

**Bachelor of Computer Applications  
(BCA)**

**SYLLABUS**

***Four Year Undergraduate Programme***

***As per NEP 2020 guidelines***

***Under Choice based Credit System***

**FOR THE STUDENTS TO BE ADMITTED IN THE SESSIONS  
2022-23, 2023-24, 2024-25**

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## Course Details for Four-Year UG Programme

S. NO.	COURSES	DISCIPLINES
1	Computer Applications (CA)- Arts & Science	Natural Science and Arts & Humanities
2	Information Technology (IT)- Arts & Science	Natural Science and Arts & Humanities
3	<b>Bachelor of Computer Applications (BCA)</b>	Computer Applications (for BCA degree)
	BCA (Web Technology)	
	BCA (Data Science)	
	BCA (Software Development)	



# **Bachelor of Computer Applications (BCA)**

# **SOFTWARE DEVELOPMENT SCHEME**

***Four Year Undergraduate Programme***

***As per NEP 2020 guidelines***

***Under Choice based Credit System***



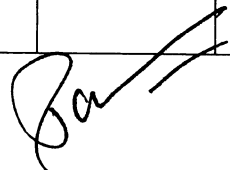
**FOR THE STUDENTS TO BE ADMITTED IN THE SESSIONS 2022-23,  
2023-24, 2024-25**

**COURSES OF STUDY****Semester-I**

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCST161	Programming Paradigms & C Language	4(3L+1P)	15	60	10	15	100
2	Minor	UMICST162	Computer Fundamentals and PC Software	4(3L+1P)	15	60	10	15	100
3	MD	UMDCST163	Computer Fundamentals	3	15	60	NA	NA	75
4	SEC	USECST104	PC Software: Installation and Troubleshooting	2	10	40	NA	NA	50

**Semester-II**

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCST261	Data and File Structures using C Language	4(3L+1P)	15	60	10	15	100
2	Minor	UMICST262	Python Programming	4(3L+1P)	15	60	10	15	100
3	MD	UMDCST263	C Programming	3	15	60	NA	NA	75
4	SEC	USECST204	Cyber Security	2	10	40	NA	NA	50





## BCA (Software Development) - FIRST SEMESTER

Course: Major  
Course Credits : ( L-P-T)  
(3-1-0)  
Total marks: 100

Course Title: Programming Paradigms & C Language  
Course Code: UMJCST161  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

***For examinations to be held in Dec 2022, 2023 and 2024***

### Course objectives & learning outcomes:

1. To learn the fundamentals of Computer programming.
2. To learn the mechanisms of different control structures.
3. To gain knowledge about linear and non linear data types in C language.
4. To brief the students about file handling.

### UNIT-I

Overview of different programming paradigms, Algorithm and its characteristics, Representation of Algorithm, Flowchart, Flowchart symbols, Advantages and Limitations of Flowchart.  
History of C language, Structure of C program, Compiling and Running a C program, Errors: Syntax, Logical, Linker and Logical, C-Preprocessor, Header file, File inclusion.  
Character set, Keyword, Identifier, Constant, Datatype, Variable, Operators: Arithmetic, Assignment, Increment and Decrement, Logical, Relational and Comma. Precedence and Associativity. 15 Hours

### UNIT-II

Conditional control statement: if, if-else, nested if, Ternary operator, if-else-if ladder, switch case, goto statement.  
Loops control statement: Loop control, while (), do-while(), for(), break statement, continue statement, nested loops.  
Functions: Types of function, function prototype, function declaration, function definition, scope, local and global variable, passing parameters to a function, call by value, pointer, call by reference.  
Storage classes in C: Types of storage classes with examples. 15 Hours

### UNIT-III

Arrays (Single and double dimensional): Definition, Declaration, Accessing, Bound Checking, Passing to function.  
Arrays and Pointers: Accessing single dimensional array using Pointers, accessing 2D array using Pointers, passing arrays to functions with pointers.  
Strings: Definition, Declaration, Accessing, passing to function, Standard Library function, string manipulation using pointers. 15 Hours

### UNIT-IV

Structure: Introduction to structures, Array of structures, Nesting of structures, Pointer to structures, Passing structures to functions, Nested Structures.  
Union: Unions initialization and accessing the members of a union.  
Data and File handling: Introduction to Data Files, File opening modes, File handling functions, Managing records in a file, Managing text files. 15 Hours

### Suggested readings/ references:

1. E. Balaguruswami, "Programming in C", PHI,
2. Gottfried. B, "Theory and problems of Programming with C Language", Tata Mc Graw Hill.
3. Kenneth. A, "C Problem Solving and Programming", PHI.
4. Dan Gookin, "C Programming", Wiley Dreamtech.
5. Y. P. Kanetkar, "Understanding Pointers In C", BPB Publications.



**BCA (Software Development) - FIRST SEMESTER**

Course: Major  
Course Credits : ( L-P-T)  
(3-1-0)  
Total marks: 100

Course Title: Programming Paradigms & C Language  
Course Code: UMJCST161  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

***For examinations to be held in Dec 2022, 2023 and 2024***

**NOTE FOR PAPER SETTERS FOR EXAMINATIONS –**

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

**Section A** shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

**Section B** shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

**Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.**

**Practical/ tutorial Evaluation**

Daily evaluation of practical's/tutorials/Viva voce/Records etc.

10 marks

**Final Examination**

15 Marks

**Pattern for external practical examination**

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

**Pattern for external tutorial examination**

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks



**BCA (Software Development) - FIRST SEMESTER**

Course: Minor  
Course Credits: (L-P-T)  
(3-1-0)  
Total marks: 100

Course Title: Computer Fundamentals and PC software.  
Course Code: UMICST162  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

***For examinations to be held in Dec 2022, 2023 and 2024***

**Course objectives & learning outcomes:**

1. To learn the fundamentals of Computer Fundamentals.
2. To learn the mechanisms of office tools.
3. To gain knowledge on software and applications.
4. To brief the students about PC software basics.

**UNIT - I**

Computer and its Characteristics, Applications of Computer, Digital and Analog Computer, Generation of Computer, Computer Types: Mainframe Computer, Super Computer, Mini Computer. Memory: RAM, ROM, EEPROM, UVPRAM, Storage Units, Various secondary storage devices like: Hard disk drives, Optical Disks: CD, DVD, Blu-ray disks, etc. Input and Output Devices: Keyboard, Mouse, Joystick, Scanner, touch panels, Monitor, LEDs, TFTs, Printer and its Types.

15 Hours

**UNIT - II**

Software and its Types (System Software, Application Software, Firmware Software) Computer Languages and its types (Machine Language, Assembly Language, High Level Language: Merits and Demerits of Computer Languages), Translators: Compiler, Linker, Interpreter, Loader, computer virus and its types, Antivirus Software.

15 Hours

**UNIT - III**

Number system: Decimal, Binary, octal, hexadecimal, conversion of one number system to another, arithmetic operations: addition, subtraction, multiplication. Complement of Numbers, complement methods: r's and r-1 complement, ASCII Code, EBCDIC.

15 Hours

**UNIT - IV**

PC Maintenance and Troubleshooting: Opening the PC and identification. Study of different blocks, Assembling and disassembling. Basic Device Configuration and Installation-Printers, Microphone, Monitor, Mother Board, Sound Card, Video Card, tips on Trouble Shooting. Types of Internet connections: Dialup, Broadband, Leased Line, Wi-Fi, Wi-Max, 2G, 3G, 4G, 5G, WWW, E-mails, Search Engines, Social Networking. Cloud application. Audio-video Conferencing. Voice over Internet Protocol (VOIP).

15 Hours

**Suggested readings/ references:**

1. P.K Sinha and Priti Sinha, "Computer Fundamentals", BPB Publications.
2. Alexix Leon, Mathewes Leon, "Fundamentals of Information Technology", Leon Techworld.
3. Suresh K. Basandra, "Computer Systems Today", Galgotia Publications.
4. V. Rajaraman, "Fundamentals of Computers", EEE.
5. Peter Norton, "Introduction to Computers", Tata Mcgraw Hill.



**BCA (Software Development) - FIRST SEMESTER**

Course: Minor  
Course Credits: (L-P-T)  
(3-1-0)  
Total marks: 100

Course Title: Computer Fundamentals and PC software.  
Course Code: UMICST162  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

***For examinations to be held in Dec 2022, 2023 and 2024***

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(4 x 3 = 12 marks)

**Section B** shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

**Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.**

**Practical/ tutorial Evaluation**

Daily evaluation of practical's/tutorials/Viva voce/Records etc.

10 marks

**Final Examination**

15 Marks

**Pattern for external practical examination**

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

**Pattern for external tutorial examination**

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks



**BCA (Software Development) - FIRST SEMESTER**

Course: Multi-Disciplinary Foundation Course (MD)  
Course Credits: (L-P-T)  
(3-0-0)  
Total marks: 75

Course Title: Computer Fundamentals  
Course Code: UMDCST163  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration

***For examinations to be held in Dec 2022, 2023, and 2024***

**Course objectives & learning outcomes:**

1. To learn the fundamentals of Computer Fundamentals.
2. To understand hardware and software.
3. To gain knowledge of operating system.
4. To brief the students about number system.

**UNIT - I**

Introduction to Computer, History of Computer, Features of Computer, Uses of Computers, Generation of Computer, Digital, Analog, Hybrid Computer, Computer Memory and its types, types of Primary memory, Storage Units, Secondary storage Devices: Hard disk drives, Optical Disks: CD, DVD, etc. Input Devices types, and Output Devices Monitor, Plotter. Printer and its Types.

10 Hours

**UNIT - II**

Software and Hardware, Type of Software: System Software, Application Software, Firmware Software, Computer Languages and its types: Machine Language, Assembly Language, High Level Language, Translators: Interpreter, Compiler, Linker, Loader, Computer Viruses introduction, Antivirus Software.

10 Hours

**UNIT - III**

Operating System, Functions of Operating System, Types of Operating System (Single User and Multi User), Windows operating system and its features, Desktop Elements of windows OS, Anatomy of Window: Title Bar, Menu Bar, Tool Bar, Scroll Bars, Document Area, and Status Bar.

10 Hours

**UNIT - IV**

Computer Number System: Decimal Number, Binary Number, Octal Number, Hexadecimal Number, Arithmetic Operations(Addition, Subtraction, Multiplication) on Binary Number, Conversion of one Number System to another.

15 Hours

**Suggested readings/ references:**

1. P.K Sinha and Priti Sinha, "Computer Fundamentals", BPB Publications.
2. Alexix Leon, Mathewes Leon, "Fundamentals of Information Technology", Leon Techworld.
3. Suresh K. Basandra, "Computer Systems Today", Galgotia Publications.
4. V. Rajaraman, "Fundamentals of Computers",EEE.
5. Peter Norton, "Introduction to Computers", Tata Mcgraw Hill.



**BCA (Software Development) - FIRST SEMESTER**

Course: Multi-Disciplinary Foundation Course (MD)  
Course Credits: (L-P-T)  
(3-0-0)  
Total marks: 75

Course Title: Computer Fundamentals  
Course Code: UMDCST163  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration

***For examinations to be held in Dec 2022, 2023, and 2024***

**NOTE FOR PAPER SETTERS FOR EXAMINATIONS –**

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

**Section A** shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

**Section B** shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

**Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.**



**BCA (Software Development) - FIRST SEMESTER**

Course: Skill Enhancement Course (SEC)  
Course Credits: (L-P-T)  
(2-0-0)  
Total marks: 50

Course Title: PC Software: Installation and Troubleshooting  
Course Code: USECST104  
Mid Semester assessment: 10 Marks of 1.5 hours duration  
End Semester assessment: 40 Marks of 2.5 hours duration

***For examinations to be held in Dec 2022, 2023, and 2024***

**Course objectives & learning outcomes:**

1. To provide knowledge about the PC Hardware.
2. To brief about different utilities and PC settings.
3. To develop the ability to configure, setup and troubleshoot PC.

**UNIT -I**

Introduction to PC Hardware: Study of basic I/O systems, Types of Memories- Static RAM and Dynamic RAM, ROM, PROM, EPROM, EEPROM, External Storage Devices, CPU (Central Processing Unit)- ALU and control, Motherboard and Processor :Types of Processor, System performance Monitoring. 10 Hours

**UNIT -II**

BIOS Configuration: Study of BIOS Set-up- Advance set-up, Boot configuration, Boot Menu, Installation of Operating System (Windows), Control panel, Installation and uninstallation of application software, Setting System Date and Time, Hard Disk: Formatting of Hard disk, Partitioning of Hard disk in different logical drives, Defragmenting Hard disk using defrag, Scan Disk for checking disk space, Disk clean up, Scan disk, Installation of Device Drivers: Different types of Motherboard drivers: Network, Audio, and Graphics, Modem. Display Settings: Resolution, Themes, multiple displays, Projector Set up. 10 Hours

**UNIT-III**

Configuration of External devices: Physical set-up of Printers- Performing test print out, Printing of document etc, Scanner set-up, Webcam, Bluetooth device, Memory card reader, Diagnostic and troubleshooting of PC: POST (Power on Self Test), Maintenance of PC, Error messages, Task Manager. Concept of compression Compression Utilities: WinZip, PKZIP, files recovery, Antivirus, CD/DVD Writing Software, Concept of Virtual drives and Image files (ISO). 10 Hours

**Suggested readings/ references:**

1. Mark Minasi, "The complete PC Upgrade & Maintenance Guide", BPB Publications.
2. D Balasubramanian, "Computer Installation and Servicing", Tata McGraw Hill Education.
3. Robert C. Brenner, "Trouble Shooting and Repair Guide", BPB Publications.
4. Scott Mueller, "Upgrading and Repairing PC's", PHI Publications, Fourth Edition.
5. Adane Nega Tarekegn, "A Simple Guide to Computer Maintenance and Troubleshooting", LAP LAMBERT Academic Publishing.
6. James Karney, "Upgrade & Maintain Your PC", M & T Books; 2nd edition.



**BCA (Software Development) - FIRST SEMESTER**

Course: Skill Enhancement Course (SEC)  
Course Credits: (L-P-T)  
(2-0-0)  
Total marks: 50

Course Title: PC Software: Installation and Troubleshooting  
Course Code: USECST104  
Mid Semester assessment: 10 Marks of 1.5 hours duration  
End Semester assessment: 40 Marks of 2.5 hours duration

***For examinations to be held in Dec 2022, 2023, and 2024***

**NOTE FOR PAPER SETTERS FOR EXAMINATIONS -**

The question paper will be divided into the following two sections. No question shall be repeated in the question paper.

**Section A** shall consist Four (4) short answer questions (at least one from each unit). The students are required to attempt all questions. Each question shall be of 2½ Marks.

(4 x 2½ = 10 marks)

**Section B** shall consist Six (6) long answer questions (two from each unit). The students are required to attempt three questions. Each question shall be of 10 Marks.

(3 x 10 = 30 marks)

**Note:** The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.





**BCA (Software Development) - SECOND SEMESTER**

Course: Major  
Course Credits: (L-P-T)  
(3-1-0)  
Total marks: 100

Course Title: Data and File Structures using C Language  
Course Code: UMCST261  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

***For examinations to be held in May 2023, 2024 and 2025***

**Course objectives & learning outcomes:**

1. To have the basic understanding of memory management.
2. To understand various sequential and non-sequential memory arrangement.
3. To understand the working of various linked lists.
4. To brief the students about various trees and graphs.

**UNIT – I**

Introduction to data structures: - Concepts of data and algorithm, Relation between Data Structure & Algorithm, Introduction to Time & Space complexity, Data types, Data Structures & Abstract data types, Representation of Arrays, Sparse matrices.

15 Hours

**UNIT – II**

Stacks and Queues: - Concept of Stacks, Operation on Stacks, Multiple stacks, Application of stacks in Infix, Postfix, Prefix, Recursion, Concept of Queues, Operation on Queues, Multiple Queues, Priority Queues, Circular Queues.

15 Hours

**UNIT – III**

Insertion, Deletion and Traversal on Linear Linked Lists, Doubly Linked List, Circular Linked List, Linked List as Data Structure, Header nodes, Stacks & Queues using linked list, Dynamic memory management, Garbage Collection.

15 Hours

**UNIT – IV**

Trees and Graphs: binary trees and its representation using Linked list, Operations on Binary Trees, Traversal Algorithms, Threaded Binary Trees and its Traversal algorithms, Representation of Graphs, Traversal methods, Applications Undirected Graphs, Directed Graph & their Traversal, Depth first, Breadth First, Shortest Path algorithms (Dijkstra and Floyd).

15 Hours

**Suggested Readings:**

1. Tanenbaum, Langsam and Augenstein, "Data Structure using C", Pearson.
2. Horowitz E. and Sahni S., "Fundamentals of data structures", Computer Science Press.
3. Robert L. Kruse, "Data structures and Program Design", Pearson.
4. Aho, Hopcraft and Ullman, "Data Structures & Algorithm", Pearson,
5. Sorenson, "Data Structure with Applications", McGraw-Hill.



**BCA (Software Development) - SECOND SEMESTER**

Course: Major  
Course Credits: (L-P-T)  
(3-1-0)  
Total marks: 100

Course Title: Data and File Structures using C Language  
Course Code: UMJCST261  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

***For examinations to be held in May 2023, 2024 and 2025***

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(4 x 3 = 12 marks)

**Section B** shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

**Note:** -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

**Practical/ tutorial Evaluation**

Daily evaluation of practical's/tutorials/Viva voce/Records etc.

10 marks

**Final Examination**

15 Marks

**Pattern for external practical examination**

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

**Pattern for external tutorial examination**

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks



**BCA (Software Development) - SECOND SEMESTER**

Course:: Minor  
Course Credits: (L-P-T)  
(3-1-0)  
Total marks: 100

Course Title: Python Programming  
Course Code: UMICST262  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

***For examinations to be held in May 2023, 2024 and 2025***

**Course objectives & learning outcomes:**

1. To Understand basics of python
2. To develop console application in python
3. To develop database application in python
4. Apply the concept of file handling in python and basic machine learning application

**UNIT I**

Introduction to Python Language, Strengths and Weaknesses, IDLE, Dynamic Types, Naming Conventions, String Values, string Operations, String Slices, String Operators, Numeric Data Types, Built-in Functions. Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods Special Methods Class Variables, Inheritance, Polymorphism.

15 Hours

**UNIT II**

Introduction, Control Flow and Syntax, Indenting, the if Statement, Relational Operators, Logical Operators, True or False, Bit Wise Operators, the while Loop, break and continue, The for Loop, Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries, Copying Collections.

15 Hours

**UNIT III**

Introduction Defining Your Own Functions Parameters Function Documentation Keyword and Optional Parameters Passing Collections to a Function Variable Number of Arguments Scope Functions - "First Class Citizens" Passing Functions to a Function Mapping Functions in a Dictionary Lambda Modules Standard Modules – sys Standard Modules – math Standard Modules – time The dir Function.

15 Hours

**UNIT IV**

I/O and Error Handling in Python: Introduction, Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data from a File, Additional File Methods, Handling IO Exceptions, Working with Directories, Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions.

15 Hours

**Suggested readings/ references:**

1. Allen B. Downey, "Think Python", O'Reilly, Sebastopol, California.
2. Aditya Kanetkar and Yashavant Kanetkar, "Let us Python", BPB publications.
3. John Zelle, "Python Programming: An Introduction to Computer Science", Franklin, Beedle & Associates Inc.
4. Martin C. Brown., "Python: The Complete Reference", McGraw Hill.
5. Harsh Bhasin, "Python for beginners", New age international ltd.



**BCA (Software Development) - SECOND SEMESTER**

Course: Minor  
Course Credits: (L-P-T)  
(3-1-0)  
Total marks: 100

Course Title: Python Programming  
Course Code: UMICST262  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

***For examinations to be held in May 2023, 2024 and 2025***

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(4 x 3 = 12 marks)

**Section B** shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

**Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.**

**Practical/ tutorial Evaluation**

Daily evaluation of practical's/tutorials/Viva voce/Records etc.

10 marks

**Final Examination**

15 Marks

**Pattern for external practical examination**

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

**Pattern for external tutorial examination**

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks



## BCA (Software Development) - SECOND SEMESTER

Course: Multidisciplinary Foundation Course (MD)  
 Course Credits: (L-P-T)  
 (3-0-0)  
 Total marks: 75

Course Title: C Programming  
 Course Code: UMDCST263  
 Mid Semester assessment: 15 Marks of 1.5 hours duration  
 End Semester assessment: 60 Marks of 3.0 hours duration

***For examinations to be held in May 2023, 2024 and 2025***

### Course objectives & learning outcomes:

1. To learn the fundamentals programming concepts.
2. To understand basic control structures.
3. To gain knowledge on referencing variables in C.
4. To brief the students about functions and parameters in C.

### UNIT - I

Algorithm, Representation of Algorithm, Flowcharts, Flowchart Symbols, Flowchart Rules, Advantages and Limitations of Flowcharts, Pseudo Code Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Format of c program, Arithmetic, Relational & Logical Operators, Assignment Operators, Increment & Decrement Operators, Operator Precedence & Associativity.

10Hours

### UNIT - II

Formatted Input, Formatted Output, escape sequences, Simple if Statement, if..else Statement, Nesting of if....else Statements, , Switch Statement, conditional Operator, goto Statement, loops, break and continue statement.

10Hours

### UNIT - III

Qualifiers, Storage classes, Pointer's definition, Declaring Pointer Variables, using pointer variable, Arrays: One, Two and Multi Dimension Arrays, Initialization of one- and two-dimensional Arrays, Declaring and Initializing String Variables, String Handling Functions.

10Hours

### UNIT - IV

Preprocessor directives, Function Definition, Function Calls (call by value & call by address method) Returning Value, Types of Functions, Recursion, Passing Arrays to Functions, Macros, Defining Structure, Declaring and Accessing Structure Variables, Structures and Unions.

15 Hours

### Suggested Readings:

1. E. Balaguruswami, "Programming in C", PHI.
2. Gottfried. B, "Theory and problems of Programming with C Language", Tata Mc Graw Hill.
3. Kenneth. A, "C Problem Solving and Programming", PHI.
4. Dan Gookin, "C Programming", Wiley Dreamtech.
5. Y. P. Kanetkar, "Understanding Pointers in C", BPB Publications.
6. Shubhnandan S. Jamwal, "Programming in C", Pearson Publications.
7. H.M. Deitel and P.J. Deitel, "C How to Program", PHI.



**BCA (Software Development) - SECOND SEMESTER**

Course: Multidisciplinary Foundation Course (MD)  
Course Credits: (L-P-T)  
(3-0-0)  
Total marks: 75

Course Title: C Programming  
Course Code: UMDCST263  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration

*For examinations to be held in May 2023, 2024 and 2025*

**NOTE FOR PAPER SETTERS FOR EXAMINATIONS –**

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**Section A** shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

**Section B** shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

**Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.**



## BCA (Software Development) - SECOND SEMESTER

Course: Skill Enhancement Course (SEC)  
 Course Credits: (L-P-T)  
 (2-0-0)  
 Total marks: 50

Course Title: Cyber Security  
 Course Code: USECST204  
 Mid Semester assessment: 10 Marks of 1.5 hours duration  
 End Semester assessment: 40 Marks of 2.5 hours duration

***For examinations to be held in May 2023, 2024 and 2025***

### Course objectives & learning outcomes:

1. To provide knowledge about the PC Hardware.
2. To brief about different utilities and PC settings.
3. To develop the ability to configure, setup and troubleshoot PC.

### UNIT –I

Cyberspace, Architecture of cyberspace, Internet, World Wide Web, Advent of internet, Internet infrastructure for data transfer and governance, Internets ociety, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.

Classification of cyber crimes, Common cyber crimes-cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks. 10 Hours

### UNIT -II

Cybercriminals modus-operandi, Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences, Organizations dealing with Cyber crime and Cyber security in India.

Introduction to Social networks, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media. 10 Hours

### UNIT-III

Definition of E-Commerce, Elements of E-Commerce security, E-Commerce threats, E-Commerce security best practices.

Introduction to digital payments, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in authorized banking transactions 10 Hours

### Suggested readings/ references:

1. R. C Mishra, "Cyber Crime Impact in the New Millennium", Auther Press Edition.
2. Sumit Belapure and Nina Godbole, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Pvt. Ltd.
3. Henry A. Oliver, "Security in the Digital Age: Social Media Security Threats and Vulnerabilities", Pearson.
4. Elias M. Awad, "Electronic Commerce", Prentice Hall of India Pvt Ltd.
5. Kumar K, "Cyber Laws: Intellectual Property & E-Commerce Security", Dominant Publishers.
6. Eric Cole, Ronald Krutz, James W. Conley, "Network Security Bible", 2nd Edition, Wiley India Pvt. Ltd.
7. E. Maiwald, "Fundamentals of Network Security", McGraw Hill.



**BCA (Software Development) - SECOND SEMESTER**

Course: Skill Enhancement Course (SEC)  
Course Credits: (L-P-T)  
(2-0-0)  
Total marks: 50

Course Title: Cyber Security  
Course Code: USECST204  
Mid Semester assessment: 10 Marks of 1.5 hours duration  
End Semester assessment: 40 Marks of 2.5 hours duration

***For examinations to be held in May 2023, 2024 and 2025***

**NOTE FOR PAPER SETTERS FOR EXAMINATIONS -**

The question paper will be divided into the following two sections. No question shall be repeated in the question paper.

**Section A** shall consist Four (4) short answer questions (at least one from each unit). The students are required to attempt all questions. Each question shall be of 2½ Marks.

(4 x 2½ = 10 marks)

**Section B** shall consist Six (6) long answer questions (two from each unit). The students are required to attempt three questions. Each question shall be of 10 Marks.

(3 x 10 = 30 marks)

**Note:** The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.





**Semester-III**

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCST361	Object Oriented programming using C++	4(3L+1P)	15	60	10	15	100
2	Major	UMJCST362	Database Management System & SQL	4(3L+1P)	15	60	10	15	100
3	Minor	UMICST363	Open-Source Software	4(3L+1T)	15	60	10	15	100
4	MD	UMDCST364	Computer Fundamentals	3	15	60	NA	NA	75
5	SEC	USECST305	System Analysis and Design	2	10	40	NA	NA	50

**Semester-IV**

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCST461	Operating System	4(3L+1P)	15	60	10	15	100
2	Major	UMJCST462	Mathematics for Computer Science	4(3L+1T)	15	60	10	15	100
3	Major	UMJCST463	PHP Language	4(3L+1T)	15	60	10	15	100
4	Major	UMJCST464	Computer Networks and Internet	4(3L+1T)	15	60	10	15	100
5	Minor	UMICST465	Numerical Methods	4(3L+1T)	15	60	10	15	100

**BCA (Software Development) - THIRD SEMESTER**

Course: Major  
Course Credits : ( L-P-T)  
(3-1-0)  
Total marks: 100

Course Title: Object Oriented Programming using C++  
Course Code: UMJCST361  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

*For examinations to be held in Dec 2023, 2024 and 2025*

**Course objectives & learning outcomes:**

1. To learn the fundamentals of object-oriented technology.
2. To learn the basics of C++ language.
3. To learn implementation of Object-Oriented Programming concepts in C++.
4. To gain knowledge mechanisms of exception handling in C++.
5. To brief the students about file handling in C++.

**Unit-1**

Object oriented programming: Definition, Characteristics, Advantages, Applications, Comparison of object-oriented programming and procedure-oriented programming; Object oriented programming concepts: Classes, Objects, Encapsulation, Abstraction, Inheritance, and Polymorphism.

15 Hrs

**Unit-2**

C++ language basics: Program structure, Character set, Identifiers, Keywords, Constants, Punctuators, Data types, Storage classes, Comments, Operators, Scope resolution operator, Member dereferencing operator, New and Delete operators, Conditional statements, Loop statements, Jump statements.

15 Hrs

**Unit-3**

Classes and objects in C++: Member functions inside and outside of the class, Constructors and destructor, Class members – private, protected, public, Static; Array and Strings in the class, Create array of objects, Define a function – Inline, Friend, Virtual, Recursive; Pass object by-value to a function, Pass object by-reference to a function.

15 Hrs

**Unit-4**

Inheritance in C++: Single, Multi-level, Hierarchical, Hybrid; Privately derived, Protected derived, Publically derived; Polymorphism in C++: Operator overloading, Function overloading, Virtual functions, Static binding, Dynamic binding; Exception handling basics in C++; File handling basics in C++.

15 Hrs

**Suggested readings/ references:**

1. E. Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill, 4<sup>th</sup> Edition, 2008.
2. Herbert Schildt, "C++ The Complete Reference", McGraw-Hill, 4<sup>th</sup> Edition, 2002.
3. Robert Lafore, "Object Oriented Programming in C++", Galgotia Publications, 3<sup>rd</sup> Edition, 2003.
4. Harvey M. Deitel and Paul J. Deitel, "C++: How to Program", Prentice Hall, 2006.



**BCA (Software Development) - THIRD SEMESTER**

Course: Major  
Course Credits : (L-P-T)  
(3-1-0)  
Total marks: 100

Course Title: Object Oriented Programming using C++  
Course Code: UMJCST361  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

*For examinations to be held in Dec 2023, 2024 and 2025*

**NOTE FOR PAPER SETTERS FOR EXAMINATIONS -**

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

**Section A** shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

**Section B** shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

**Note:** -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

**Practical/ tutorial Evaluation**

Daily evaluation of practical's/tutorials/Viva voce/Records etc.

**Final Examination**

10 marks

**Pattern for external practical examination**

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

15 Marks

**Pattern for external tutorial examination**

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks



## BCA (Software Development) - THIRD SEMESTER

Course: Major  
Course Credits: (L-P-T)  
(3-1-0)  
Total marks: 100

Course Title: Database Management System & SQL  
Course Code: UMJCST362  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

*For examinations to be held in Dec 2023, 2024 and 2025*

### Course objectives & learning outcomes:

1. To learn the fundamentals of Databases.
2. To learn the basics of Relational Databases.
3. To gain knowledge Structure Query Language.
4. To brief the students about Normalization of tables in Relational Databases.

#### Unit-1

Database concepts: Data, Field, Record, File, Database, Advantages of databases, Disadvantages of databases;  
Database management system: Need of DBMS, Components of DBMS – Database administrator, DML pre compiler, DDL compiler, Query processor, Database manager, File manager, Data dictionary, Data files;  
Three level architecture of DBMS: External, Conceptual, and Internal; 15 Hrs

#### Unit-2

ER model of a database: Entities, Attributes, Relationships, ER diagrams, Notations, Conversion to Relation database design. Relational model of a database: Advantages, Relations, Schema, State, Tuple, Attribute, Domain; Keys: Super, Candidate, Primary, Alternate, Foreign; Relational constraints: Domain constraints, Key constraints, Integrity constraints; Relational operations: Insertion, Deletion, Updation, Selection, Projection, Joins. 15 Hrs

#### Unit-3

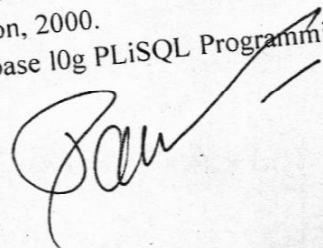
Dependencies: Functional dependency, Join dependency, Inclusion dependency, Template dependency;  
Normalization: 1<sup>st</sup> normal form, 2<sup>nd</sup> normal form, 3<sup>rd</sup> normal form, BCNF normal form, 4<sup>th</sup> normal form, 5<sup>th</sup> normal form. Concurrent transaction processing: Schedule, Concurrency problems, Serializable Schedules, Serializability; Lock Based Protocols: Locks, Binary Lock, Two Phase Locking (2PL), Deadlock handling; 15 Hrs

#### Unit-4

SQL: Features of SQL; DDL: Create, Alter, Drop; DML: Select, Arithmetic, Precedence, Where, Alias, Concatenation, Literal, Distinct, Between, In, Like, Null, Logical, Order By, Group By, Having, Insert Into, Update, Delete, Count, Sum, Avg, Max, Min; Views, and data dictionary; Joins: Equi Join, Natural Join, Outer Join, Self-Join. 15 Hrs

### Suggested readings/ references:

1. Bayross, Ivan, "SQL, PL/SQL: The programming language of Oracle", BPB publications 2009.
2. Bipin Desai, "An Introduction to Database Systems", Galgotia Publications Pvt. Ltd.
3. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, "Database System Concept", McGrawHill, 7<sup>th</sup> Edition, 2020.
4. Ramon Mata-Toledo and Pauline Cushman, "Schaum's Outline of Fundamentals of Relational Databases (Schaum's Outline Series) Toledo", McGraw-Hill Education, 2000.
5. Scott Urman, Ron Hardman and Michael McLaughlin, "Oracle Database 10g PLiSQL Programming", Tata McGraw-Hill, 8<sup>th</sup> Edition, 2008.





**BCA (Software Development) - THIRD SEMESTER**

Course: Major  
Course Credits: (L-P-T)  
(3-1-0)  
Total marks: 100

Course Title: Database Management System & SQL  
Course Code: UMJCST362  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

*For examinations to be held in Dec 2023, 2024 and 2025*

**NOTE FOR PAPER SETTERS FOR EXAMINATIONS -**

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**Section A** shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

**Section B** shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

**Note:** -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

**Practical/ tutorial Evaluation**

Daily evaluation of practical's/tutorials/Viva voce/Records etc.



10 marks

**Final Examination**

15 Marks

**Pattern for external practical examination**

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

**Pattern for external tutorial examination**

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

**BCA (Software Development) - THIRD SEMESTER**

Course: Minor  
Course Credits: (L-P-T)  
(3-0-1)  
Total marks: 100

Course Title: Open-Source Software  
Course Code: UMICST363  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25

***For examinations to be held in Dec 2023, 2024 and 2025***

**Course objectives & learning outcomes:**

1. Students will understand what an open-source project is.
2. Students will know how to use common open-source tools.
3. Students will be able to find and contribute to open-source projects.
4. Students will create and lead an open-source project.

**Unit-1**

Introduction to OSS, History, Need of Open Sources, Advantages and disadvantages of OSS, Brief understanding of Software Development Life Cycle, Development and maintenance of Open-Source Software.

15 Hrs

**Unit-2**

Commercial Software Vs Open-Source Software, Free Software Vs Freeware Softwares, Software Licensing - GPL, LGPL and other licenses. Salient features of OSS like (Open Office, GAMBAS, GIMP, MySQL)

15 Hrs

**Unit-3**

Applications of Open-Source Operating System LINUX: - Introduction, General Overview, Kernel Mode and Usermode – Process and Scheduling, Development with Linux.

15 Hrs

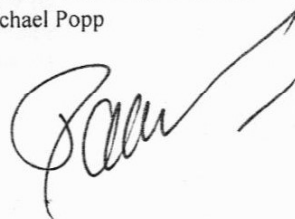
**Unit-4**

Open-Source Software Organizations, hands on training on open office, Data recovery softwares, Apache Web Server its installation and deploying website.

15 Hrs

**Suggested references:**

1. Embedded Software Development: The Open-Source Approach by Ivan Cibrario Bertolotti and Tingting Hu
2. Understanding Open Source & Free Software Licensing by O Reilly and Andrew M. ST.Laurent
3. Best practices for commercial use of open-source software by Karl Michael Popp
4. Open-Source Software by Jeffrey P. Brown
5. Software Engineering by Roger S. Pressman



## BCA (Software Development) - THIRD SEMESTER

Course: Minor  
 Course Credits: (L-P-T)  
 (3-0-1)  
 Total marks: 100

Course Title: Open-Source Software  
 Course Code: UMICST363  
 Mid Semester assessment: 15 Marks of 1.5 hours duration  
 End Semester assessment: 60 Marks of 3.0 hours duration  
 Practical: 25 Marks

*For examinations to be held in Dec 2023, 2024 and 2025*

### NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

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(4 x 3 = 12 marks)

**Section B** shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

**Note:** -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

### Practical/ tutorial Evaluation

Daily evaluation of practical's/tutorials/Viva voce/Records etc.

### Final Examination

10 marks

15 Marks

### Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

### Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks



**BCA (Software Development) - THIRD SEMESTER**

Course: Multi-Disciplinary (MD)

Course Credits: (L-P-T)  
(3-0-0)

Total marks: 75

Course Title: Computer Fundamentals

Course Code: UMDCST364

Mid Semester assessment: 15 Marks of 1.5 hours duration

End Semester assessment: 60 Marks of 3.0 hours duration

***For examinations to be held in Dec 2023, 2024 and 2025*****Course objectives & learning outcomes:**

1. To learn the fundamentals of Computer Fundamentals.
2. To understand hardware and software.
3. To gain knowledge of operating system.
4. To brief the students about number system.

**UNIT - I**

Introduction to Computer, History of Computer, Features of Computer, Uses of Computers, Generation of Computer, Digital, Analog, Hybrid Computer, Computer Memory and its types, types of Primary memory, Storage Units, Secondary storage Devices: Hard disk drives, Optical Disks: CD, DVD, etc. Input Devices types, and Output Devices Monitor, Plotter. Printer and its Types.

10 Hours

**UNIT - II**

Software and Hardware, Type of Software: System Software, Application Software, Firmware Software, Computer Languages and its types: Machine Language, Assembly Language, High Level Language, Translators: Interpreter, Compiler, Linker, Loader, Computer Viruses introduction, Antivirus Software.

10 Hours

**UNIT - III**

Operating System, Functions of Operating System, Types of Operating System (Single User and Multi User), Windows operating system and its features, Desktop Elements of windows OS, Anatomy of Window: Title Bar, Menu Bar, Tool Bar, Scroll Bars, Document Area, and Status Bar.

10 Hours

**UNIT - IV**

Computer Number System: Decimal Number, Binary Number, Octal Number, Hexadecimal Number, Arithmetic Operations(Addition, Subtraction, Multiplication) on Binary Number, Conversion of one Number System to another.

15 Hours

**Suggested readings/ references:**

1. P.K Sinha and Priti Sinha, "Computer Fundamentals", BPB Publications.
2. Alexix Leon, Mathewes Leon, "Fundamentals of Information Technology", Leon Techworld.
3. Suresh K. Basandra, "Computer Systems Today", Galgotia Publications.
4. V. Rajaraman, "Fundamentals of Computers",EEE.
5. Peter Norton, "Introduction to Computers", Tata Mcgraw Hill.





**BCA (Software Development) - THIRD SEMESTER**

Course: Multi-Disciplinary (MD)

Course Credits: (L-P-T)

(3-0-0)

Total marks: 75

Course Title: Computer Fundamentals

Course Code: UMDCST364

Mid Semester assessment: 15 Marks of 1.5 hours duration

End Semester assessment: 60 Marks of 3.0 hours duration

***For examinations to be held in Dec 2023, 2024 and 2025*****NOTE FOR PAPER SETTERS FOR EXAMINATIONS -**

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

**Section A** shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

**Section B** shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

**Note:** -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.



**BCA (Software Development) - THIRD SEMESTER**

Course: Skill Enhancement Course (SEC)

Course Title: System Analysis and Design

Course Credits: (L-P-T)  
(2-0-0)

Course Code: USECST305

Total marks: 50

Mid Semester assessment: 10 Marks of 1.5 hours duration

End Semester assessment: 40 Marks of 2.5 hours duration

*For examinations to be held in Dec 2023, 2024 and 2025***Course objectives & learning outcomes:**

1. To learn the basics of Software and system development life cycle.
2. To learn different SRS and feasibility study.
3. To gain knowledge on DFDs, ER diagrams and tools.

**Unit-1**

Software Systems Analysis and Design Life Cycle: Requirements determination, requirements specifications, feasibility analysis, final specifications, hardware and software study, Software system design, Software system implementation, Software system evaluation, Software system modification.

15 Hours

**Unit-II**

Role of Software systems analyst, tools used in Software system analysis Information gathering: strategies, methods, case study Software system requirements specification: classification of requirements as strategic, tactical, operational and statutory. Feasibility analysis: deciding project goals, examining alternative solutions, cost – benefit analysis.

15 Hours

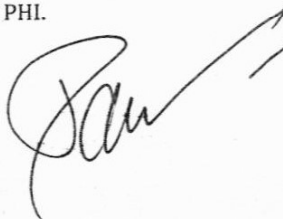
**Unit-III**

Tools for systems analysts: data flow diagrams, case study for use of DFD, leveling of DFDs, leveling rules, logical and physical DFDs, software tools to create DFDs. Data oriented Software systems design: entity relationship model, E-R diagrams, relationships, cardinality and participation, data base design.

15 Hours

**Suggested Readings:**

1. Software Engineering by Roger S. Pressman- Tata McGraw Hill.
2. Software Project Management by Bob Hughes and Mike Cotterell- Tata McGraw Hill.
3. Software Project Management by S. Kelkar- PHI.
4. Information Technology Project Management by Kathey and Schwalbe Thomson Learning
5. An Integrated Approach to Software Engineering by P. Jalote- PHI.



**BCA (Software Development) - THIRD SEMESTER**

Course: Skill Enhancement Course (SEC)  
Course Credits: (L-P-T)  
(2-0-0)  
Total marks: 50

Course Title: System Analysis and Design  
Course Code: USECST305  
Mid Semester assessment: 10 Marks of 1.5 hours duration  
End Semester assessment: 40 Marks of 2.5 hours duration

***For examinations to be held in Dec 2023, 2024 and 2025***

**NOTE FOR PAPER SETTERS FOR EXAMINATIONS -**

The question paper will be divided into the following two sections. No question shall be repeated in the question paper.

**Section A** shall consist Four (4) short answer questions (at least one from each unit). The students are required to attempt all questions. Each question shall be of 2½ Marks.

(4 x 2½ = 10 marks)

**Section B** shall consist Six (6) long answer questions (two from each unit). The students are required to attempt three questions. Each question shall be of 10 Marks.

(3 x 10 = 30 marks)

**Note:** The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.



**BCA (Software Development) – FOURTH SEMESTER**

Course: Major  
Course Credits: (L-P-T)  
(3-1-0)  
Total marks: 100

Course Title: Operating System  
Course Code: UMJCST461  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

*For examinations to be held in May 2024, 2025 and 2026*

**Course objectives & learning outcomes:**

1. Manage the computer's resources, such as the central processing unit, memory, disk drives, and printers
2. Establish a user interface
3. Execute and provide services for applications software.

**UNIT I**

Introduction to Python Language, Strengths and Weaknesses, IDLE, Dynamic Types, Naming Conventions, String Values, string Operations, String Slices, String Operators, Numeric Data Types, Built-in Functions. Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods Special Methods Class Variables, Inheritance, Polymorphism.

15 Hours

**UNIT II**

Introduction, Control Flow and Syntax, Indenting, the if Statement, Relational Operators, Logical Operators, True or False, Bit Wise Operators, the while Loop, break and continue, The for Loop, Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries, Copying Collections.

15 Hours

**UNIT III**

Introduction Defining Your Own Functions Parameters Function Documentation Keyword and Optional Parameters Passing Collections to a Function Variable Number of Arguments Scope Functions - "First Class Citizens" Passing Functions to a Function Mapping Functions in a Dictionary Lambda Modules Standard Modules – sys Standard Modules – math Standard Modules – time The dir Function.

15 Hours

**UNIT IV**

I/O and Error Handling in Python: Introduction, Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data from a File, Additional File Methods, Handling IO Exceptions, Working with Directories, Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions.

15 Hours

**Suggested readings/ references:**

1. Allen B. Downey, "Think Python", O'Reilly, Sebastopol, California.
2. Aditya Kanetkar and Yashavant Kanetkar, "Let us Python", BPB publications.
3. John Zelle, "Python Programming: An Introduction to Computer Science", Franklin, Beedle & Associates Inc.
4. Martin C. Brown., "Python: The Complete Reference", McGraw Hill.
5. Harsh Bhasin, "Python for beginners", New age international ltd.



**BCA (Software Development) - FOURTH SEMESTER**

Course: Major  
Course Credits: (L-P-T)  
(3-1-0)  
Total marks: 100

Course Title: Operating System  
Course Code: UMJCST461  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

*For examinations to be held in May 2024, 2025 and 2026*

**NOTE FOR PAPER SETTERS FOR EXAMINATIONS -**

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

**Section A** shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

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(4 x 12 = 48 marks)

**Note:** -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

**Practical/ tutorial Evaluation**

Daily evaluation of practical's/tutorials/Viva voce/Records etc.

**Final Examination**

10 marks

15 Marks

**Pattern for external practical examination**

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

**Pattern for external tutorial examination**

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks



**BCA (Software Development) – FOURTH SEMESTER**

Course: Major  
Course Credits: (L-P-T)  
(3-0-1)  
Total marks: 100

Course Title: Mathematics for Computer Science  
Course Code: UMJCST462  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

*For examinations to be held in May 2024, 2025 and 2026*

**Course objectives & learning outcomes:**

1. Help in carrying out logical and mathematical set operations on mathematical and other real-world entities.
2. Explore and apply key concepts in logical thinking to business problems.
3. Effectively express the concepts and results of Number Theory,
4. To reinforce the plotting of points in two-dimensional Cartesian coordinate system.

**UNIT I**

Sets, Relations and Functions: Definition of Sets and Subsets; Intersection, Union and Complements, Demorgan's Law; Cardinality; Relations - Equivalence relation etc. Mapping One-one Onto etc. Partition of Sets, Inverse Mapping.

15 Hours

**UNIT II**

Logic & Methods of Proof: Propositions, Connectives, Well-formed formulas, Truth Tables, Equivalence of WFF, logical identities, semantics, Normal forms of WFF, reasoning, disjunctive normal form, principle disjunctive normal form, conjunctive normal form, predicate calculus, rules of inference. Direct proof, Indirect Proofs, Counter examples, Proof by Induction, Strong and weak induction.

15 Hours

**UNIT III**

Modulo arithmetic, Congruence and their applications, Multiplicative inverse, Euler's extended algorithm, Fermat's little theorem, Totient function, Euler's theorem, primitive roots, discrete logarithms, split search algorithm, Chinese remainder theorem. Prime numbers, Number bases, Primarily testing, discrete logarithm, primitive roots, Number sieves, Quadratic Residues.

15 Hours

**UNIT IV**

Cartesian Coordinates, Two-dimensional coordinate system, Point, locus of a point, Line, Slope of a line, Regular geometric shapes, special points in triangles, angle between two straight lines, Distance between two parallel lines; Circle, parametric equation, relative position of line and circle, tangents and chords, Conic Section, Parabola, Ellipse, Hyperbola. Three-dimensional coordinate system, Lines and planes.

15 Hours

**Suggested readings/ references:**

1. Modern Algebra by Prof. M.R. Puri and Dr. Raj Krishan Publisher: Malhotra Brothers
2. Trembley, J.P. and Manohar, R.P.: Discrete Mathematical Structures with Applications to Computer Science. McGraw-Hill.
3. Lew: Computer Science: A Mathematical Introduction, Prentice – Hall International (Paperback Edition).
4. Kenneth. H. Rosen: Discrete mathematics and its applications 3rd Edition, McGraw Hill international edition.
5. Algebraic Number Theory by Serge. Lang, Springer; 2nd edition.

**BCA (Software Development) - FOURTH SEMESTER**

Course: Major  
Course Credits: (L-P-T)  
(3-0-1)  
Total marks: 100

Course Title: Mathematics for Computer Science  
Course Code: UMJCST462  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

***For examinations to be held in May 2024, 2025 and 2026***

**NOTE FOR PAPER SETTERS FOR EXAMINATIONS -**

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**Section A** shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

**Section B** shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

**Note:** -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

**Practical/ tutorial Evaluation**

Daily evaluation of practical's/tutorials/Viva voce/Records etc.

10 marks

**Final Examination**

15 Marks

**Pattern for external practical examination**

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

**Pattern for external tutorial examination**

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

**BCA (Software Development) – FOURTH SEMESTER**

Course: Major  
Course Credits: (L-P-T)  
(3-0-1)  
Total marks: 100

Course Title: PHP Language  
Course Code: UMJCST463  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

*For examinations to be held in May 2024, 2025 and 2026*

**Course objectives & learning outcomes:**

1. How to use PHP to add some dynamic aspects to our pages. How to use HTML forms.
2. The difference between GET and POST requests.
3. How to use cookies to store some data in the browser and pass it to the next request.

**UNIT-I**

Introduction: History, Evaluation, Features, Installing PHP, Basic of PHP Development, Working of PHP Scripts, Data Types, Variables, Constants, Statements, Flow Control Statements, Expressions and Operators, Loops, Types of Errors, Namespaces.

15 Hrs

**UNIT-II**

Arrays: Types of Arrays, Operations on Arrays: Element Looping with Index based array, Looping with associative array using each () and foreach(), Some useful Library function. Strings: Introduction to Strings, Comparing Strings, Manipulating and Searching Strings Functions: Calling a Function, Define a function, Call by value and Call by reference, Recursive function.

15 Hrs

**UNIT-III**

Form Handling: Working with Forms, GET Variable and POST Variable, REQUEST Variable, Combine HTML and PHP Code, Using Hidden Fields, Capturing Form Data, Form Validation, Creating the Upload Script, Redirecting the User. Understanding Exception and error, Try, catch, throw

15 Hrs

**UNIT-IV**

Working with File and Directories: Understanding File and Directory, Opening and Closing a File, Copying, Renaming and Deleting a File, Working with Directories, File Uploading and Downloading. PHP with MySQL: Installing and Configuring MySQL, Performing Basic DML Database Operations: Insert, Delete, Update, Select, Cookies: Setting and Using Cookie Variables, Session: Managing User Preferences with Sessions.

15 Hrs

**SUGGESTED READINGS:**

1. Robin Nixon, "Learning PHP, MySQL & JavaScript", O'Reilly Media, 2021.
2. Richard Blum, "PHP, MySQL & JavaScript All-in-One For Dummies", Wiley, 2018.
3. Steven Holzner, "PHP: The Complete Reference". McGraw-Hill books, 2017.
4. Lynn Beighley, Michael Morrison, "Head First PHP & MySQL: A Brain-Friendly Guide", O'Reilly.



**BCA (Software Development) - FOURTH SEMESTER**

Course: Major  
Course Credits: (L-P-T)  
(3-0-1)  
Total marks: 100

Course Title: PHP Language  
Course Code: UMJCST463  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

***For examinations to be held in May 2024, 2025 and 2026***

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**Final Examination**

15 Marks

**Pattern for external practical examination**

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

**Pattern for external tutorial examination**

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

**BCA (Software Development) – FOURTH SEMESTER**

Course: Major  
Course Credits: (L-P-T)  
(3-0-1)  
Total marks: 100

Course Title: Computer Networks and Internet  
Course Code: UMJCST464  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

*For examinations to be held in May 2024, 2025 and 2026*

**Course objectives & learning outcomes:**

1. Recognize computer networks.
2. List computer network topologies.
3. Explain each computer network topology physically or logically.
4. List required hardware to constitute computer network.
5. Explain the mission of each computer network.
6. Recognize essential computer network protocols.

**Unit -1**

Basic Concepts of Network: Network Classification, topologies, protocols, Connection-Oriented & Connectionless Network Services. Transmission Media (guided and unguided). Overview of OSI and TCP/IP reference model.

15 Hrs

**Unit-2**

THE DATA LINK LAYER: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, example data link protocols - HDLC, the data link layer in the internet. THE NETWORK LAYER: Network layer design issues, routing algorithms, Congestion control algorithms, Internetworking, the network layer in the internet (IPv4 and IPv6), Quality of Service.

15 Hrs

**Unit-3**

THE TRANSPORT LAYER: Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP. THE APPLICATION LAYER: Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http. APPLICATION LAYER PROTOCOLS: Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet.

15 Hrs

**Unit - 4**

HTML 5: - New markup and elements (header, footer, nav elements), Form Elements, Video and Audio tags, Canvas Element, Input type: - Color, email, range, time, date, week, month, tel, url. CSS 3: - Responsive web design, CSS3 Selectors, CSS3 variable and functions, CSS3 backgrounds, gradients, text Overflow, drop shadows, box sizing, Transition, Animations.

15 Hrs

**SUGGESTED READINGS:**

1. Behrouz A. Forouzan (2006), Data communication and Networking, 4th Edition, Mc-Graw-Hill, India.
2. Kurose, Ross (2010), Computer Networking: A top down approach, Pearson Education, India.
3. HTML5 and CSS3 Masterclass by Robin Nixon
4. HTML5 A COMPLETE GUIDE 2019 EDITION BY Gerardus Blokdyk

**BCA (Software Development) - FOURTH SEMESTER**

Course: Major  
Course Credits: (L-P-T)  
(3-0-1)  
Total marks: 100

Course Title: Computer Networks and Internet  
Course Code: UMJCST464  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
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***For examinations to be held in May 2024, 2025 and 2026***

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**Final Examination**

15 Marks

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Viva-Voce	5 Marks
Total	15 Marks

**Pattern for external tutorial examination**

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Viva-Voce	5 Marks
Total	15 Marks



**BCA (Software Development) – FOURTH SEMESTER**

Course: Minor  
Course Credits: (L-P-T)  
(3-0-1)  
Total marks: 100

Course Title: Numerical Methods  
Course Code: UMICST465  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
Practical: 25 Marks

*For examinations to be held in May 2024, 2025 and 2026*

**Course objectives & learning outcomes:**

1. Grasp the basic elements of numerical methods and error analysis.
2. Understand the basics of approximation, integration and differentiation.
3. Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.
4. Repetitive nature of computers to solve complex problems that require lots of iterations.

**UNIT 1**

Computer Arithmetic Number System, Conversion of Numbers, Representation of numbers, Floating point representation, Arithmetic operations with Normalized Floating-point Numbers, consequences of normalization. Errors in number representation, Types of errors, absolute and relative error.

15 Hrs

**UNIT 2**

Introduction, Methods of Solution, Iterative Methods, Bisection method, False position method, Newton-Raphson method, Convergence of solution.

15 Hrs

**UNIT 3**

Simultaneous Linear Equations; Solutions of Simultaneous Linear equations – Gauss elimination method and pivoting, Ill conditioned equations and refinement of solutions; Jacobi and Gauss – Seidal interactive methods.

15 Hrs

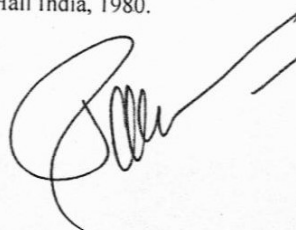
**UNIT 4**

Numerical differentiation and Integration, Solutions of Differential Equations; Runge - Kutta methods; Interpolations and Approximations: Polynomial interpolation Newton, Lagranges etc. Spline Interpolation, Difference tables;

15 Hrs

**Books:**

1. Stoer, Bullrich: Computer Oriented Numerical Methods, Springer Verlag, 1980.
2. Krishnamurthy, E.V., Sen, S.K.: Computer Based Numerical Algorithm, East West Press, 1984.
3. Rajaraman, V.: Computer Oriented Numerical Methods, Prentice Hall India, 1980.
4. S.S. Sastry: Introductory Methods of Numerical Analysis.





**BCA (Software Development) - FOURTH SEMESTER**

Course: Minor  
Course Credits: (L-P-T)  
(3-0-1)  
Total marks: 100

Course Title: Numerical Methods  
Course Code: UMICST465  
Mid Semester assessment: 15 Marks of 1.5 hours duration  
End Semester assessment: 60 Marks of 3.0 hours duration  
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**Final Examination**

15 Marks

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Total	15 Marks

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