3: Demonstrate an understanding of data types, control structures, functions, arrays, and pointers
CO4: Develop basic programming solutions using C language.
CO5: Apply basic programming concepts to solve practical problems.

Unit – I

Computer Fundamentals: Generations of Computers, Block Diagram along with its components, classification of computers, Applications of computers in various fields.Input/Output Devices, Memory: Concept of primary & secondary memory, Cache Memory, Secondary storage devices.

Overview of Networking & Operating System: Introduction to computer networking, Network types, Network topologies, Internet and its applications; Operating system and its functions.

Unit – II

Planning the Computer Program: Problem definition, Program design, Debugging, Types of errors in programming, Techniques of Problem Solving- Flowcharting, Algorithms

Overview of C: History of C, Importance of C, Elements of C: C character set, identifiers and keywords, Data types, Constants and Variables, Assignment statement, Symbolic constant, Structure of a C Program,printf(), scanf() Functions, Operators & Expression, type casting and conversion, operator hierarchy & associativity.
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Unit – III

Decision making & Branching: Decision making with IF statement, IF-ELSE statement, Nested IF statement, ELSE-IF ladder, switch statement, goto statement.

Decision making & Looping: while, do-while and for loop, jumps in loops, break, continue statement, Nested loops

Unit – IV

Functions: Standard Mathematical functions, Input/output: Unformatted & formatted I/O function in C, Input functions output functions, string manipulation functions.User defined functions**:** Introduction/Definition, function prototype, Local and global variables, passing parameters, recursion.

Arrays & Pointers: Definition, types, initialization, processing an array, passing arrays to functions, Declaration and initialization of string, Input/output of string data, Introduction to pointers.

Suggested Readings:

1. Gottfried, Byron S.: Programming with C, Tata McGraw Hill
2. Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Book Publishing Company(Private) Limited, NewDelhi.
3. Balagurusamy, E.: Programming in ANSI C, Tata McGraw-Hill
4. Jeri R. Hanly & Elliot P. Koffman: Problem Solving and Program Design in C, Addison Wesley.
5. Yashwant Kanetker: Let us C, BPB.
6. Rajaraman, V.: Computer Programming in C, PHI.
7. Yashwant Kanetker: Working with C, BPB.
8. Any other book covering the contents of the subject.

Note: Latest and additional good books may be suggested and added from time to time.

Name of the Program	**4-Year Bachelor Program in Computer Applications**	**Program Code**	**-----**
Name of the Course	**Computing Fundamentals and PC Software**	**Course Code**	**23BCA401MI01**
Hours/Week	**4**	**Credits (L:T:P)**	**3:0:1**
Max. Marks.	**Theory: 50 (35+15)** **Practical: 50 (35+15)**	**Time of end term examination**	**3 Hours**

Note: The examiner has to set nine questions in all by setting two questions from each Unit and Question No. 1 consisting of 7 parts (short-answer type questions) covering the entire syllabus. Student will be required to attempt five questions in all by selecting one question from each Unit and Question No. 1, which is compulsory.

Course Objectives:

The main objective is to introduce computer to all undergraduate students, regardless of their specialization. It will help them to pursue specialized programmes in the area of computer. The focus of the course is to introduce basic concepts of computer, computer memory, software, ICT and MS-office tools.

Course Outcomes:

By the End of course the students will be able to:
CO1: Understand the fundamental concepts of Computers & its applications.
CO2: Understand the basic concepts of memory, storage devices and operating system.
CO3.Understand the concept of ICT.
CO4: Get exposure of data processing tool.
CO5: Get exposure of data analysis and Presentation tool.

Unit – I

Introduction to Computers: Introduction, Definition, Characteristics of Computer, Evolution of Computer, Generations of Computer, Block diagram of computer systems, Classification of Computers, Applications of Computer, Capabilities, and Limitations of Computer, Input and Output devices, Computer Virus and Antivirus.

Unit – II

Memory: Concept of primary & secondary memory, RAM, ROM, types of RAM and ROM, Cache Memory.**Secondary storage devices:** Sequential & direct access devices viz. magnetic tape, magnetic disk, optical disks, Virtual memory.
Software & Operating System: Software & its types, Operating System & its functions.
Computer Network: Concept of Networking, Types of Networks, Network topology

Unit – III

ICT: Introduction, ICT tools and terminology. Basics of Internet, Intranet, E-mail, Audio and Video-conferencing. Digital initiatives- SWAYAM, National digital library.

Documentation Using MS-Word: Introduction to word processing, Toolbars, Creating & Editing Document, Formatting Document and printing document, Finding and replacing text, Format painter, Header and footer, Spelling and Grammar Tool, Page Formatting, Bookmark, Mail Merge, Macros, Tables and File Management.

Unit – IV

Electronic Spreadsheet using MS-Excel: Introduction to MS-Excel, Feature of MS-Excel, Creating & Editing Worksheet, Formatting and Essential Operations, Formulas and Functions, Charts, Cell referencing, Pivot table & Pivot Chart, Linking, Sorting, Filtering.

Presentation using MS-PowerPoint: Starting MS–Power Point, working with power point, Creating, Saving andPrinting a presentation, Working with Animation, adding a slide to presentation, navigating through a presentation, Slide-sorter, Slide-show, Editing slides, Working with Graphics and Multimedia in PowerPoint (Inserting Photo, Video & Sound).

Suggested Readings:

1. Gill Nasib Singh: Handbook of Computer Fundamentals, Khanna Book PublishingCompany(Pvt.) Limited, New Delhi.
2. Balagurusamy E: Computing Fundamentals and C Programming, Tata McGraw Hill.
3. Norton, Peter: Introduction to Computer, McGraw-Hill
4. Leon, Alexis & Leon, Mathews: Introduction to Computers, Leon Tech World
5. Rajaraman, V.: Fundamentals of Computers, PHI
6. Gill, Nasib Singh: Essentials of Computer and Network Technology, Khanna Books Publishing Co.(P), New Delhi
7. Russell A. Stultz: Learn Microsoft Office — BPB Publication
8. Any other book covering the contents of the subject.

Note: Latest and additional good books may be suggested and added from time to time.

Multidisciplinary Course (MDC) 1st Semester

[To be chosen by the students other than that of Bachelor Program in Computer Applications]

Name of the Program	**4-Year Bachelor Program in Computer Applications**	**Program Code**	**-----**
Name of the Course	**Foundations of Information Technology**	**Course Code**	**23BCAX01MD01**
Hours/Week	**3**	**Credits (L:T:P)**	**3:0:0**
Max. Marks.	**Theory: 75 (50+25)**	**Time of end term examination**	**3 Hours**

Note: The examiner has to set nine questions in all by setting two questions from each Unit and Question No. 1 consisting of 5 short-answer type questions covering the entire syllabus. Student will be required to attempt five questions in all by selecting one question from each Unit and Question No. 1, which is compulsory.

Course Objectives:

The main objective is to introduce IT in a simple language to all undergraduate students, regardless of their specialization. It will help them to pursue specialized programs leading to technical and professional careers and certifications in the IT industry. The focus of the subject is on introducing skills relating to IT basics, computer applications, programming, interactive medias, Internet basics etc.

Course Outcomes:

By the end of the course the students will be able to:
CO1: Understand the fundamental concepts of Computers its applications & Understand various input and output devices.
CO2: Understand the concept of Memory and operating System.
CO3. Understand the concept of data communication, networking and internet.
CO4: Get exposure of memory and operating system.
CO5: Know about E-Mail and the concepts related to Business data processing.

Unit – I

Introduction: Historical evolution of computers,Classification of computers, Block Diagram along its components and characteristics, Usefulness of Computers. Human being Vs. Computer, Applications of computers in various fields.

Input/Output Devices: Keyboards, mouse, joysticks, trackballs, digitizer, voice-recognition, optical-recognition, scanners, terminals, point-of-sale terminals, machine-vision systems, Printer & its types

Unit – II

Memory & Mass Storage Devices: Characteristics of memory systems, types of memory, RAM, ROM, magnetic disks-floppy disk, hard-disk; optical disks; Magnetic tapes; Concepts of Virtual and Cache memory

Operating System: Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.

Unit – III

Data Communication: Communication Process, Data Transmission speed, Communication Types (modes), Data Transmission Medias, Modem and its working, characteristics, Types of Networks, LAN topologies, Computer Protocols, Concepts relating to networking.

Internet: Introduction to Internet, WWW and Web Browsers; Applications of Internet; connecting to internet; What is ISP?; Search Engines; Understanding URL; Domain name; IP Address; Web page, Website and home page.

Unit – IV

Electronic Mail: Introduction, advantages and disadvantages, User Ids, Passwords, e-mail addresses, message components, message composition, Web Browsers and search engines.

Business Data Processing: Introduction, data storage hierarchy, Method of organizing data, File Types, File Organization, File Utilities.

Suggested Readings:

1. Gill Nasib Singh: Handbook of Computer Fundamentals, KhannaBookPublishingCompany(Pvt.)Limited, NewDelhi.
2. Donald Sanders: Computers Today, McGraw-Hill Publishers.
3. Davis: Introduction to Computers, McGraw-Hill Publishers.
4. V.Rajaraman: Fundamental of Computers, Prentice-Hall India Ltd.,NewDelhi.
5. R Bangia: Learning MS-Office2000, Khanna Book Pub.

6. Sanders: Teach yourself MS-Office, BPB Publications.
7. Bott: MS-Office, PHI.
8. Any other book covering the contents of the subject.

Note: Latest and additional good books may be suggested and added from time to time.

Name of the Program	**4-Year Bachelor Program in Computer Applications**	**Program Code**	**-----**
Name of the Course	**Internet & Web Design**	**Course Code**	**23BCA401SE01**
Hours/Week	**3**	**Credits (L:T:P)**	**1:0:2**
Max. Marks.	**Theory: 25 (20+5)** **Practical: 50 (35+15)**	**Time of end term examination**	**3 Hours**

Note: The examiner has to set nine questions in all by setting two questions from each Unit and Question No. 1 consisting of 5 short-answer type questions covering the entire syllabus. Student will be required to attempt five questions in all by selecting one question from each Unit and Question No. 1, which is compulsory.

Course Objective:

The objective of this course is to acquire knowledge and Skills for creation of Web Sites. Also to acquire the knowledge regarding creation of Web applications using tools and techniques used in industry and how to design a basic web site using HTML & CSS to demonstrate responsive web design.

Course Outcomes:

By the end of the course the students will be able to:
CO1: Understand the fundamental concept of internet and search engine.
CO2: Understand the concept of Web-casting techniques.
CO3.Understand the concept of website planning.
CO4: Get exposure of HTML.
CO5: Get exposure of CSS.

Unit – I

Introduction to Internet and World Wide Web:A brief Introduction to the Internet, Evolution of World Wide Web; Basic features; Web Browsers; Web Servers; Hypertext Transfer Protocol, URLs; Searching and Web-Casting Techniques; Search Engines and Search Tools, Domain Name System, Home Page, Web page and website.

Unit – II

Web Publishing: Hosting your Site; Internet Service Provider; Phases of Planning and designing your Web Site; Steps for developing your Site; Choosing the contents;

Web Development: Introduction to HTML; Hypertext and HTML; HTML Document Features; HTML command Tags; Headers; Text styles; Text Structuring; Text colors and Background; Formatting text.

Unit – III

List: Ordered and Unordered lists, Table Creation and Layouts. Images; Inserting Graphics; Frame Creation and Layouts; Creating Links; Working with Forms and Menus; Working with Radio Buttons and Check Boxes; Text Boxes; Page layouts.

Unit – IV

Cascading Style Sheets (CSS): Basic Concepts, Properties, Creation of Style Sheets. Common Tasks with CSS: Text, Fonts, Margins, Links, Tables, Colors. Marquee. Mouse Overs. Filters and Transitions. Adding Links. Adding Tables. Adding Forms. Adding Image and Sound. Use of CSS in HTML Documents, Linking and Embedding of CSS in HTML.

Suggested Readings:

1. Raj Kamal: Internet and Web Technologies, Tata McGraw-Hill.
2. Ramesh Bangia:Multimedia and Web Technology, Firewall Media.
3. Thomas A. Powell : Web Design: The Complete Reference , 4/e, Tata McGraw-Hill
4. Wendy Willard : HTML Beginners Guide, Tata McGraw-Hill.
5. Deitel and Goldberg : Internet and World Wide Web, How to Program, PHI.
6. Any other book covering the contents of the subject.

Note: Latest and additional good books may be suggested and added from time to time.

List of Programs

1. Write HTML code to display your education details in a tabular format.
2. Write HTML code to display your CV on a web page.
3. Write HTML code to create a Home page having three links: About Us, Our Services and Contact Us. Create separate web pages for the three links.
4. Write HTML code to create a login form. On submitting the form, the user should get navigated to a profile page.
5. Write HTML code to create a Registration Form. On submitting the form, the user should be asked to login with new credentials.

6. Write HTML code to create your Institute website, Department Website and Tutorial website for specific subject.
7. Write HTML code to illustrate the usage of the following:
   • Ordered List • Unordered List • Definition List
8. Write HTML code to create a frameset having header, navigation and content sections.
9. Write HTML code to demonstrate the usage of inline CSS.
10. Write HTML code to demonstrate the usage of internal CSS.
11. Write HTML code to demonstrate the usage of external CSS.
12. Write HTML program to create a webpage to show different art forms of India, with appropriate title on the title bar. Use different heading tags for the headings, and list them using ordered list.
13. Write HTML program to create sections in the document using appropriate tags and apply different color as background to them. Use internal hyperlinks to move to different points within the page.
14. Write HTML program to insert a picture on the webpage, giving description for the picture in a paragraph. Use properties of height, width, hspace, vspace and align, with different values.
15. Write HTML Program, to create a profile of 2 pages, the First page containing the applicant's picture with personal details using unordered lists, and the second containing Educational details using tables. Use hyperlinks to move to the next page.

Any other programs assigned by the teachers.

Second Semester

Name of the Program	**4-Year Bachelor Program in Computer Applications**	**Program Code**	**-----**
Name of the Course	**Digital Logic Design**	**Course Code**	**23BCA402DS01**
Hours/Week	**4**	**Credits (L:T:P)**	**4:0:0**
Max. Marks.	**Theory: 100 (70+30)**	**Time of end term examination**	**3 Hours**

Note: The examiner has to set nine questions in all by setting two questions from each Unit and Question No. 1 consisting of 7 parts (short-answer type questions) covering the entire syllabus. Student will be required to attempt five questions in all by selecting one question from each Unit and Question No. 1, which is compulsory.

Course Objectives:

To acquire the basic knowledge of digital logic levels and application to understand digital electronics circuits. This course also prepares students to perform the analysis and design of various digital electronic circuits, design and analyze sequential and combinational logic circuits.

Course Outcomes:

By the end of the course the students will be able to:
CO1: Understand the concept of logic gates.
CO2: Understand and use of number system and their conversion.
CO3: Learn the concept of combinational circuit and sequential circuits.
CO4: Understand the concept of computer organization and instruction sets.
CO5: Explore memory organization and Input output organization.

Unit – I

Digital Systems and Binary Numbers: Digital Systems: Digital Signals, Digital Waveforms, Digital Computers and Digital Integrated Circuits. **Number Systems:** Binary Number Systems, Octal and Hexadecimal Number System. Number Base Conversions. Complements, Signed Binary Numbers and Binary Codes, Error Detection and Correction codes.

Boolean Algebra and Logic Gates: Boolean Algebra: Axiomatic Definition, Theorems and Properties. Boolean Functions, Canonical Standard forms: SOP and POS forms. **Digital Logic Gates:** NOT, OR, AND, NOR, NAND, XOR and XNOR. Universal Gates and their implementation

Unit – II

Gate Level Minimization: Karnaugh Map (K-map) Method: Simplification: Algebra postulates and Canonical forms. Prime Implicants: Types, Determination and Selection of Prime implicants.

Don't Care Conditions, NAND and NOR implementation.

Unit – III

Combinational Circuits: Introduction, Characteristics and Designing principles of Combinational circuits. Binary Adder: Half-Adder & Full-Adder, Subtractor: Half-Subtractor & Full-Subtractor, Parallel binary Adder/Subtractor, Binary Multiplier, Comparators, Multiplexers, De-multiplexers, Encoders and Decoders.

Unit – IV

Sequential Circuits: Characteristics of Sequential Circuits, Latches, **Flip-Flops:** Introduction, S-R Flip flop, J-K Flip Flop, D Flip flop, T Flip flop and Master Slave Flip flop.

Registers: Shift Registers, Applications of Registers. **Counters**: Asynchronous & Synchronous Counters. Modulo-N Counters and Up-Down Counters.

Suggested Readings:

1. Mano, M.M. : Digital Logic and Computer Design, Prentice- Hall of India.
2. Gill, Nasib Singh and Dixit J.B.: Digital Design and Computer Organisation, University Science Press (Laxmi Publications), New Delhi.
3. Stallings, William: Computer Organisation & Architecture.
4. Mano, M.M. : Digital Design, Prentice-Hall of India.
5. Anand Kumar : Fundamentals of Digital Circuits, PHI.
6. Tokheim : Digital Electronics, TMH.
7. S. Rangnekar: Digital Electronics, ISTE/ EXCEL
8. Any other book covering the contents of the subject.

Note: Latest and additional good books may be suggested and added from time to time.

Name of the Program	**4-Year UG program in Computer Applications**	**Program Code**	**-----**
Name of the Course	**Data and File Structures**	**Course Code**	**23BCA402DS02**
Hours/Week	**4**	**Credits (L:T:P)**	**3:0:1**
Max. Marks.	**Theory: 75 (50+25)** **Practical: 25 (20+5)**	**Time of end term examination**	**3 Hours**

Note: The examiner has to set nine questions in all by setting two questions from each Unit and Question No. 1 consisting of 5 parts (short-answer type questions) covering the entire syllabus. Student will be required to attempt five questions in all by selecting one question from each Unit and Question No. 1, which is compulsory.

Course Objectives:

The course aims to empower students with a comprehensive skill set in data and file structures, fostering both theoretical understanding and practical application, preparing them for analyzing and applying algorithms, design and apply efficient algorithms using data structures, understand the significance of efficient data and file organization, develop coding proficiency in data structure applications.

Course Outcomes:

By the end of the course the students will be able to:
CO1: Understand the fundamental concepts of data structures.
CO2: Design and implement various data structures to solve computational problems.
CO3: Apply data structures for efficient storage and retrieval of information.
CO4: Develop algorithms for searching and sorting data.
CO5: Implement file handling operations in a programming environment.

Unit – I

Introduction: Elementary data organization, Data Structure definition, Data type vs. data structure, Categories of data structures, Data structure operations, Applications of data structures.

Arrays: Introduction, Linear arrays, Representation of linear array in memory, address calculations, Traversal, Insertions, Deletion in an array, Multidimensional arrays, Parallel arrays, Sparse arrays.

Searching: Introduction, Sequential search, Binary search, Prerequisite for binary search, Comparison in terms of efficiency.

Unit – II

Sorting: Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort, Comparison in terms of their efficiency
Stack: Introduction, Array and linked representation of stacks, Operations on stacks, Applications of stacks: Polish notation, Recursion.

Queues: Introduction, Array and linked representation of queues, Operations on queues, Deques, Priority Queues, Applications of queues.

Unit – III

Linked List: Introduction, Representation of linked lists in memory, Traversal, Insertion, Deletion, Searching in a linked list, Header linked list, Circular linked list, Two-way linked list, Threaded lists, Garbage collection, Applications of linked lists.
Tree: Introduction, Definition, Representing Binary tree in memory, Traversing binary trees, Traversal algorithms using stacks.
Graph: Introduction, Graph Theory terminology, Sequential and Linked representation of Graphs.

Unit – IV

Introduction to file structures: Concept of a file, types of files, File operations - open, read, write, close. External storage devices, Concepts of record, file, database and database system.

File Organization: Sequential file organisation – structures and processing, Record structures and access methods. Indexed sequential file organisation – structures and processing, Indexing techniques, B-trees and hashing for indexed files. Direct file organisation. Hashed File Organization - Hash function implementation.

Suggested Readings:

1. Seymour Lipschutz, “Data Structure”, Tata-McGraw-Hill
2. Horowitz, Sahni & Anderson-Freed, “Fundamentals of Data Structures in C”, Orient Longman.
3. Trembley, J.P. And Sorenson P.G., “An Introduction to Data Structures With Applications”, McGraw-Hill International Student Edition, New York.
4. Mark Allen Weiss Data Structures and Algorithm Analysis In C, Addison- Wesley, (An Imprint Of Pearson Education), Mexico City.Prentice- Hall Of India Pvt. Ltd., New Delhi.
5. Yedidyan Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, “Data Structures Using C”, Prentice- Hall of India Pvt. Ltd., New Delhi.
6. Any other book covering the contents of the subject.

Note: Latest and additional good books may be suggested and added from time to time.

Name of the Program	**4-Year Bachelor Program in Computer Applications**	**Program Code**	**-----**
Name of the Course	**Programming in C & Data Structure**	**Course Code**	**23BCA402MI01**
Hours/Week	**4**	**Credits (L:T:P)**	**3:0:1**
Max. Marks.	**Theory: 75 (50+25)** **Practical: 25 (20+5)**	**Time of end term examination**	**3 Hours**

Note: The examiner has to set nine questions in all by setting two questions from each Unit and Question No. 1 consisting of 7 parts (short-answer type questions) covering the entire syllabus. Student will be required to attempt five questions in all by selecting one question from each Unit and Question No. 1, which is compulsory.

Course Objectives:

The objective of this course is to inculcate logical thinking amongst the young minds and to teach the C Programming Language and data structure. Students will be able to develop logics which will help them to create programs and applications in C. By learning the basic programming constructs, they can easily switch over to any other language in future.Students will also understand the concept of data structure which will help them to develop more complex programs.

Course Outcomes:

By the End of course the students will be able to:
CO1 Achieve Knowledge of design and development of C problem solving skills
CO2 Understand the basic principles of Programming in C language
CO3 Implement the concept of function, array and pointrrs in C language
CO4 Understand and implement the concept of linear data structure such as link list, stack and queue.
CO5 Understand and implement the non linear data structure tree and graph.

Unit – I

C Programming Fundamentals: Basic concepts of a C program, Declaration, Assignment & Print statements, Data Types, operators and expressions, decision making & branching, Programming examples.

Unit – II

Functions: Standard Mathematical functions, Input/output: Unformatted & formatted I/O function in C, Input functions, output functions.

User defined functions: Introduction/Definition, prototype, Local and global variables, passing parameters.

Introduction to array and pointers.

Unit – III

Introduction: Elementary data organization, Data Structure, Categories of data structures, Data structure operations, Applications of data structures.

Linear Data Structure: Array, Linked List, Stack, Queue and their Implementation.

Unit – IV

Non-Linear Data Structure: Tree; Introduction, Definition, Representing Binary tree in memory, Traversing binary trees, Traversal algorithms using stacks.

Graph: Introduction, Graph theory terminology, Sequential and linked representation of graphs.

Suggested Readings:

1. Yashwant Kanetker: Let us C, BPB.
2. Rajaraman, V.: Computer Programming in C, PHI.
3. Yashwant Kanetker: Working with C, BPB.
4. Trembley, J.P. And Sorenson P.G.: An Introduction to Data Structures With Applications, McGraw-Hill International Student Edition, New York.
5. Mark Allen Weiss: Data Structures and Algorithm Analysis In C, Addison- Wesley, (An Imprint Of Pearson Education), Mexico City.Prentice- Hall Of India Pvt. Ltd., New Delhi.
6. Yedidyan Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum: Data Structures Using C, Prentice-Hall of India Pvt. Ltd., New Delhi.
7. Any other book covering the contents of the subject.

Note: Latest and additional good books may be suggested and added from time to time.

Multidisciplinary Courses (MDC) 2nd Semester

[To be chosen by the students other than that of Bachelor Program in Computer Applications]

Name of the Program	**4-Year Bachelor Program in Computer Applications**	**Program Code**	**-----**
Name of the Course	**Office Automation**	**Course Code**	**23BCAX02MD01**
Hours/Week	**3**	**Credits (L:T:P)**	**2:0:1**
Max. Marks.	**Theory: 25 (20+5)** **Practical: 50 (35+15)**	**Time of end term examination**	**3 Hours**

Note: The examiner has to set nine questions in all by setting two questions from each Unit and Question No. 1 consisting of short-answer type questions covering the entire syllabus. Student will be required to attempt five questions in all by selecting one question from each Unit and Question No. 1, which is compulsory.

Course Objectives:

Office automation course enables students in crafting professional word documents, excel spread sheets, power point presentations using the Microsoft suite of office tools. To familiarize the students in preparation of documents and presentations with office automation tools.

Course Outcomes:

By the end of the course the students will be able to:
CO1: Understand the fundamental concepts of window operating system.
CO2: Understand and use of various functions of windows.
CO3. Get exposure of word processing tool.
CO4: Get exposure of data analysis tool.
CO5: Get exposure of Presentation tool.

Unit – I

MS-Windows: Operating system-Definition & functions, basics of Windows. Basic components of windows, icons, types of icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders. Control panel – display properties, adding and removing software and hardware, setting date and time, screensaver and appearance. Using windows accessories.

Unit – II

Documentation Using MS-Word: Introduction to word processing interface, Toolbars Creating & Editing Document, Formatting Document, Finding and replacing text, Format painter, Header and footer, Drop cap, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, Bookmark, Previewing and printing document, Advance Features of MS-Word-Mail Merge, Macros and Tables

Unit – III

Electronic Spread Sheet using MS-Excel: Introduction to MS-Excel, Cell, cell address, Creating & Editing Worksheet, Formatting and Essential Operations, Moving and copying data in excel, Header and footer, Formulas and Functions, Charts, Cell referencing, Page setup, Macros, Advance features of MS-Excel-Pivot table & Pivot Chart, Linking and Consolidation, Database Management using Excel-Sorting, Filtering, Validation, What if analysis with Goal Seek

Unit – IV

Presentation using MS-PowerPoint: Presentations, Creating, Manipulating & Enhancing Slides, Organizational Charts, Excel Charts, Word Art, Layering art Objects, Animations and Sounds, Inserting Animated Pictures or Accessing through Object, Inserting Recorded Sound Effect or In-Built Sound Effect.

Suggested Readings:

1. Microsoft Office – Complete Reference – BPB Publication
2. Russell A. Stultz: Learn Microsoft Office — BPB Publication
3. Courter, G Marquis: Microsoft Office 2000, Professional Edition. BPB.
4. Koers, D: Microsoft Office XP Fast and Easy. PHI.
5. Nelson, S L and Kelly, J: Office XP: The Complete Reference. Tata McGraw- Hill.
6. Any other book covering the contents of the subject.

Note: Latest and additional good books may be suggested and added from time to time.

Name of the Program	4-Year Bachelor Program in Computer Applications	Program Code	-----
Name of the Course	Python Programming	Course Code	23BCA402SE01
Hours/Week	3	Credits (L:T:P)	1:0:2
Max. Marks.	Theory: 25(20+5) Practical: 50 (35+15)	Time of end term examination	3 Hours

Course Objectives:

The course is designed to impart knowledge of one of the latest and most powerful programming languages – Python. Python programming is intended for software engineers, system analysts, program managers and user support personnel who wish to learn the Python programming language.

Course Outcomes:

By the end of the course the students will be able to:
CO1: Develop problem-solving skills and critical thinking in Python using basic programming constructs including variables, operators and data types.
CO2: Will be able to learn the automating repetitive tasks using loop and conditional controlled statements.
CO3:Understand the complex data types including lists, tuples, dictionaries and Function packages.
CO4: Identify and use libraries for algorithmic thinking to implement various data structures.
CO5: Will be able to implement important context of database programming.

Unit – I

Introduction to Python: History and Features of Python Programming, Basics of Python:Keywords, Variables, Operators, I/O Statements, Indentation, and Comments. Python Basic Data Types, Data Types Declaration, and Implementation.

Unit – II

Flow Control Statement: if statement, if-else statement, nested-if statement,if-elif-else ladder, While loop, range() Function, For Loop, Nested Loops, Infinite Loop, Break Statement, Continue Statement, Pass Statement

Unit – III

Python Complex data types: String Data Type, String Manipulation Methods and implementation using Python Programming
List and Dictionary Data Type, Declaration, and Implementation using Various built-in Functions and Libraries

Unit – IV

Python File Operations: Reading Files, Writing Files in Python, Understanding Read Functions:read(), readline(), readlines(), Understanding Write Functions: write() and writelines() Manipulating file pointer using seek Programming, using file operations.

Database Programming: Connecting to a Database, Creating Tables, INSERT, UPDATE, DELETE and READ operations, Transaction Control, Disconnecting from a database, and Exception Handling in Databases.

Suggested Readings:

1. Al Sweigart: Automate the Boring Stuff with Python.
2. Allen B. Downey: Think Python: How to Think Like a Computer Scientist, 2nd Edition, Green Tea Press
3. Charles Dierbach: Introduction to Computer Science Using Python, 1st Edition, Wiley India Pvt Ltd.
4. Wesley J Chun: Core Python Applications Programming, 3rd Edition, Pearson Education India
5. Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich: Data Structures and Algorithms in Python, 1st Edition, Wiley India Pvt Ltd
6. Reema Thareja: Python Programming using problem solving approach, Oxford University press.
7. Charles R. Severance: Python for Everybody: Exploring Data Using Python 3, 1 st Edition, Shroff Publishers.
8. Any other book covering the contents of the subject.

Note: Latest and additional good books may be suggested and added from time to time.

List of Python Programs

1. Write a program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. Write a program, using user-defined function to find the area of a rectangle, square, circle and triangle

by accepting suitable input parameters from the user.

3. Write a program to display the first n terms of the Fibonacci series.
4. Write a program to find the factorial of the given number.
5. Write a program to count the number of even and odd numbers from N numbers.
6. Write a program to create a function that accepts a string and calculates the number of upper case letters and lower case letters.
7. Write a program to reverse a given string and check whether the given string is a palindrome or not.
8. Write a program to find the sum of all items in a dictionary.
9. Write a program to perform arithmetic operations (addition, subtraction, multiplication, and division) on two numbers entered by a user.
10. Write a program to find the largest and smallest numbers in the list entered by the user.
11. Write a program to find whether the given number is Armstrong Number or not.
12. Write a program to print the multiplication table of a given number.
13. Write a program to check whether a given number is a prime number or not.
14. Write a program to perform string operations (concatenation, slicing, indexing, and length).
15. Write a program to find the largest and smallest number in a matrix entered by the user.
16. Write a program to sort a list of elements using the bubble sort algorithm.
17. Write a program to implement a simple calculator using functions.
18. Write a program to implement a linear search algorithm to search an element in the list entered by a user.
19. Write a program to implement a binary search algorithm to searchan element in the list entered by a user.
20. Write a program to implement a selection sortalgorithm to sort all the elements in the list entered by a user.

Any other programs assigned by the teachers.