



## SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE

(Autonomous)

[An Autonomous College Affiliated to Periyar University, Salem, Tamil Nadu]

[Accredited by NAAC with 'A' Grade with CGPA of 3.27]

[Recognized 2(f) & 12(B) Status under UGC Act of 1956]

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## DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

CHOICE BASED CREDIT SYSTEM (CBCS)

### REGULATIONS AND SYLLABUS FOR BSC COMPUTER SCIENCE PROGRAMME (SEMESTER PATTERN)

(For Students Admitted in the College from the Academic Year 2020-2021)



### Programme Outcomes (POs)

<b>PO1</b>	Understand fundamental concepts of key areas in Computer Science and enable students expose technical, analytical and creative skills.
<b>PO2</b>	Build student's effective communication, ethical attitudes, team work and logical proficiency.
<b>PO3</b>	Students are to be passionately engaged in primary learning with intend to think differently, understanding and applying knowledge of mathematical, algorithmic and computing skills to acquire employability.
<b>PO4</b>	Students are to be imparted with a broad conceptual background in the Computing sciences to design, implement and evaluate a computational system.
<b>PO5</b>	Make use of modern tools and techniques to develop practical skills for fulfilling the needs of industry and society.

### Programme Specific Outcomes (PSOs)

<b>PSO1</b>	Possess basic knowledge on core concepts of Computer Science the knowledge of Computer Science through theory and practicals.
<b>PSO2</b>	Demonstrate mastery of Computer Science in the following core knowledge areas <ul style="list-style-type: none"> <li>• Data Structures and Programming Languages</li> <li>• Databases, Software Engineering and Web Development</li> <li>• Operating System and Computer Hardware</li> </ul>
<b>PSO3</b>	Apply problem-solving skills and the knowledge of programming languages in computer science to solve real world problems.
<b>PSO4</b>	Empowered with analytical mind and critical thinking.
<b>PSO5</b>	Develop practical skills to fulfill the needs of industry and society



## SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE

(Autonomous)

Bachelor of Science (B.Sc.) in Computer Science

**Programme Pattern and Syllabus (CBCS)**

(For Students Admitted in the College from the Academic Year 2020-2021 Onwards)

Sl. No.	Part	Nature of Course	Course Code	Name of the Course	Hours/Week	Credits	Marks		
							CIA	ESE	Total
<b>SEMESTER I</b>									
1	I	Language	20UTA1F01	Tamil – I	5	3	25	75	100
2	II	English	20UEN1F01	English – I	5	3	25	75	100
3	III	Core – I	20UCS1C01	Programming in Python	5	4	25	75	100
4		Core – II	20UCS1C02	Digital Computer Fundamentals	5	4	25	75	100
5		Core Practical – I	20UCS1P01	Programming in Python Lab	3	2	40	60	100
6		Allied – I	20UMA1A01	Mathematics – I	5	3	25	75	100
7	IV	Value Education	20UVE101	Yoga	2	2	25	75	100
<b>Total</b>					<b>30</b>	<b>21</b>	<b>190</b>	<b>510</b>	<b>700</b>
<b>SEMESTER II</b>									
8	I	Language	20UTA2F02	Tamil – II	5	3	25	75	100
9	II	English	20UEN2F02	English – II	5	3	25	75	100
10	III	Core – III	20UCS2C03	Programming in C	5	4	25	75	100
11		Core – IV	20UCS2C04	Data Structures & Algorithms	4	4	25	75	100
12		Core Practical – II	20UCS2P02	Data Structure using C Lab	3	2	40	60	100
13		Allied – II	20UMA2A02	Mathematics – II	4	3	25	75	100
14	IV	SBEC – I	20UCS2S01	Office Automation Lab	2	2	40	60	100
15		Common Course	20UES201	Environmental Studies	2	2	25	75	100
<b>Total</b>					<b>30</b>	<b>23</b>	<b>230</b>	<b>570</b>	<b>800</b>
<b>SEMESTER III</b>									
16	I	Language	20UTA3F03	Tamil – III	5	3	25	75	100



17	II	English	20UEN3F03	English – III	5	3	25	75	100
18	III	Core – V	20UCS3C05	Programming in C++	5	4	25	75	100
19		Core – VI	20UCS3C06	Operating Systems	5	4	25	75	100
20		Core Practical – III	20UCS3P03	Programming in C++ Lab	3	2	40	60	100
21		Allied – I	20UCM3A01	Principles of Accountancy	5	3	25	75	100
22	IV	NMEC – I		Non Major Elective Course – I	2	2	25	75	100
<b>Total</b>					<b>30</b>	<b>21</b>	<b>190</b>	<b>510</b>	<b>700</b>
<b>SEMESTER IV</b>									
23	I	Language	20UFTA04	Tamil – IV	5	3	25	75	100
24	II	English	20UFEN04	English – IV	5	3	25	75	100
25	III	Core – VII	20UCS4C07	Web Technology	4	4	25	75	100
26		Core – VIII	20UCS4C08	Software Engineering	4	4	25	75	100
27		Core Practical – IV	20UCS4P04	Web Technology Lab	2	2	40	60	100
28		Allied – II	20UCM4A02	Cost and Management Accounting	4	3	25	75	100
29		Allied – II Practical	20UCM4AP01	Allied Commerce Practical	2	2	40	60	100
30	IV	SBEC – II	20UCS4S02	Quantitative Aptitude – I	2	2	40	60	100
31		NMEC – II		Non Major Elective Course – II	2	2	25	75	100
<b>Total</b>					<b>30</b>	<b>25</b>	<b>270</b>	<b>630</b>	<b>900</b>
<b>SEMESTER V</b>									
32	III	Core – IX	20UCS5C09	Relational Database Management System	6	4	25	75	100
33		Core – X	20UCS5C10	.Net Programming	6	4	25	75	100
34		Core – XI	20UCS5C11	Computer Networks	6	4	25	75	100
35		Core Practical – V	20UCS5P05	.Net Programming Lab	3	2	40	60	100
36		Elective – I		Elective – I	6	5	25	75	100
37	IV	SBEC – III	20UCS5S03	Mobile App Development Lab	3	2	40	60	100



<b>Total</b>					<b>30</b>	<b>21</b>	<b>180</b>	<b>420</b>	<b>600</b>
<b>SEMESTER VI</b>									
38	III	Core – XII	20UCS6C12	PHP With MySQL	5	4	25	75	100
39		Core – XIII	20UCS6C13	Computer Graphics	5	4	25	75	100
40		Core – XIV	20UCS6C14	Java programming	5	4	25	75	100
41		Core Practical – VI	20UCS6P06	PHP With MySQL Lab	3	2	40	60	100
42		Core Practical – VII	20UCS6P07	Java Programming Lab	3	2	40	60	100
43		Elective – II	–	Elective – II	5	5	25	75	100
44		Project	20UCS6PR1	.Net/PHP/Android	2	5	40	60	100
45	IV	SBEC – IV	20UCS6S04	Quantitative Aptitude – II	2	2	40	60	100
46	V		20UCS6EX01	Extension Activities	-	1	-	-	-
<b>Total</b>					<b>30</b>	<b>29</b>	<b>260</b>	<b>540</b>	<b>800</b>
<b>Grand Total</b>					<b>180</b>	<b>140</b>	<b>1320</b>	<b>3180</b>	<b>4500</b>

**Note**

CBCS – Choice Based Credit system

CIA – Continuous Internal Assessment

ESE – End of Semester Examinations

**Elective Courses****Elective – I**

Semester	Part	Course Code	Paper	Course Title
V	III	20UCS5E01	I	Mobile Computing
		20UCS5E02	II	Software Testing
		20UCS5E03	III	E-Commerce Technologies

**Elective – II**

Semester	Part	Course Code	Paper	Course Title
VI	III	20UCS6E04	I	Data Mining
		20UCS6E05	II	Cyber Safety
		20UCS6E06	III	Network Security

**SBEC – Skill Based Elective Courses\***

Part	Semester	Title of the Paper	Hours		Credit	Maximum Marks		
			Lecture	Lab		CIA	ESE	Total
IV	II	Office Automation 20UCS2S01	-	2	2	40	60	100
	IV	Quantitative Aptitude – I 20UCS4S02	-	2	2	25	75	100
	V	Mobile App Development 20UCS5S03	-	2	2	40	60	100
	VI	Quantitative Aptitude – II 20UCS6S04	-	2	2	25	75	100



### Non Major Elective Course – (NMEC)

Extra Disciplinary Subjects offered by the Department of Computer Science. The department can offer any one of the subjects to the other major subject students in each semester.

NMEC – Non-Major Elective Courses							
Part	Semester	Title of the Paper	Hours	Credit	Maximum Marks		
			Lect.		CIA	ESE	Total
IV	III	NMEC I: Basics of Computers 20UCS3N01	2	2	25	75	100
		NMEC I: System Administration and Maintenance - 20UCS3N02	2	2	25	75	100
	IV	NMEC II: Office Automation 20UCS4N03	2	2	25	75	100
		NMEC II: Basics of Internet 20UCS4N04	2	2	25	75	100

#### List of Extension Activities

1. National Cade Corps (NCC)
2. National Service Scheme (NSS)
3. Youth Red Cross (YRC)
4. Physical Education (PYE)
5. Eco Club (ECC)
6. Red Ribbon Club (RRC)
7. Women Empowerment Cell (WEC)



# PROGRAMME SYLLABUS





Program: B.Sc. Computer Science				
Core – I		Course Code: 20UCS1C01		Course Title: Programming in Python
Semester	Hours/Week	Total Hours	Credits	Total Marks
I	5	75	4	100

### Course Objectives

1. To understand the nature of python programming.
2. To describe the core syntax and semantics of python programming language.
3. To infer the object-oriented programming concepts in python.
4. To understand why Python is a useful scripting language for developers.
5. To get practical knowledge of a popular programming language Python.

### **UNIT – I**

Instant Hacking: The Basics: Numbers and Expressions – Variables – Statements – Getting Input from the User – Functions – Modules – Saving and Executing Your Programs – Strings.

### **UNIT – II**

Lists and Tuples: Common Sequence Operations – Lists: Python’s Workhorse – Tuples: Immutable Sequences. Working with Strings: String Formatting: The Long Version – String Methods.

### **UNIT – III**

Conditionals, Loops, and Some Other Statements: More About Print and Import – Assignment Magic – Conditions and Conditional Statements – Loops.

### **UNIT – IV**

Dictionaries: When Indices Won’t Do: Dictionary Uses – Creating and using Dictionaries. Abstraction: Creating Your Own Functions – The Magic of Parameters: Keyword Parameters and Defaults – Scoping – Recursion. More Abstraction: The Magic of Objects – Classes and Types.

**UNIT – V**

Files and Stuff: Opening Files – The Basic File Methods. Database Support: The Python Database API – SQLite and PySQLite.

**Text Book**

1. Magnus Lie Hetland, “Beginning Python- From Novice to Professional”, Apress Publishers, 2009, ISBN: 978-81-8489-092-1.

**Reference Books**

1. Dr. R. Nageswara Rao, “Core Python Programming”, Dreamtech Press, Wiley Publication, Second edition, 2017, ISBN: 9789386052308
2. Mark Lutz, “Learning Python”, O’ Reilly, 2007, ISBN: 978-0-596-15806-4.
3. David Beazley and Brain K Jones, “Python Cookbook”, O, Reilly, Third edition, 2013. ISBN: 978- 1449340377.

**Course Outcomes (COs)**

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand and explain Python Programming.	K1 & K2
CO2	Interpret the fundamental Python syntax and semantics.	K2 & K3
CO3	Understand the concept of scripting and the contributions of scripting languages.	K3
CO4	Articulate the Object-Oriented Programming concepts used in python.	K3
CO5	Connect a Python program with a database.	K3 & K4

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**



**Mapping of COs with POs**

<b>PO</b> <b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	S	M	S	S	M
<b>CO2</b>	S	M	S	S	M
<b>CO3</b>	S	S	S	S	M
<b>CO4</b>	S	M	S	M	S
<b>CO5</b>	S	S	S	S	S

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
Core – II		Course Code: 20UCS1C02		Course Title: Digital Computer Fundamentals
Semester	Hours/Week	Total Hours	Credits	Total Marks
I	5	75	4	100

### Course Objectives

1. Understand and describe the basics of various digital components.
2. Understand binary, hexadecimal and octal number systems and their arithmetic.
3. Understand how logic circuits and Boolean algebra forms as the basics of digital computer
4. Identify and illustrate basic organization of computer.
5. Knowledge in memory elements like RAM, ROM and Magnetic disk.

#### **UNIT – I**

Number Systems and Codes: Binary Number System – Binary-to-Decimal Conversion – Decimal-to-Binary Conversion – Octal Numbers – Hexadecimal Numbers – The ASCII Code – The Excess-3 Code – The Gray Code.

#### **UNIT – II**

Digital Logic: The Basic Gates – NOT, OR, AND – Universal Logic Gates – NOR, NAND – AND-OR-Invert Gates. Combinational Logic Circuits: Boolean Laws and Theorems – Sum-of-Products Method – Truth Table to Karnaugh Map – Pairs, Quads, and Octets – Karnaugh Simplification – Don't-care Conditions – Product-of-Sums Simplification.

#### **UNIT – III**

Data-Processing Circuits: 16-to-1 Multiplexer – 1-to-16 De-Multiplexer – BCD-to-Decimal Decoder – Decimal-to-BCD Encoder – Exclusive-OR Gates. Arithmetic Circuits: Binary Addition – Binary Subtraction – Unsigned Binary Numbers – Sign-magnitude Numbers – 2'S Complement Representation – 2'S Compliment Arithmetic.

**UNIT – IV**

Arithmetic Circuits: Arithmetic Building Blocks – The Adder – Subtractor. Flip-Flops: RS Flip-flops – Edge-Triggered D Flip-flops – Edge Triggered JK Flip-flops – JK Master-slave Flip-flops.

**UNIT – V**

Registers: Serial-In Serial-Out – Serial-In Parallel-Out – Parallel-In Serial-Out – Parallel-In Parallel-Out (54/74174). Memory: Introduction – Magnetic Memory – Optical Memory.

**Text Book**

1. Donald P Leach, Albert Paul Malvino and Goutam Saha, “Digital Principles and Applications,” 8<sup>th</sup> Edition, TMH, 2006.

**Reference Books**

1. Morris Mano, “Digital Logic and Computer Design”, 4<sup>th</sup> Edition, Pearson, 2008.
2. Thomas C Bartee, “Digital Computer Fundamentals”, Sixth Edition, Tata McGraw-Hill, 1985.

**Course Outcomes (COs)**

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Describe various number system and codes.	K1 & K2
CO2	Apply Boolean laws and rules to simplify simple expressions.	K2 & K3
CO3	Experiment combinational and sequential circuits.	K4 & K5
CO4	Identify and illustrate basic organization of computer.	K3
CO5	Illustrate the memory concepts, I/O devices and peripherals.	K3 & K4

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**



**Mapping of COs with POs**

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	M	M	M	S	M
<b>CO2</b>	M	M	S	S	M
<b>CO3</b>	S	S	S	S	M
<b>CO4</b>	S	M	S	M	S
<b>CO5</b>	S	S	M	S	M

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
Core Practical – I		Course Code: 20UCS1P01		Course Title: Programming in Python Lab
Semester	Hours/Week	Total Hours	Credits	Total Marks
I	3	45	2	100

### Course Objectives

1. To train the students for the basics of coding and executing Python scripts.
2. To understand the various data structures available in Python programming language and apply them in solving computational problems.
3. To get practical knowledge of a popular programming language Python.

### **List of Practicals**

1. Program to swap two numbers without taking a temporary variable.
2. Implement python script to read person's age from keyboard and display whether he is eligible for voting or not.
3. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
4. To display elements of tuples in reverse order.
5. Program to add two matrices using lists.
6. Count words in a String using Dictionary.
7. Implement Python Script to check given string is palindrome or not.
8. Define a function max\_of\_three() that takes three numbers as arguments and returns the largest of them. Implement Python script to print factorial of a number using Recursion.
9. Find the area and perimeter of the circle using class and objects
10. Write Python script to copy file contents from one file to another.
11. Write a python program to perform various database operations (create, insert, delete, update).



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn to design and implement efficient programs using python.	K1 & K2
CO2	Improve Programming Skill in Python.	K3 & K4
CO3	Learn working with the new data types in python.	K4, K5 & K6
CO4	Possesses knowledge to implement in Python.	K4
CO5	Connect a Python program with a database.	K5 & K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	M
CO2	M	M	S	S	M
CO3	S	S	S	S	M
CO4	S	M	S	S	S
CO5	S	S	S	S	S

**S – Strong**

**M – Medium**

**L – Low**





Program: B.Sc. Computer Science				
Core – III		Course Code: 20UCS2C03		Course Title: Programming in C
Semester II	Hours/Week	Total Hours	Credits	Total Marks
	5	75	4	100

### Course Objectives

1. Learn the basic structure of C Programming.
2. To understand the nature of C programming.
3. To describe the core syntax and semantics of C programming language.
4. To help students to get the practical knowledge of a programming language.
5. Understand the decision making and branching statement in C.

### **UNIT – I**

Overview of C: History of C – Importance of C – Basic Structure of C Programs. Constants, Variables and Data types: Character Set – C Tokens – Keywords and Identifiers – Constants – Variables – Data types – Declaration of Variables – Declaration of Storage Classes – Assigning Values to Variables – Defining Symbolic Constants. Operators and Expression: Types of Operators – Arithmetic Expressions – Evaluation of Expressions – Precedence of Arithmetic Operators – Type Conversions in Expressions – Operator Precedence and Associativity. Managing Input and Output Operations: Reading and Writing a Character – Formatted Input and Output.

### **UNIT – II**

Decision Making and Branching: Simple IF, IF-ELSE, Nesting of IF-ELSE, ELSE-IF ladder, Switch Statements – GOTO Statements. Decision Making and Looping: WHILE Statement – DO Statement – FOR Statement – Jumps in Loops. Arrays: Definition & Declaration – One Dimensional – Two Dimensional – Multi Dimensional Arrays – Dynamic Arrays.

### **UNIT – III**

Character Arrays and Strings: Introduction – Declaring and Initializing String Variables – Reading Strings from Terminal – Writing Strings to Screen – String Handling Functions –



Table of Strings. User – Defined Functions: Introduction – Need for User – Defined Function – A Multi-Function Program – Elements of User-Defined Function – Definition of Functions – Return Values and their Types – Function Calls – Function Declaration – All Category of Functions – Nesting of Functions – Recursion – Passing Arrays to Functions – Passing Strings to Function.

#### **UNIT – IV**

Structures and Unions: Introduction – Defining a Structure – Declaring Structure Variables – Accessing Structure Members – Structure Initialization – Copying and Comparing Structure Variables – Arrays of Structures – Arrays within Structures – Structures within Structures – Structures and Functions – Unions – Size of Structures – Bit Fields. Pointers: Introduction – Understanding Pointers – Accessing the Address of a Variable – Initializing of Pointer Variables. Chain of Pointers – Pointer Expressions – Pointers and Arrays – Pointers and Character Strings – Arrays of Pointers – Pointers as Function Arguments – Functions Returning Pointers – Pointers to Functions – Pointer and Structures.

#### **UNIT – V**

File Management: Introduction – Defining and Opening a File – Closing a File – Input/Output Operation on Files – Error Handling During I/O Operations – Random Access Files – Command Line Arguments.

#### **Text Book**

1. E. Balgurusamy, “Programming in ANSI C”, 5<sup>th</sup> Edition, Tata McGraw Hill, New Delhi, 2010.

#### **Reference Books**

1. Herbert Schildt, “C: The complete Reference”, 4<sup>th</sup> Edition, Tata Mc Graw Hill, 2003.
2. B.L. Juneja, “Programming in C”, 1<sup>st</sup> Edition, Cengage Learning, 2012.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember and understand the concept of C.	K1 & K2
CO2	Apply the concept of Array, Function, String and Pointers.	K3
CO3	Analyze the concept of branching and looping statements.	K4
CO4	Develop solutions to problems using C programming.	K4 & K5
CO5	Ability to build C programming to solve real world problems.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	M
CO2	S	M	S	S	M
CO3	S	M	S	M	M
CO4	S	S	S	S	S
CO5	S	S	S	S	S

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
Core – IV		Course Code: 20UCS2C04		Course Title: Data Structures and Algorithms
Semester	Hours/Week	Total Hours	Credits	Total Marks
II	4	60	4	100

### Course Objectives

1. To have fundamental knowledge about data and the way it is stored.
2. To educate the concepts of fundamentals of writing algorithms and approach in problem solving.
3. To understand the concepts like stacks, queues, lists and its structures.
4. Knowing the concepts of Trees, Tree Traversals and Graphs
5. Develop some applications using data structures.

### **UNIT – I**

Algorithms (Analysis and design): Problem Solving – Top-Down and Bottom-Up Approaches to Algorithm Design – Use of Algorithms in Problem Solving – Design, Implementation, Verification of Algorithm – Efficiency Analysis of Algorithms: Space, Time Complexity, and Frequency Count – Sample Algorithms: Exchange the Value of Two Variables – Summation of Set of Numbers – Decimal to Binary Conversion – Sorting – Factorial – Fibonacci – Finding a Largest Number in an Array – Reverse the Order of Elements in Array.

### **UNIT – II**

Introduction: Definitions – Concepts – Overview – Implementation of Data Structures. Arrays: Definition – Terminology – One Dimensional Array – Multi Dimensional Array. Stacks: Introduction – Definition – Representation of Stacks – Operations on Stacks – Applications of Stack: Evaluation of Arithmetic Expression – Implementation of Recursion – Factorial Calculation.

**UNIT – III**

Queues: Introduction – Definition – Representation of Queues – Various Queue Structures: Circular Queue – De-queue – Priority Queue – Applications of Queues: CPU Scheduling. Linked List: Definition – Single Linked List – Double Linked List – Circular Double Linked List – Applications: Sparse Matrix – Polynomial.

**UNIT – IV**

Trees: Terminologies – Definitions & Concepts – Representation of Binary Tree – Operations on Binary Tree – Types of Binary Trees: Expression Tree – Binary Search Tree – Heap Tree – Red Black Tree.

Graphs: Introduction – Graph terminologies – Representation of Graphs – Operations on Graphs – Applications of Graph: Shortest Path Problem – Minimum Spanning Tree: Kruskal and Prims Algorithm.

**UNIT – V**

Searching: Terminologies – Linear Search Techniques with – Array, Linked List, and Ordered List – Binary Search – Non Linear Search- Binary Tree Searching – Binary Search Tree Searching. Sorting: Terminologies – Sorting Techniques – Insertion Sort – Selection sort – Bubble sort – Quick sort – Merge sort.

**Text Books**

1. Sathish Jain, Shashi Singh, “Data Structure Made Simple”, 1<sup>st</sup> Edition, BPB Publications, New Delhi, 2006.
2. Debasis Samanta, “Classic Data Structures”, 2<sup>nd</sup> Edition, PHI Learning, New Delhi, 2009.

**Reference Books**

1. Aprita Gopal, “Magnifying Data Structures”, 1<sup>st</sup> Edition, PHI Learning, New Delhi, 2010.
2. Chitra A & Rajan PT, “Data Structures”, 2<sup>nd</sup> Edition, Vijay Nicole Publications, 2016.
3. Ellis Horowitz and Sartaj Sahni, “Fundamentals of Data Structure”, Galgotia Publications, New Delhi, 1985.
4. Ellis Horowitz and Sartaj Sahni, “Fundamentals of Computer Algorithms”, Galgotia Publications, New Delhi, 1985.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the representations of data and various algorithms.	K1 & K2
CO2	Analyze the complexity of different algorithms.	K3 & K4
CO3	Remember the concept of algorithms for searching, sorting and dynamic programming.	K1, K2 & K3
CO4	Adapting the algorithmic concepts and implement new ones.	K4 & K5
CO5	Apply appropriate algorithms and data structure for real time.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	M
CO2	S	S	M	S	M
CO3	S	M	S	M	M
CO4	S	S	S	S	S
CO5	S	S	S	S	S

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
<b>Core Practical – II</b>		<b>Course Code: 20UCS2P02</b>		<b>Course Title: Data Structure using C Lab</b>
<b>Semester</b> II	<b>Hours/Week</b> 3	<b>Total Hours</b> 45	<b>Credits</b> 2	<b>Total Marks</b> 100

### Course Objectives

1. To impart adequate knowledge on the need of programming languages and problem solving techniques.
2. To develop an in-depth understanding of functional and logical concepts of C Programming.
3. To understand the various data structures and apply them in solving computational problems
4. To get practical knowledge of a popular programming language C.

### **List of Practicals**

1. Implement Push and Pop Operations of a Stack using Array.
2. Write a program to perform factorial calculation using recursion.
3. Implement Add and Delete Operations on Queue using Pointer.
4. Implement Add and Delete Operations on Circular Queue.
5. Write a Program to convert an Infix Expression to Postfix Expression using Arrays.
6. Write a Program to add Two Polynomials using Pointers.
7. Perform Tree Traversals for a Binary Tree using Recursion.
8. Write a program to perform Binary Search.
9. Sort the given list of numbers using Heap Sort.
10. Sort the given list of numbers using Quick Sort.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Improve an ability to develop programs in C.	K1 & K2
CO2	Learn to implement various data structures using arrays and pointers in C language.	K3 & K4
CO3	Evaluating infix and postfix expressions by using C.	K5
CO4	Possess knowledge to solve polynomial problems in C language.	K3, K4 & K5
CO5	Enable to implement searching and sorting problems in C.	K3, K4 & K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	M	M	S	S	M
CO3	S	S	S	S	M
CO4	S	M	S	S	S
CO5	S	S	S	S	S

S – Strong

M – Medium

L – Low





Program: B.Sc. Computer Science				
Core – V		Course Code: 20UCS3C05		Course Title: Programming in C++
Semester	Hours/Week	Total Hours	Credits	Total Marks
III	5	75	4	100

### Course Objectives

1. To understand the key concept of Object Oriented Programming.
2. To familiarize the students with language environment and to develop the programs for solving the problems using function overloading, constructors and object.
3. To develop student's programming skill to write programs in C++ using classes and objects.
4. To familiar with the concepts of Constructors, Polymorphism and Inheritance.

#### **UNIT – I**

Object-Oriented Programming: Principles – Benefits of OOP – Application of OOP – Tokens, Expression and Control Structures: Tokens – Keywords – Identifiers and Constants – Data Types – Constants – Variables – Operators – Manipulators – Expressions – Control Structure.

#### **UNIT – II**

Functions – Prototyping – Call by Reference – Return by Reference – Inline Functions – Default Arguments – const Arguments – Function Overloading – Friend and Virtual Functions, Classes and Objects – Class – Member Functions – Arrays with in a Class – Memory Allocation for Objects – Static Data Members – Static Member Functions – Arrays of Objects – Objects as Function Arguments – Friendly Functions – Returning Objects – const Member Functions – Pointers to Members, Constructors and Destructors.

#### **UNIT – III**

Operator Overloading and Type Conversions, Inheritance: Extending Classes – Derived Classes – Single Inheritance – Multilevel Inheritance – Multiple Inheritance – Hierarchical Inheritance – Hybrid Inheritance – Virtual Base Classes – Abstract Classes, Pointers, Virtual



Functions and Polymorphism. Pointers: Pointers to Objects –this Pointer – Pointers to Derived Classes – Virtual Functions – Pure Virtual Functions.

#### **UNIT – IV**

Managing I/O Operations: C++ Streams – C++ Stream Classes – Unformatted I/O and Formatted I/O Operations – Managing Output with Manipulators, Working with Files – Classes for File Stream Operations – Opening and Closing a File – Detecting End-of-File – File Pointers and their Manipulators – Sequential I/O Operations – Updating a File – Error Handling during File Operations – Command Line Arguments.

#### **UNIT – V**

Templates: Class Templates – Class Templates with Multiple Parameters – Function Templates – Function Templates with Multiple Parameters – Overloading of Template Functions – Member Function Templates – Non-Type Template Arguments, Exception Handling: Basics – Exception Handling Mechanism – Throwing Mechanism – Catching Mechanism – Rethrowing an Exception – Specifying Exceptions.

#### **Text Book**

1. E. Balagurusamy, “Object Oriented Programming with C++”, 5<sup>th</sup> Edition, Tate McGraw Hill Publication Ltd., New Delhi, 2011.

#### **Reference Books**

1. M. T. Somashekara, “Object Oriented programming with C++”, 2<sup>nd</sup> Edition, Prentice Hall of India Learning Limited, 2012.
2. Behrouz A.Forouzan, “A Structured Approach Using C++”, 2<sup>nd</sup> Edition, Cengage Learning, 2003.
3. H. Schildt, “C++”, “The Complete Reference”, 4<sup>th</sup> Edition, TMH Edition, 2003.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Implement the concepts of object-oriented programming.	K3
CO2	Apply string functions to perform operator overloading.	K3 & K4
CO3	Demonstrate virtual functions and inheritance.	K4
CO4	Implement files and command line arguments.	K4 & K5
CO5	Build real world applications in C++.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	M	M	S	M
CO3	S	S	S	M	M
CO4	S	M	S	M	M
CO5	S	S	S	S	S

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
Core – VI		Course Code: 20UCS3C06		Course Title: Operating System
Semester	Hours/Week	Total Hours	Credits	Total Marks
III	5	75	4	100

### Course Objectives

1. Study the basic concepts and structure of operating systems.
2. Learn about Processes, Threads and Inter process communication.
3. Learn various Scheduling algorithms and memory management schemes.
4. Understand the principles of concurrency and Deadlocks.
5. Study I/O management and File systems.

#### **UNIT – I**

Introduction – History of Operating System – Different Kinds of Operating System – Operation System Concepts – System Calls – Operating System Structure.

#### **UNIT – II**

Processes and Threads: Processes – Threads – Thread Model and Usage – Inter Process Communication.

#### **UNIT – III**

Scheduling – Memory Management: Memory Abstraction – Virtual Memory – Page Replacement Algorithms.

#### **UNIT – IV**

Deadlocks: Resources – Introduction to Deadlocks – Deadlock Detection and Recovery – Deadlocks Avoidance – Deadlock Prevention. Multiple Processor System: Multiprocessors – Multi Computers.

#### **UNIT – V**

Input/Output: Principles of I/O Hardware – Principles of I/O Software. Files Systems: Files – Directories – Files Systems Implementation – File System Management and Optimization.

**Text Book**

1. Andrew S. Tanenbaum, “Modern Operating Systems”, 2<sup>nd</sup> Edition, PHI private Limited, New Delhi, 2008.

**Reference Books**

1. William Stallings, “Operating Systems – Internals & Design Principles”, 5<sup>th</sup> Edition, Prentice – Hall of India Private Ltd., New Delhi, 2004.
2. Sridhar Vaidyanathan, “Operating System”, 1<sup>st</sup> Edition, Vijay Nicole Publications, 2014.

**Course Outcomes (COs)**

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Define operating system and its types.	K1
CO2	Understand the role of operating system as a CPU scheduler.	K2
CO3	Apply the process management through process synchronization and deadlock.	K3
CO4	Build skills to apply virtual memory and memory scheduling.	K3
CO5	Develop problem solving techniques for disk scheduling and file management.	K3

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	M	M	M	M	M
CO2	S	M	M	M	M
CO3	S	S	S	M	S
CO4	S	M	S	S	S
CO5	S	S	S	M	S

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
<b>Core Practical – III</b>		<b>Course Code: 20UCS3P03</b>		<b>Course Title: Programming in C++ Lab</b>
<b>Semester III</b>	<b>Hours/Week 3</b>	<b>Total Hours 45</b>	<b>Credits 2</b>	<b>Total Marks 100</b>

### Course Objectives

1. To impart adequate knowledge on real world problem solving techniques in C++.
2. To develop an in-depth understanding of functional and logical concepts of C++.
3. To develop the programs for solving the problems using function overloading, constructors and object.
4. Provides methods and technologies involved in building complex software.

### **List of Practicals**

1. Write a C++ program to create a class ARITHMETIC which consists of a FLOAT and an INTEGER variable. Write member functions ADD(),SUB(), MUL(), DIV() to perform addition, subtraction, multiplication, division respectively. Write a member function to get and display values.
2. Write a C++ program to create a class FLOAT that contains one float data member. Overload all the four Arithmetic operators so that they operate on the object FLOAT.
3. Write a C++ program to create a class STRING. Write a Member Function to initialize, get and display strings. Overload the operators ++ and == to concatenate two Strings and to compare two strings respectively.
4. Write a C++ program to create class, which consists of EMPLOYEE Detail like E\_Number, E\_Name, Department, Basic, Salary, Grade. Write a member function to get and display them. Derive a class PAY from the above class and write a member function to calculate DA, HRA and PF depending on the grade.
5. Write a C++ program to create a class SHAPE which consists of two VIRTUAL FUNCTIONS Calculate\_Area() and Calculate\_Perimeter() to calculate area and perimeter of various figures. Derive three classes SQUARE, RECTANGLE, TRIANGLE from class Shape and Calculate Area and Perimeter of each class separately and display the result.



6. Write a C++ program using Function Overloading to read two Matrices of different Data Types such as integers and floating point numbers. Find out the sum of the above two matrices separately and display the sum of these arrays individually.
7. Write a program to convert an Infix Expression to Postfix Expression using Arrays.
8. Write a C++ program to create a class to implement the data structure STACK. Write a constructor to initialize the TOP of the STACK. Write a member function PUSH() to insert an element and member function POP() to delete an element. Check for overflow and underflow conditions.
9. Write a C++ program to check whether the given string is a palindrome or not using Pointers.
10. Write a C++ program to merge two files into a single file

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Implement the concepts of object oriented programming.	K3
CO2	Apply string functions to perform operator overloading.	K3
CO3	Demonstrate Function Overloading and inheritance.	K4
CO4	Ability to implement data structures with C++	K4 & K5
CO5	Implement files and command line arguments.	K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	M	S	M	M
CO3	S	M	S	M	M
CO4	S	S	S	S	S
CO5	S	S	S	M	S

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
Core – VII		Course Code: 20UCS4C07		Course Title: Web Technology
Semester	Hours/Week	Total Hours	Credits	Total Marks
IV	4	60	4	100

### Course Objectives

1. Course demonstrates an in-depth understanding of the tools and technologies necessary for business application design and development.
2. Coaches students to design a static and dynamic webpages.
3. To implement the concepts like scripting concepts and Cascading Style Sheets.
4. It educates students to build a website with rich internet applications.
5. It covers client side scripting like HTML, JavaScript and server side scripting like servlets, JSPs and web servers and database interfacing.

### **UNIT – I**

Internet Principles: Introduction to Internet – Client Server Model – Protocol – Internet IP Address-Domain Name – Internet Services – Electronic Mail – World Wide Web – Internet Security – E-Commerce – EDI.

### **UNIT – II**

Introduction to HTML: HTML Tags – HTML Documents – Headings – Hyperlinks using Anchor Tag-Formatting Characters – Font – Images and Pictures – Listing – Tables in HTML Tags – Frameset Definition – Frame Definition – Nested Framesets – HTML Forms – Elements of a Form Use Tags.

### **UNIT – III**

JavaScript: Data Types – Variables – Operators – Conditional Statements using Javascript – Document Objects – Image Objects using Javascript – Forms and Elements – Event Handling – Browser Object – Submit Event and Data Validation – Parseint() Function – ParseFloat() Function – Recursive Function.



**UNIT – IV**

Server Side Script with JSP: Client Responsibilities – Server Responsibilities – Introduction to JSP – JSP Architecture – JSP Servers – JSP Tags – Request Object – Response Object – JSP Page.

**UNIT – V**

JSP with JDBC: Creating ODBC Data Source Name – Introduction to JDBC – Telephone Directory with JDBC – Servlet Environment and Role – Protocol Support – HTML Support – Servlet Life Cycle – HTML to Servlet Communication.

**Text Book**

1. C. Xavier, “Web Technology and Design”, 1<sup>st</sup> Edition, New Age International, 2011.

**Reference Book**

1. H.M. Deitel, P.J. Deitel, “Internet and World Wide Web - How to Program”, 3<sup>rd</sup> Edition, Pearson Publication, 2006.

**Course Outcomes (COs)**

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Outline the history of the web, and technologies that makes the web pages and publishing them.	K1
CO2	Design a static webpage by applying HTML elements.	K2 & K3
CO3	Apply CSS concepts for designing HTML web pages.	K3
CO4	Implement a webpage with database connectivity using Java.	K3 & K4
CO5	Make the web pages more dynamic and interactive.	K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**



**Mapping of COs with POs**

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	S	M	S	M	M
<b>CO2</b>	S	S	S	S	M
<b>CO3</b>	S	S	S	M	S
<b>CO4</b>	S	M	S	S	S
<b>CO5</b>	S	S	S	M	M

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
Core – VIII		Course Code: 20UCS4C08		Course Title: Software Engineering
Semester	Hours/Week	Total Hours	Credits	Total Marks
IV	4	60	4	100

### Course Objectives

1. Understanding of software requirements and the SRS documents.
2. Understanding of the role of project management including planning, scheduling, risk management, etc.
3. Describe different models and understanding of different software architectural styles.
4. Understanding on quality control and how to ensure good quality software.
5. Be successful professionals in the field with firm fundamental knowledge of software engineering.
6. Apply their foundations in software engineering to adapt to readily changing environments using the appropriate theory, principles and processes.

### **UNIT – I**

Introduction – Software Engineering Discipline – Evolution and Impact – Programs Vs Software Products. Software Life Cycle Models: Use of a Life Cycle Models – Classical Waterfall Model – Iterative Waterfall Model – Prototyping Model – Evolutionary Model – Spiral Model. Software Project Management: Responsibilities of a Software Project Manager – Project Planning – Metrics for Project Size Estimation – Project Estimation Techniques – Risk Management.

### **UNIT – II**

Requirements Analysis and Specification: Requirements Gathering and Analysis – Software Requirements Specification (SRS) – Formal System Development Techniques. Software Design: Characteristics of a Good Software Design – Cohesion and Coupling – Neat Arrangement – Software Design Approaches.



### UNIT – III

Function-Oriented Software Design: Overview of SA/SD Methodology – Structured Analysis – Data Flow Diagrams (DFDs). Object Modeling Using UML: Overview of Object-Oriented Concepts – UML Diagrams – Use Case Model – Class Diagrams – Interaction Diagrams – Activity Diagrams – State Chart Diagram.

### UNIT – IV

User Interface Design: Characteristics of a Good User Interface – Basic Concepts – Types of User Interfaces – Component-Based GUI Development; Coding and Testing: Coding – Testing – UNIT Testing – Black-Box Testing – White-Box Testing – Debugging – Integration Testing – System Testing.

### UNIT – V

Software Reliability and Quality Management: Software Reliability – Statistical Testing – Software Quality – Software Quality Management System – ISO 9000. Computer Aided Software Engineering: CASE Environment – CASE support in Software Life Cycle – Characteristics of CASE Tools – Architecture of a CASE Environment. Software Maintenance: Characteristics of Software Maintenance – Software Reverse Engineering – Software Maintenance Process Models – Estimation of Maintenance Cost. Software Reuse: Issues in any Reuse Program – Reuse Approach.

### Text Book

1. Rajib Mall, “Fundamentals of Software Engineering”, 3<sup>rd</sup> Edition, Prentice Hall of India Private Limited, 2008.

### Reference Books

1. Roger S.Pressman and Bruce R.Maxim, “Software Engineering: A Practitioner's Approach”, 8<sup>th</sup> Edition, McGraw Hill Higher Education, 2015.
2. Rajib Mall, “Fundamentals of Software Engineering”, 4<sup>th</sup> Edition, Prentice Hall of India Private Limited, 2014.
3. Richard Fairley, “Software Engineering Concepts”, TMGH Publications, 2004.



4. Hans van Vliet, “Software Engineering: Principles and Practice”, Third Edition, Wiley, 2010.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Apply the software engineering life cycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.	K3 & K4
CO2	Ability to work in one or more significant application domains.	K3 & K4
CO3	Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.	K4, K5 & K6
CO4	Ability to work as an effective member or leader of software engineering teams.	K4
CO5	Ability to understand and meet ethical standards and legal responsibilities.	K5 & K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	M
CO2	S	S	S	S	M
CO3	S	S	S	M	S
CO4	S	M	S	S	S
CO5	S	S	S	M	M

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
Core Practical – IV		Course Code: 20UCS4P04		Course Title: Web Technology Lab
Semester IV	Hours/Week 2	Total Hours 30	Credits 2	Total Marks 100

### Course Objectives

1. To develop an ability to design and implement static and dynamic website.
2. Enable the students to create HTML forms and validate them with Java script.
3. To enable the students to design and develop the Web applications in open source environment.
4. To make the students work with web pages and style sheets effectively.
5. To enable the students to design the web pages with java script.

### **List of Practicals**

1. Create a form having number of elements (Textboxes, Radio buttons, Checkboxes, and so on). Write JavaScript code to count the number of elements in a form.
2. Create a HTML form that has number of Textboxes. When the form runs in the Browser fill the textboxes with data. Write JavaScript code that verifies that all textboxes has been filled. If a textboxes has been left empty, popup an alert indicating which textbox has been left empty.
3. Develop a HTML Form, which accepts any Mathematical expression. Write JavaScript code to Evaluates the expression and Displays the result.
4. Create a page with dynamic effects. Write the code to include layers and basic animation.
5. Write a JavaScript code to find the sum of N natural Numbers. (Use user defined function)
6. Write a JavaScript code block using arrays and generate the current date in words, this should include the day, month and year.
7. Create a form for Student information. Write JavaScript code to find Total, Average, Result and Grade.
8. Create a form for Employee information. Write JavaScript code to find DA, HRA, PF, TAX, Gross pay, Deduction and Net pay.
9. Create a form consists of a two Multiple choice lists and one single choice list



- a. The first multiple choice list, displays the Major dishes available.
  - b. The second multiple choice list, displays the Starters available.
  - c. The single choice list, displays the Soft drinks available.
10. Create a web page using two image files, which switch between one another as the mouse pointer moves over the image. Use the on Mouse Over and on Mouse Out event handlers.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand modern protocols and systems used on Web, such as HTML.	K2
CO2	Select and apply markup languages for processing combine multiple web technologies to create advanced web pages.	K3
CO3	Apply Web Technologies to design dynamic webpages.	K3 & K4
CO4	Enable to write well-structured, easily maintained JavaScript.	K4 & K5
CO5	Create Web forms and perform Manipulations with Scripting.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	M	S	M	M
CO3	S	M	S	S	M
CO4	S	S	S	S	S
CO5	S	S	S	S	S

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
Core – IX		Course Code: 20UCS5C09		Course Title: Relational Database Management System
Semester V	Hours/Week 6	Total Hours 90	Credits 4	Total Marks 100

### Course Objectives

1. The objective of the course is to present an introduction to relational database management systems, with an emphasis on how to organize, maintain and retrieve efficiently and effectively information from a database.
2. List and explain the fundamental concepts of a relational database system.
3. Analyze database requirements and determine the entities involved in the system and their relationship to one another.
4. Develop the logical design of the database using data modeling concepts such as entity-relationship diagrams.
5. Create a relational database using a relational database package.
6. Manipulate a database using SQL.

### **UNIT – I**

Introduction: Database System Applications – DBMS Vs. File System – View of Data – Data Model – Database Languages – Database Users and Administrators – Transaction Management – Database System Structure – Application Architecture. Data Models: Basic Concepts – Constraint – Keys – ER Diagram – Weak Entity – Extended ER Features – Design of an ER Schema.

### **UNIT – II**

Relational Model: Structure of Relational Databases – Relational Algebra. SQL: Background – Basic Structure – Set Operation – Aggregate Function – Null Values – Nested Sub Queries – Views – Modification of the Database – Data Definition Language – Embedded SQL – Dynamic SQL.



**UNIT – III**

Data Normalization: Pitfalls in Relational Database Design – Decomposition – Functional Dependencies – Normalization – First Normal Form – Second Normal Form – Third Normal Form – Boyce-Codd Normal Form – Fourth Normal Form – Fifth Normal Form – Denormalization – Database Security: Data Security Requirements – Protecting the Data within the Database – Granting and Revoking Privileges – Data Encryption.

**UNIT – IV**

PL/SQL: A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Declaration – Assignment operation – Bind variables – Substitution Variables – Printing – Arithmetic Operators. Control Structures and Embedded SQL: Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. PL/SQL Cursors and Exceptions: Cursors – Implicit & Explicit Cursors and Attributes – Cursor FOR loops – SELECT...FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.

**UNIT – V**

PL/SQL Composite Data Types: Records – Tables – Varrays. Named Blocks: Procedures – Functions – Packages – Triggers – Data Dictionary Views.

**Text Books**

1. A Silberschatz, H Korth, S Sudarshan, “Database System and Concepts”, 5<sup>th</sup> Edition McGraw-Hill, 2005.
2. Alexis Leon & Mathews Leon, “Fundamentals of DBMS”, 2<sup>nd</sup> Edition, Vijay Nicole Publications, 2014.
3. Nilesh Shah, “Database Systems Using Oracle”, 2<sup>nd</sup> Edition, Pearson, 2004.

**Reference Book**

1. Alexis Leon & Mathews Leon, “Essential of DBMS”, 2<sup>nd</sup> reprint, Vijay Nicole Publications, 2009.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Describe the fundamental elements of relational database management systems.	K1 & K2
CO2	Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.	K2
CO3	Design ER-models to represent simple database application scenarios.	K3
CO4	Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.	K4
CO5	Improve the database design by normalization.	K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	M
CO2	S	M	S	M	M
CO3	S	S	S	M	S
CO4	S	S	S	M	M
CO5	S	S	S	S	S

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
Core – X		Course Code: 20UCS5C10		Course Title: .Net Programming
Semester	Hours/Week	Total Hours	Credits	Total Marks
V	6	90	4	100

### Course Objectives

1. Creates web based applications using . net frameworks.
2. Use different server controls to create rich user interactive websites.
3. Access data from the database in data bound controls on the web page.
4. Apply master page to different pages in the website.

### **UNIT – I**

The .NET Framework – Learning the .NET languages – Introduction – .Net Revolution – .Net Framework and its Architecture – CLR – What is Assembly – Components of Assembly – DLL Hell and Assembly Versioning – Objects and Namespaces – Setting Up ASP.NET and IIS.

### **UNIT – II**

Developing VB.NET Applications – Introduction to VB.Net, The .Net Frame Work and Common Language Runtime, Building VB. Net Application, VB IDE, Forms, Properties, Events, VB Language - Console Application and 46 Windows Application, Data Type, Declaring Variable, Scope of Variable, Operators and Statements.

### **UNIT – III**

Windows Applications - Forms, Adding Controls to Forms, Handling Events, MsgBox, Input Box, Multiple Forms, Handling Mouse and Keyboard Events, Object Oriented Programming Creating and Using Classes and Objects, Handling Exceptions – On Error Goto.

**UNIT – IV**

Developing ASP.NET Applications – ASP.NET Applications – Understanding ASP.NET Controls – Overview of ASP.NET Framework, Web Form Fundamentals – Web Control Classes – Using Visual Studio.NET – Validation and Rich Controls – State Management – Tracing, Logging, and Error Handling.

**UNIT – V**

ADO.NET – Overview of ADO.NET – ADO.NET Data Access – Connected and Disconnected Database, Create Connection using ADO.NET Object Model, Connection Class, Command Class. Data binding – Data List – Data Grid – Repeater – Files, Streams and Email.

**Text Books**

1. James Holmes, “Struts: The Complete Reference”, McGraw Hill Professional, 2nd Edition, 2007
2. Mathew Mac Donald, “ASP.NET Complete Reference”, TMH, 2005.
3. Steven Holzner, “Visual Basic. NET Black Book”, Wiley Publisher, 1<sup>st</sup> Edition, 2000.

**Reference Books**

1. J.Liberty, D.Hurwitz, “Programming ASP.NET”, O’REILLY, 3<sup>rd</sup> Edition, 2006.
2. Tim Anderson, “Visual Basic. Net Programming in Easy Steps”, Dreamtech Press.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Describes .NET Framework and Common Language Runtime.	K1 & K2
CO2	Understand the development and deployment of enterprise applications.	K2
CO3	Develop ASP.Net web services, secure web services and .Net remoting applications.	K2 & K3
CO4	Interpret concepts of constructors , inheritance and interface.	K4 & K5
CO5	Ability to handle data access technologies in ADO.NET for data manipulations.	K5 & K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	S	S
CO2	S	S	S	S	S
CO3	M	S	S	S	S
CO4	M	S	S	S	S
CO5	M	M	S	S	S

S – Strong

M – Medium

L – Low



Program: B.Sc. Computer Science				
Core – XI		Course Code: 20UCS5C11		Course Title: Computer Networks
Semester	Hours/Week	Total Hours	Credits	Total Marks
V	6	90	4	100

### Course Objectives

1. To understand the concepts of network terminology and concepts of the OSI reference model and the TCP/IP reference model and protocols such as TCP, UDP and IP.
2. To be familiar with the concepts of protocols, network interfaces, and design/performance issues in different layers.

### **UNIT – I**

Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP Models – Example Networks: Internet, 3G Mobile Phone Networks, Wireless LANs – RFID and Sensor Networks – Physical Layer – Theoretical Basis for Data Communication - Guided Transmission Media.

### **UNIT – II**

Wireless Transmission – Communication Satellites – Digital Modulation and Multiplexing – Telephones Network Structure – Local Loop, Trunks and Multiplexing, Switching. Data Link Layer: Design Issues – Error Detection and Correction.

### **UNIT – III**

Elementary Data Link Protocols – Sliding Window Protocols – Example Data Link Protocols – Packet over SONET, ADSL – Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols.

### **UNIT – IV**

Network Layer – Design Issues – Routing Algorithms – Congestion Control Algorithms – Quality of Service – Network Layer of Internet – IP protocol – IP Address – Internet Control Protocol.

**UNIT – V**

Transport Layer – Transport Service – Elements of Transport Protocol – Addressing, Establishing & Releasing a Connection – Error Control, Flow Control, Multiplexing and Crash Recovery – Internet Transport Protocol – TCP – Network Security: Cryptography.

**Text Book**

1. S. Tanenbaum, “Computer Networks”, Fifth Edition, Pearson Education Inc, 2010.

**Reference Books**

1. B. Forouzan, “Introduction to Data Communications in Networking”, Tata McGraw Hill, New Delhi, 1998.
2. F. Halsall, “Data Communications, Computer Networks and Open Systems”, Addison Wesley, 1995.
3. D. Bertsekas and R. Gallager, “Data Networks”, Prentice Hall of India, New Delhi, 1992.

**Course Outcomes (COs)**

On successful completion of the course, the students will be able to

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CO1</b>	Understand the organization of computer networks, factors influencing computer network development and the reasons for having variety of different types of networks.	K1 & K2
<b>CO2</b>	Understand and apply the functionality of each layer of OSI and TCP/IP reference model.	K2 & K3
<b>CO3</b>	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.	K3 & K4
<b>CO4</b>	Apply knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission.	K4 & K5
<b>CO5</b>	Learn about the concepts of various layer and its protocols.	K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	S	M	S	M	M
<b>CO2</b>	S	M	S	M	M
<b>CO3</b>	S	S	S	S	S
<b>CO4</b>	S	S	S	M	M
<b>CO5</b>	S	S	S	M	M

**S – Strong****M – Medium****L – Low**





Program: B.Sc. Computer Science				
Core Practical – V		Course Code: 20UCS5P05		Course Title: .Net Programming Lab
Semester V	Hours/Week 3	Total Hours 45	Credits 2	Total Marks 100

### Course Objectives

1. Creates web based applications using . net frameworks.
2. Use different server controls to create rich user interactive websites.
3. Access data from the database in data bound controls on the web page.
4. Apply master page to different pages in the website.

### **List of Programs**

1. Develop a Program for simple calculator.
2. Develop an application to create, save, update, delete and search employee profile in employee database system (with database connectivity).
3. Develop an application to create inventory management system (with database connectivity).
4. Develop an application to create student mark entry system (with database connectivity).
5. Design an ASP.Net Web Forms using the Applications.
6. Develop an ASP.Net Program to illustrate Validation Controls.
7. Develop an ASP.Net Program using Web User controls.
8. Develop an ASP.Net Program using Data Binding with Server controls.
9. Develop an ASP.Net Program using Database Programming concepts in ADO.Net.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Describes .NET Framework and Common Language Runtime.	K1 & K2
CO2	Understand the development and deployment of enterprise applications.	K2
CO3	Develop ASP.Net web services, secure web services and .Net remoting applications.	K2 & K3
CO4	Interpret concepts of constructors, inheritance and interface.	K4 & K5
CO5	Ability to handle data access technologies in ADO.NET for data manipulations.	K5 & K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	S	S
CO2	S	S	S	S	S
CO3	M	S	S	S	S
CO4	M	S	S	S	S
CO5	M	M	S	S	S

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
Core – XII		Course Code: 20UCS6C12		Course Title: PHP with MySQL
Semester	Hours/Week	Total Hours	Credits	Total Marks
VI	5	75	4	100

### Course Objectives

1. Understand the usage of PHP and MySQL in Dynamic Web Development.
2. Understand data types, built in and User defined Functions of PHP.
3. Understand Object Oriented Programming paradigm in PHP.
4. Build a simple and functional web application using PHP with MySQL.

### **UNIT – I**

Introducing PHP – Basic Development Concepts – Creating First PHP Scripts – Using Variable and Operators – Storing Data in Variable – Understanding Data Types – Setting and Checking Variables Data Types – Using Constants – Manipulating Variables with Operators.

### **UNIT – II**

Controlling Program Flow: Writing Simple Conditional Statements – Writing More Complex Conditional Statements – Repeating Action with Loops – Working with String and Numeric Functions.

### **UNIT – III**

Working with Arrays: Storing Data in Arrays – Processing Arrays with Loops and Iterations – Using Arrays with Forms - Working with Array Functions – Working with Dates and Times.

### **UNIT – IV**

Using Functions and Classes: Creating User-Defined Functions – Creating Classes – Using Advanced OOP Concepts. Working with Files and Directories: Reading Files – Writing Files – Processing Directories.

**UNIT – V**

Working with Database and SQL: Introducing Database and SQL – Using MySQL – Adding and Modifying Data – Handling Errors – Using SQLite Extension and PDO Extension. Introduction XML - Simple XML and DOM Extension.

**Text Book**

1. Vikram Vaswani, “PHP A Beginner's Guide”, Tata McGraw-Hill, 2008.

**Reference Books**

1. Steven Holzner, “The PHP Complete Reference”, Tata McGraw-Hill, 2007.
2. Steven Holzer, “Spring into PHP5”, Tata McGraw Hill Edition, 2011.

**Course Outcomes (COs)**

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concept of PHP.	K1 & K2
CO2	Use HTML form elements in PHP.	K2 & K3
CO3	Enhance data manipulation at client end will have sound knowledge in data validation and handling dynamic data with PHP fundamentals.	K3 & K4
CO4	Create Database applications and manipulate them with PHP - MySQL suite.	K5 & K6
CO5	Handling challenges at backend, performing validation at Server end with PHP - MySQL suite.	K4 & K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**



**Mapping of COs with POs**

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	M
CO2	S	S	S	S	M
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
Core – XIII		Course Code: 20UCS6C13		Course Title: Computer Graphics
Semester	Hours/Week	Total Hours	Credits	Total Marks
VI	5	75	4	100

### Course Objectives

1. Understand the basic concepts of computer graphics.
2. Gain experience in interactive computer graphics.
3. Understand the concepts of different type of geometric transformation of objects in 2D and 3D.
4. Learn about 2D viewing, 3D viewing, perspective, lighting, and geometry.

### **UNIT – I**

Introduction to Graphic Devices – Picture Representation, Display Devices, Display Adapters, Types of Printers, Plotters & Input Devices.

### **UNIT – II**

Transformations – Basic 2D & 3D Transformations – Translation, Scaling, Rotation, Reflection, Shearing, Multiple Transformations, Rotation about an Axis Parallel to a Coordinate Axis, Rotation about an Arbitrary Axis in Space, Affine and Perspective Geometry, Orthographic Projections and Axonometric Projections.

### **UNIT – III**

Raster Scan Graphics – Bresenham's Line and Circle Drawing Algorithms, Scan Conversion, RLE, Frame Buffer, Scan Converting Polygons – Edge Fill and Seed Fill Algorithms, Anti-Aliasing and Half Toning.

### **UNIT – IV**

Clipping and Display File Compilation – Sutherland – Cohen Line Clipping Algorithm, Windowing and Viewporting – Segmented Display File, Structure and Compilation – Hidden



Surface and Hidden Line Removal – Backface Removal Algorithm, Z- Buffer, Warnock Algorithm, Hidden Line Elimination.

#### **UNIT – V**

Plane Curves and Space Curves – Curve Representation, Nonparametric and Parametric Curves, Representation of Space Curves, Cubic Spline, Parabolic Blended Curves, Bezier Curves and B – spline Curves.

#### **Text Books**

1. D.F. Rogers, J.A. Adams, “Mathematical Elements for Computer Graphics”, 2<sup>nd</sup> Edition, Tata McGraw-Hill, New Delhi, 2002.
2. D. F. Rogers, “Procedural elements for Computer Graphics”, 2<sup>nd</sup> Edition, Tata McGraw-Hill, New Delhi, 2001.

#### **Reference Books**

1. W.M. Neumann and R.F. Sproull, “Principles of Interactive Computer Graphics”, Tata McGraw-Hill, New Delhi, 2002.
2. D. Hearn and M. P. Baker, 2004, Computer Graphics (C Version), 2<sup>nd</sup> Edition, Pearson Education.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Have a basic understanding of the core concepts of computer graphics.	K1 & K2
CO2	Use of geometric transformations on graphics objects and their application in composite form.	K2 & K3
CO3	Extract scene with different clipping methods and its transformation to graphics display.	K3 & K4
CO4	Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.	K3 & K4
CO5	Render projected objects to naturalize the scene in 2D view and use of illumination models for this.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	M
CO2	S	S	S	M	M
CO3	S	S	S	M	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

**S – Strong**

**M – Medium**

**L – Low**





Program: B.Sc. Computer Science				
Core – XIIV		Course Code: 20UCS6C14		Course Title: Java Programming
Semester	Hours/Week	Total Hours	Credits	Total Marks
VI	5	75	4	100

### Course Objectives

1. To understand the concepts of Object Oriented Programming.
2. To gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
3. To understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms.
4. To understand the principles of inheritance, packages, graphics, applet and interfaces using API to solve real world problems.

### **UNIT – I**

Java Overview: Introduction – Simple Java Program – Java Program Structure – Java Tokens – Java Statements – JVM – Command Line Arguments – Constants, Variables, and Data Types – Operators and Expressions.

### **UNIT – II**

Decision Making and Branching: Introduction – Decision Making with if Statement – Simple if Statement – The if...else Statement – Nesting of if...else Statement – The else if Ladder – The Switch Statement – The ?: Operator. Decision Making and Looping: Introduction – The While Statement – The Do Statement – The For Statement – Jumps in Loops – Labelled Loops. Classes, Objects and Methods: Introduction – Defining a Class – Fields Declaration – Methods Declaration – Creating Objects – Accessing Class Members – Constructors – Methods Overloading – Static Members – Nesting of Methods – Inheritance – Overriding Methods – Final Variables and Methods – Final Classes – Finalizer Methods – Abstract Methods and Classes – Visibility Control.



### UNIT – III

Arrays, Strings and Vectors: Introduction – One-dimensional Arrays – Creating an Array – Two dimensional Arrays – Strings – Vectors – Wrapper Classes – Enumerated Types – Annotations.

Interfaces: Introduction – Defining Interfaces – Extending Interfaces – Implementing Interfaces – Accessing Interface Variables – Packages: Introduction – Java API Packages – Using System Packages – Naming Conventions – Creating Packages – Accessing a Package – Using a Package – Adding a Class to a Package – Hiding Classes – Static Import.

### UNIT – IV

Multithreaded Programming: Introduction – Creating Threads – Extending the Thread Class – Stopping and Blocking a Thread - Life Cycle of a Thread – Using Thread Methods – Thread Exceptions – Thread Priority – Implementing the Runnable Interface. Managing Errors and Exceptions: Introduction – Types of Errors – Exceptions – Syntax of Exception Handling Code – Multiple Catch Statements – Using Finally Statement – Throwing Our Own Exceptions. Applet Programming: Introduction – Difference Between Applets and Applications – Write Applets – Building Applet Code – Applet Life Cycle – Creating an Executable Applet – Designing a Web Page – Applet Tag – Adding Applet to HTML File – Running the Applet – Applet Tags – Passing Parameters to Applets – Aligning the Display – Displaying Numerical Values – Getting Input from the User – Event Handling.

### UNIT – V

Graphics Programming: Introduction – The Graphics Class - Lines and Rectangles – Circles and Ellipses – Drawing Arcs – Drawing Polygons – Line Graphs – Using Control Loops in Applets – Drawing Bar Charts. Managing I/O Files in Java: Introduction – Concept of Stream – Stream Classes – Byte Stream Classes – Character Stream Classes.

### Text Book

1. E. Balagurusamy, “Programming with Java,” 4<sup>th</sup> Edition, Tata McGraw Hill Pub. Ltd., New Delhi, 2009.

### Reference Books

1. Herbert Schild, “Java: The Complete Reference”, Ninth Edition, Oracle Press, 2014.



2. Rohit Khurana, “Programming with JAVA”, VIKAS Pub., 2014.
3. C Thomas Wu, “An Introduction to Object Oriented Programming with Java”, 5<sup>th</sup> Edition, McGraw Hill Publishing, 2010.
2. James M Slack, “Programming and Problem Solving with JAVA”, Thomson Learning, 2002.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understanding of the principles and practice of object oriented analysis and design in the construction of robust, maintainable programs which satisfy their requirements.	K1 & K2
CO2	Understand the concepts of arrays, strings, packages and multithreading.	K2
CO3	Understand and apply the concept of package, interface, multithreading and File handling in java.	K2 & K3
CO4	Analyze the concepts of applet programming, graphics programming and files.	K4
CO5	Create a software application using the Java programming language.	K5 & K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	M
CO2	S	M	S	S	M
CO3	S	S	S	M	M
CO4	S	M	S	M	M
CO5	S	S	S	S	S

S – Strong

M – Medium

L – Low



Program: B.Sc. Computer Science				
Core Practical – VI		Course Code: 20UCS6P06		Course Title: PHP with MySQL Lab
Semester	Hours/Week	Total Hours	Credits	Total Marks
VI	3	45	2	100

### Course Objectives

1. Understand the usage of PHP and MySQL in Dynamic Web Development.
2. Understand and Apply data types, built in and User defined Functions of PHP.
3. Learn Object Oriented Programming paradigm in PHP.
4. Build a simple and functional web application using PHP with MySQL.

### **List of Practicals**

1. Write a PHP program to find the factorial of a number using forms.
2. Write a PHP program to design a login form using Conditional Statements.
3. Write a PHP program to design a visiting card.
4. Design a simple web page to generate multiplication table for a given number using PHP.
5. Design a web page that should compute one's age on a given date using PHP.
6. Write a PHP program to download a file from the server.
7. Write a PHP program to store the current date and time in a COOKIE and display 'Last Visited' date and time on the web page.
8. Write a PHP program to design a calendar for the current year.
9. Write a PHP Program to create a time table for the current semester.
10. Write a PHP Program to access the Student Examinations Result Database.
11. Write a PHP Program to manipulate data in MySQL database.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concept of PHP.	K1 & K2
CO2	Use HTML form elements in PHP.	K3
CO3	Enhance data manipulation at client end will have sound knowledge in data validation and handling dynamic data with PHP fundamentals.	K3 & K4
CO4	Create Database applications and manipulate them with PHP-MySQL suite.	K5 & K6
CO5	Handling challenges at backend, performing validation at Server end with PHP-MySQL suite.	K4 & K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	M
CO2	S	S	S	S	M
CO3	S	S	S	M	M
CO4	S	S	S	M	S
CO5	S	S	S	M	M

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
Core Practical – VII		Course Code: 20UCS6P07		Course Title: Java Programming Lab
Semester VI	Hours/Week 3	Total Hours 45	Credits 2	Total Marks 100

### Course Objectives

1. This course introduces computer programming using the JAVA programming language with object oriented programming principles.
2. Emphasis is placed on event-driven programming methods, including creating and manipulating objects, classes, graphics concepts, applet programming concepts, etc.
3. Upon completion, students should be able to design code and debug JAVA language programs.

### **List of Practicals**

1. Write a program to find the Area of Square, Rectangle and Circle using Method Overloading.
2. Write a program to sort the list of numbers using Command Line Arguments.
3. Write a program to multiply the given two matrices.
4. Write a program to design a class to represent a bank account. Include the following:  
Data Members: Name of the depositor, Account number, Type of account, and Balance amount in the account.  
Methods: To assign initial values, To deposit an amount, To withdraw an amount after checking balance, and To display the name and balance.
5. Write a program that import the user defined package and access the Member variable of classes that contained by Package.
6. Write a program to handle the Exception using try and multiple catch blocks.
7. Write a program to illustrate the use of multi threads.
8. Write a program to create student registration form using applet with Name, Address, Sex, Class, Email-id.
9. Write a program to draw the line, rectangle, oval, text using the graphics method.



10. Write a program to create a sequential file that could store details about five products. Details include product code, cost, and number of items available and are provided through the keyboard. Compute and print the total value of all the five products.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the fundamentals of Java programming language.	K1
CO2	Understand the basics of Java programming, multi-threaded programs and Exception handling.	K2
CO3	Analyze and use Java in a variety of applications.	K3 & K4
CO4	Write and debug a software application developed using the Java programming language.	K5 & K6
CO5	Apply validation techniques to build a reliable solution to a given problem. Apply all the programming concepts as and when required in the future application development.	K4 & K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	M
CO2	S	M	S	M	M
CO3	S	M	S	M	M
CO4	S	S	S	M	S
CO5	S	S	S	M	S

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
Project		Course Code: 20UCS6PR1		Course Title: Project
Semester	Hours/Week	Total Hours	Credits	Total Marks
VI	2	30	5	100

### Course Objectives

1. To implement the concepts of SDLC.
2. To experience development of real time applications.
3. To practice the students rapid application development.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Develop knowledge in Software project.	K1
CO2	Understand the concept and challenges in Software Project Management	K1
CO3	To analyses the issues in developing applications.	K2
CO4	Gain hands-on experience on systematic approach in project development.	K3
CO5	Can experience the bottlenecks of various languages and solve it.	K4

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	M	M	M	S	S
CO2	S	M	S	S	S
CO3	S	S	S	M	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S – Strong

M – Medium

L – Low





# ELECTIVE COURSES



Program: B.Sc. Computer Science				
Elective – I		Course Code: 20UCS5E01		Course Title: Paper: I - Mobile Computing
Semester	Hours/Week	Total Hours	Credits	Total Marks
V	6	90	5	100

### Course Objectives

1. To introduce the concepts of wireless devices.
2. To introduce wireless communication and networking principles, that support connectivity to cellular networks, Wireless LAN, GSM, CDMA.
3. To explore both theoretical and practical issues of mobile computing.
4. To introduce the WAP Architecture, MANET and Routing.

### **UNIT – I**

Introduction – Mobile and Wireless Devices – Simplified Reference Model – Need for Mobile Computing – Wireless Transmissions – Multiplexing – Spread Spectrum and Cellular Systems – Medium Access Control – Comparisons.

### **UNIT – II**

Telecommunication Systems – GSM – Architecture – Sessions – Protocols – Hand Over and Security – UMTS and IMT – 2000 – Satellite Systems.

### **UNIT – III**

Wireless LAN - IEEE S02.11 – Hiper LAN – Bluetooth – Security and Link Management.

### **UNIT – IV**

Mobile Network Layer - Mobile IP – Goals – Packet Delivery – Strategies – Registration – Tunneling and Reverse Tunneling – Adhoc Networks – Routing Strategies.

**UNIT – V**

Mobile Transport Layer – Congestion Control – Implication of TCP Improvement – Mobility – Indirect – Snooping – Mobile – Transaction Oriented TCP - TCP Over Wireless – Performance.

**Text Book**

1. J. Schiller, “Mobile Communications”, 2<sup>nd</sup> Edition, Pearson Education, Delhi, 2003.

**Reference Books**

1. Hansmann, Merk, Nicklous, Stober, “Principles of Mobile Computing”, 2<sup>nd</sup> Edition, Springer (India), 2004.
2. Pahlavan, Krishnamurthy, “Principle of wireless Networks: A unified Approach”, Pearson Education, Delhi, 2003.
3. Martyn Mallick, “Mobile and Wireless Design Essentials”, Wiley Dreamtech India Pvt. Ltd., New Delhi, 2004.

**Course Outcomes (COs)**

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand and identify the GSM, GPRS and Bluetooth software model for mobile computing.	K1 & K2
CO2	Apply different mobile applications.	K2 & K3
CO3	Analysing the concepts of Routing Protocols in MANET and Global System for Mobile Communication.	K3 & K4
CO4	Understanding of the characteristics and limitations of mobile hardware devices including their user-interface modalities.	K5
CO5	Analyze QoS over wire and wireless channels to promote the awareness of ethics and current marketing scenarios.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**



**Mapping of COs with POs**

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	M	M	M	M	M
<b>CO2</b>	M	M	M	S	S
<b>CO3</b>	M	M	S	S	S
<b>CO4</b>	S	S	S	S	S
<b>CO5</b>	S	S	S	S	S

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
Elective – I		Course Code: 20UCS5E02		Course Title: Paper – II Software Testing
Semester	Hours/Week	Total Hours	Credits	Total Marks
V	6	90	5	100

### Course Objectives

1. To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
2. To learn how to planning a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
3. To gain software testing experience by applying software testing knowledge and methods to practice-oriented software testing projects.
4. To learn how to write software testing documents, and communicate with engineers in various forms.
5. To gain the techniques and skills on how to use modern software testing tools to support software testing projects.

#### **UNIT – I**

Introduction: Purpose – Productivity and Quality in Software – Testing vs Debugging – Model for Testing – Bugs – Types of Bugs – Testing and Design Style.

#### **UNIT – II**

Flow / Graphs and Path Testing – Achievable Paths – Path Instrumentation – Application – Transaction Flow Testing Techniques.

#### **UNIT – III**

Data Flow Testing Strategies – Domain Testing: Domains and Paths – Domains and Interface Testing.

#### **UNIT – IV**

Linguistic – Metrics – Structural Metric – Path Products and Path Expressions. Syntax Testing – Formats – Test Cases

**UNIT – V**

Logic Based Testing – Decision Tables – Transition Testing – States, State Graph, State Testing.

**Text Books**

1. B. Beizer, “Software Testing Techniques”, II Edn., DreamTech India, New Delhi, 2003.
2. K.V.K. Prasad, “Software Testing Tools”, DreamTech. India, New Delhi, 2005.

**Reference Books**

1. Burnstein, “Practical Software Testing”, Springer International Edn, 2003.
2. E. Kit, “Software Testing in the Real World: Improving the Process”, Pearson Education, Delhi, 1995.
3. R. Rajani, and P.P. Oak, “Software Testing”, Tata McGraw Hill, New Delhi, 2004.

**Course Outcomes (COs)**

On successful completion of the course, the students will be able to

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CO1</b>	Ability to apply software testing knowledge and engineering methods.	K3
<b>CO2</b>	Ability to design and conduct a software test process for a software testing project.	K3 & K4
<b>CO3</b>	Identify the needs of software test automation and develop a test tool to support test automation.	K6
<b>CO4</b>	Understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.	K5 & K6
<b>CO5</b>	Ability to use software testing methods and modern software testing tools for their testing projects.	K3 & K4

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	S	S	M	M
CO3	S	S	S	M	S
CO4	S	S	S	S	S
CO5	S	S	S	M	M

S – Strong

M – Medium

L – Low



Program: B.Sc. Computer Science				
Elective – I		Course Code: 20UCS5E03		Course Title: Paper – III E-Commerce Technologies
Semester	Hours/Week	Total Hours	Credits	Total Marks
V	6	90	5	100

### Course Objectives

1. To acquire the knowledge of internet and intranet.
2. To know the concept of security issues and business process reengineering.
3. To identify key concepts related to the regulation of the internet and e-commerce.
4. Learn the technologies facilitating electronic business and commercial transactions.
5. Know about legal and policy frameworks governing electronic business, platforms, and use of the internet.
6. Gain knowledge in Current issues and concerns relating to e-commerce and internet regulation.

### **UNIT – I**

History of E-commerce and Indian Business Context: E-Commerce –Emergence of the Internet – Emergence of the WWW – Advantages of E-Commerce – Transition to E-Commerce in India – The Internet and India – E-transition Challenges for Indian Corporate. Business Models for E-commerce: Business Model – E-Business Models Based on the Relationship of Transaction Parties – E-Business Models Based on the Relationship of Transaction Types.

### **UNIT – II**

Enabling Technologies of the World Wide Web: World Wide Web – Internet Client-Server Applications – Networks and Internets – Software Agents – Internet Standards and Specifications – ISP. E-Marketing: Traditional Marketing – Identifying Web Presence Goals – Online Marketing – E-Advertising – E-branding.



**UNIT – III**

E-Security: Information System Security – Security on the Internet – E-Business Risk Management Issues – Information Security Environment in India. Legal and Ethical Issues: Cyberstalking – Privacy is at Risk in the Internet Age – Phishing – Application Fraud – Skimming – Copyright – Internet Gambling – Threats to Children.

**UNIT – IV**

E-Payment Systems: Main Concerns in Internet Banking – Digital Payment Requirements – Digital Token-Based E-Payment Systems – Classification of New Payment Systems – Properties of Electronic Cash – Risk and E-Payment Systems – Designing E-Payment Systems – Digital Signature – Online Financial Services in India – Online Stock Trading.

**UNIT – V**

Information Systems for Mobile Commerce: What is Mobile Commerce? – Wireless Applications – Cellular Network – Wireless Spectrum – Technologies for Mobile Commerce – Wireless Technologies – Different Generations in Wireless Communication – Security Issues Pertaining to Cellular Technology. Portals for E-Business: Portals – Human Resource Management – Various HRIS Modules.

**Text Book**

1. P.T. Joseph, S.J., “E-Commerce - An Indian Perspective”, 4<sup>th</sup> Edition, PHI, 2012.

**Reference Books**

1. David Whiteley, “E-Commerce Strategy, Technologies and Applications”, Tata Mc-Graw-Hill, 2001.
2. Kamalesh K. Bajaj, Debjani Nag, “E-Commerce: The Cutting Edge of Business”, TMH, New Delhi, 2000.
3. Gary Schneider, “Electronic Commerce”, Cengage Learning, 2012.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts and technologies used in the field of management information Systems.	K1 & K2
CO2	Have the knowledge of the different types of management information systems.	K2
CO3	Understand the processes of developing and implementing information systems.	K3
CO4	Be aware of the ethical, social, and security issues of information systems.	K2
CO5	Assess electronic payment systems and Recognize and discuss global E-commerce issues.	K4 & K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	M
CO2	S	M	S	M	M
CO3	S	M	S	M	M
CO4	S	M	S	L	M
CO5	S	S	S	M	L

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
Elective – II		Course Code: 20UCS6E04		Course Title: Paper – I Data Mining
Semester VI	Hours/Week 5	Total Hours 75	Credits 5	Total Marks 100

### Course Objectives

1. To identify the scope and essentiality of Data Mining and Warehousing.
2. To analyze data, choose relevant models and algorithms for respective applications.
3. To develop research interest towards advances in data mining.
4. To categorize and differentiate between situations for applying different data-mining techniques.

### **UNIT – I**

Introduction: Data Mining Tasks – Data Mining Versus Knowledge Discovery in Databases – Relational Databases – Data Warehouses – Transactional Databases – Object Oriented Databases – Spatial Databases – Temporal Databases – Text and Multimedia Databases – Heterogeneous Databases - Mining Issues – Metrics – Social Implications of Data Mining.

### **UNIT – II**

Data Preprocessing: Why Preprocess the Data – Data Cleaning – Data Integration – Data Transformation – Data Reduction – Data Discretization.

### **UNIT – III**

Data Mining Techniques: Association Rule Mining – The Apriori Algorithm – Multilevel Association Rules – Multidimensional Association Rules – Constraint Based Association Mining.

### **UNIT – IV**

Classification and Prediction: Issues Regarding Classification and Prediction – Decision Tree Induction – Bayesian Classification – Back Propagation – Classification Methods – Prediction – Classifiers Accuracy.

**UNIT – V**

Clustering Techniques: Cluster Analysis – Clustering Methods – Hierarchical Methods – Density Based Methods – Outlier Analysis – Introduction to Advanced Topics: Web Mining, Spatial Mining and Temporal Mining.

**Text Book**

1. J. Han and M. Kamber, “Data Mining: Concepts and Techniques”, Morgan Kaufmann, New Delhi, 2001.

**Reference Books**

1. M.H. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education, Delhi, 2003.
2. Paulraj Ponnaiah, “Data Warehousing Fundamentals”, Wiley Publishers, 2001.
3. S.N. Sivananda and S. Sumathi, “Data Mining”, Thomsan Learning, Chennai, 2006.

**Course Outcomes (COs)**

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Evaluate the performance of different data-mining algorithms.	K4
CO2	Preprocess the data for mining applications.	K2
CO3	Apply the association rules for mining the data.	K3 & K4
CO4	Design and deploy appropriate classification techniques.	K5 & K6
CO5	Cluster the high dimensional data for better organization of the data.	K3, K4 & K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	S	S	S	M
CO3	S	S	S	S	S
CO4	S	S	S	M	S
CO5	S	S	S	M	S

S – Strong

M – Medium

L – Low



Program: B.Sc. Computer Science				
Elective – II		Course Code: 20UCS6E05		Course Title: Paper – II Cyber Safety
Semester VI	Hours/Week 5	Total Hours 75	Credits 5	Total Marks 100

### Course Objectives

1. To exposures of financial loss ranging from cyber security cracks to theft of knowledgeable property are emergent problems.
2. To know about cost of security.
3. To understand the configuration and security challenges.
4. Educate the dark side of computer's.
5. To protect from outside attacks and to safe use the networks.

### **UNIT – I**

Cyber security: Steps for a Secure Cloud, Azure Security Center Cost Model: Shared Cost Model - License Cost of Security Center – Azure Cost of Data Storage – Other Considerations - Enterprise Security Architecture – Ransomware Lessons Learned.

### **UNIT – II**

Cloud Security Operations: Cloud Security Challenges – Security Center Overview – Security Center Placement - Select an Azure Subscription. Azure Security Center Configuration: Azure Infrastructure Design – Standard Tier Advantages- Using Security Center.

### **UNIT – III**

Dark Side of the Computer: Viruses, Trojans, and Attacks – Vulnerabilities, Risk Assessment, and Risk Management – Emerging Field of Cyber Security.

### **UNIT – IV**

Internet, Social Media, and Cyber Attacks on Critical Infrastructures – Cyber Threat Spectrum – Cyberspace Attacks and Weapons.

**UNIT – V**

Basics of Critical Infrastructure Protection – Random Nature of Faults, Failures, and Engineering- In the Presence of Attackers – Issues of Time and Sequence – Economic Impact on Regulation and Duties to Protect – Critical Infrastructure Protection Strategies and Operations - Protection Design Goals and Duties to Protect.

**Text Books**

1. Marshall Copeland, “Cyber Security on Azure: An IT Professional’s Guide to Microsoft Azure Security Center”, Apress, First Edition, 2017.
2. Taylor & Francis Group Edited, “Cyber-security Protecting Critical Infrastructures from Cyber Attack and Cyber Warfare”, CRC Press, 2015.

**Reference Books**

1. Bruce Schneier, Neils Ferguson, “Practical Cryptography”, Wiley Dreamtech India Pvt. Ltd., First Edition, 2003.
2. Douglas R Simson, “Cryptography – Theory and practice”, CRC Press, First Edition, 1995.

**Course Outcomes (COs)**

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Know about the security issues in the real world.	K1
CO2	Apply appropriate strategies to protect from attacks.	K3
CO3	Analyze and evaluate the cyber security needs of an organization.	K4
CO4	Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.	K4
CO5	Measure the performance and troubleshoot cyber security system.	K4 & K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**



**Mapping of COs with POs**

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	M
CO2	S	S	S	M	M
CO3	S	S	S	M	M
CO4	S	S	S	M	M
CO5	S	S	S	M	M

**S – Strong**

**M – Medium**

**L – Low**





Program: B.Sc. Computer Science				
Elective – II		Course Code: 20UCS6E06		Course Title: Paper - III Network Security
Semester VI	Hours/Week 5	Total Hours 75	Credits 5	Total Marks 100

### Course Objectives

1. To know about various encryption techniques algorithms and models.
2. To understand the concept of key concepts in cryptography.
3. To understand the approaches of authentication, hash functions and mitigate attacks.
4. To impart knowledge on Network security.

### **UNIT – I**

Model of Network Security – Security Attacks, Services and Attacks – OSI Security Architecture – Classical Encryption Techniques – SDES – Block Cipher Principles DES – Strength of DES – Block Cipher Design Principles – Block Cipher Mode of Operation – Evaluation Criteria for AES – RC4 – Differential and Linear Cryptanalysis – Placement of Encryption Function – Traffic Confidentiality.

### **UNIT – II**

Number Theory – Prime Number – Modular Arithmetic – Euclid’s Algorithm - Fermet’s and Euler’s Theorem – Primality – Chinese Remainder Theorem – Discrete Alogarithm – Public Key Cryptography and RSA – Key Distribution – Key Management – Diffie Hellman Key Exchange – Elliptic Curve Cryptography.

### **UNIT – III**

Authentication Requirement – Authentication Function – MAC – Hash Function – Security of Hash Function and MAC – SHA - HMAC – CMAC - Digital Signature and Authentication Protocols – DSS.

**UNIT – IV**

Authentication Applications – Kerberos – X.509 Authentication Services – Email Security – IP Security – Web Security.

**UNIT – V**

Intruder – Intrusion Detection System – Virus and Related Threats – Countermeasures – Firewalls Design Principles – Trusted Systems – Practical Implementation of Cryptography and Security.

**Text Book**

1. William Stallings, “Cryptography & Network Security”, Pearson Education, Fourth Edition, 2010.

**Reference Books**

1. Charlie Kaufman, Radia Perlman, Mike Speciner, “Network Security, Private Communication in Public World”, PHI Second Edition, 2002.
2. Bruce Schneier, Neils Ferguson, “Practical Cryptography”, Wiley Dreamtech India Pvt. Ltd., First Edition, 2003.
3. Douglas R Simson “Cryptography – Theory and practice”, CRC Press, First Edition, 1995.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamentals of networks security, security architecture, threats, vulnerabilities, Security practices and System security standards.	K1 & K2
CO2	Apply the knowledge towards Authentication schemes to simulate different applications of different cryptographic operations cryptographic algorithms.	K2 & K3
CO3	Analyze the problem and develop the optimal cryptographic algorithms for the data in real time.	K3&K4
CO4	Evaluate and compare the model performances using various evaluation measures.	K5
CO5	Learn about concepts of system level and Network Level security.	K2

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	M
CO2	S	S	M	M	M
CO3	S	S	S	S	S
CO4	S	S	S	M	M
CO5	S	S	S	M	M

**S – Strong**

**M – Medium**

**L – Low**



# Skill Based Elective Course (SBEC)



Program: B.Sc. Computer Science				
SBEC – I		Course Code: 20UCS2S01		Course Title: Office Automation Lab
Semester II	Hours/Week 2	Total Hours 30	Credits 2	Total Marks 100

### Course Objectives

1. Give students an in-depth understanding of why MS Office package.
2. Provide hands-on use of Microsoft Office applications Word, Excel and PowerPoint.
3. Create a new document and format a document, prepare how to create bio-data, create how to insert a table in document and create mailing labels using mail merge.
4. Create a database in Excel and sort the data, prepare mark list for a student, Pay bill preparation, Invoice report and generate a graph for the given data.
5. Create presentation in PowerPoint for a seminar, prepare organization charts, and prepare charts to display percentage of marks in each semester for all students.

### **MS-Word**

1. Text Manipulation: Write a paragraph about your institution and Change the font size and type, Spell check, Aligning and justification of Text.
2. Find and Replace: Write a paragraph about yourself and do the following.  
Find and Replace - Use Numbering Bullets, Footer and Headers.
3. Tables and manipulation: Creation, Insertion, Deletion (Columns and Rows).  
Create a mark sheet.
4. Mail Merge: Prepare an invitation to invite your friends to your birthday party. Prepare at least five letters.

### **MS-Excel**

1. Mark list preparation for a student using Data sorting-Ascending and Descending (both numbers and alphabets).
2. Individual Payroll preparation.
3. Invoice Report preparation.
4. Drawing Charts. Take your own table.

**MS-Powerpoint**

1. Create a slide show presentation for a seminar using Tables and Organization Charts.
2. Create a slide show presentation to display percentage of marks in each semester for all students.
  - a) Use bar chart (X-axis: Semester, Y-axis: % marks).
  - b) Use different presentation template different transition effect for each slide.

**MS-Access**

1. Creating Table using different methods.
2. Generating reports.

**Course Outcomes (COs)**

On successful completion of the course, the students will be able to

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CO1</b>	Create a document for various purposes, edit and format the document according to the need.	K3
<b>CO2</b>	Gain knowledge to create spreadsheets and use features like formulas and charts creation, fill series, sorting and filtering.	K3
<b>CO3</b>	Prepare PowerPoint presentation for their seminar including slide show, effects, graphs, etc.	K4
<b>CO4</b>	Enable the students to create database and handle the query.	K5 & K6
<b>CO5</b>	Learn to generate reports using MS ACCESS.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**



**Mapping of COs with POs**

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	S	M	S	M	L
<b>CO2</b>	S	S	S	L	L
<b>CO3</b>	S	S	S	M	M
<b>CO4</b>	S	S	S	M	S
<b>CO5</b>	S	M	S	M	M

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
SBEC – II		Course Code: 20UCS4S02		Course Title: Quantitative Aptitude – I
Semester	Hours/Week	Total Hours	Credits	Total Marks
IV	2	30	2	100

### Course Objectives

1. Students will be able to recognize and understand the meaning of targeted grammatical structures in written and spoken form which includes Tense, Sentence Pattern, Articles and Prepositions.
2. The objectives of the Soft Skills are to give each student a realistic perspective of work expectations including interview skills like GD, gestures and other interpersonal skills.
3. To enhance the problem-solving skills, to improve the basic mathematical skills and to help students who are preparing for any type of competitive examinations.
4. Verbal reasoning is intended to test a student ability to understand the potential for critical thinking, problem-solving and ultimately intelligence.

#### **UNIT – I**

Communication: Tense – Sentence Pattern - Articles – Prepositions.

#### **UNIT – II**

Soft Skill: Self Introduction - Interpersonal Skills – Soft Skills Training – Group Discussion – Importance of GD – Types of GD – Movements and Gestures to be Avoided in a GD.

#### **UNIT – III**

Numerical Aptitude: Problems on Numbers – Problems on Ages – Percentage.

#### **UNIT – IV**

Numerical Aptitude: Profit and Loss – Ratio & Proportion – Time & Work.

#### **UNIT – V**

Verbal Reasoning: Letter Series – Number Series – Coding and Decoding.





### Text Books

1. Hari Mohan Prasad & Uma Rani Sinha, “Objective English for Competitive Examinations”, Tata McGraw Hill Education Private Ltd., 2016. (Unit – I)
2. M. S. Rao, “Soft Skills Enhancing Employability-Connecting Campus with Corporate”, IK International Publishing House, New Delhi, 2010. (Unit – II)
3. Alex. K, “Soft Skills-Know Yourself and Know the World”, S.Chand Company Ltd., 2011. (Unit – II)
4. R.S. Aggarwal, “Quantitative Aptitude”, S. Chand Company Limited, 2010. (Unit – III & IV)
5. R.S. Agarwal, “A Modern Approach to Verbal Reasoning (Fully Solved)” –Revised Edition, S. Chand Company Limited, New Delhi, 2012. (Unit – V)

### Reference Books

1. Dr. Rashmi Singh, “Essential English for Competitive Examinations”, 2nd Edition, Disha Publications, 2019.
2. Disha Experts, “Rapid Quantitative Aptitude - With Shortcuts & Tricks for Competitive Exams”, Disha Publications, 2018.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Students can communicate with simple English without any grammatical error.	K3
CO2	Soft Skill improves students work life skills where they can participate in interview in effective manner.	K3
CO3	Students will be expected to actively do mathematics such as Problems on numbers, Problems on Ages, Percentage, Profit and loss, Ratio & Proportion and Time & Work.	K4
CO4	Students have the ability to solve coding decoding, letter series and number series.	K4

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**



### Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	L
CO2	S	S	S	L	L
CO3	S	S	S	M	M
CO4	S	S	S	L	M

S – Strong

M – Medium

L – Low



Program: B.Sc. Computer Science				
SBEC – III		Course Code: 20UCS5S03		Course Title: Mobile App Development Lab
Semester V	Hours/Week 3	Total Hours 45	Credits 2	Total Marks 100

### Course Objectives

1. Understand the basic concept of mobile devices and types of mobile operating system.
2. Ability to know the concept of cross platform system architecture.
3. Use the development tools in the Android development environment.
4. To develop their own apps using the major components of Android API.
5. Use the Java programming language to build.

### **List of Programs**

1. Sample Application about Android Resources
2. Sample Application about Layouts
3. Sample Application about Intents
4. Sample Application about user interfaces
5. Sample Application about Animations
6. Sample Application about SQLite
7. Calculator App in Android
8. Simple Android Camera Application
9. Basic List View Demo in Android
10. Google Map in Android



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand various mobile application development tools.	K2
CO2	Known about Android.	K2
CO3	Understand user interface methods.	K2
CO4	Identify android resources.	K3
CO5	Ability to create mobile application in real time.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	M
CO2	S	M	M	L	L
CO3	S	M	S	M	M
CO4	S	M	S	L	M
CO5	S	S	S	S	S

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
SBEC – IV		Course Code: 20UCS6S04		Course Title: Quantitative Aptitude – II
Semester	Hours/Week	Total Hours	Credits	Total Marks
VI	2	30	2	100

### Course Objectives

1. Students will be able to recognize and understand the meaning of targeted grammatical structures in written and spoken form which includes Active voice, Passive Voice, Question tag, Reading Comprehension.
2. The objectives of the Soft Skills are to give each student a realistic perspective of work expectations including interview skills like GD, gestures and other interpersonal skills.
3. To enhance the problem-solving skills, to improve the basic mathematical skills and to help students who are preparing for any type of competitive examinations.
4. Verbal reasoning is intended to test a student ability to understand the potential for critical thinking, problem-solving and ultimately intelligence.

#### **UNIT – I**

Communication: Active Voice – Passive Voice – Question Tag - Reading Comprehension.

#### **Unit – II**

Soft Skill: Employability Skills – Resume Preparation – Interview Tips and Questions – GD Skills – GD Etiquette – Essential Elements of a GD.

#### **Unit – III**

Numerical Aptitude: Time & Distance – Simple Interest – Compound Interest.

#### **Unit – IV**

Reasoning: Counting figures: Squares and Triangles. Completion of Incomplete Pattern.

#### **Unit – V**

Reasoning: Blood Relation Problems – Sense of Directions – Arrangement Problems – Syllogism.

**Text Books**

1. Hari Mohan Prasad & Uma Rani Sinha, “Objective English for Competitive Examinations”, Tata McGraw Hill Education Private Ltd, Fifth edition, 2014. (Unit – I)
2. M. S. Rao, “Soft Skills Enhancing Employability-Connecting Campus with Corporate”, IK International Publishing House, New Delhi, 2010. (Unit – II)
3. Alex. K, “Soft Skills-Know Yourself and Know the World”, S.Chand Company Ltd., 2011. (Unit – II)
4. R.S. Aggarwal, “Quantitative Aptitude”, S. Chand 2010. (Unit – III & IV)
5. R.S. Agarwal, “A Modern Approach to Verbal Reasoning (Fully Solved)” –Revised Edition, S. Chand Company Limited, New Delhi, 2012. (Unit – V)

**Reference Books**

1. Dr. Rashmi Singh, “Essential English for Competitive Examinations”, 2nd Edition, Disha Publications, 2019.
2. Disha Experts, “Rapid Quantitative Aptitude - With Shortcuts & Tricks for Competitive Exams”, Disha Publications, 2018.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Students can communicate with simple English without any grammatical error.	K3
CO2	Soft Skill improves students work life skills where they can participate in interview in effective manner.	K3
CO3	Students will be expected to actively do mathematics such as Time & Distance, Simple Interest and Compound Interest.	K4
CO4	Students have the ability to solve Blood Relation Problems, Sense of Directions Arrangement Problems and Syllogism.	K4

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	L
CO2	S	S	S	L	L
CO3	S	S	S	M	M
CO4	S	S	S	L	M

**S – Strong**

**M – Medium**

**L – Low**



# Non Major Elective Course (NMEC)





Program: B.Sc. Computer Science				
NMEC – I		Course Code: 20UCS3N01		Course Title: Basics of Computer
Semester III	Hours/Week 2	Total Hours 30	Credits 2	Total Marks 100

### Course Objectives

1. Understand the basic of computer such as types, characteristics and generations.
2. Acquire knowledge about number system.
3. Know about Input and Output devices of computer
4. Learn basic concept of operation system, database, programming languages and office packages.

### **UNIT – I**

Introduction to Computer: Introduction – Types of computers – Characteristics of Computers. Generations of Computers: First Generation – Second Generation – Third Generation – Fourth Generation – Fifth Generation. Classification of Digital Computers: Introduction – Microcomputers – Personal Computer – Portable Computers – Mini Computers – Super Computers – Main Frames.

### **UNIT – II**

Number System: Introduction – Decimal Number System – Binary Number System – Binary-Decimal Conversion – Decimal Binary Conversion – Binary Addition – Binary Subtraction – Complements – 9's Complement – 10's Complement – 1's Complements – 2's Complements – BCD – Bits, Bytes, Words – Octal – Hexadecimal Number System.

### **UNIT – III**

Anatomy of Digital Computer: Functions and Components of Computer – Central Processing UNIT – Control UNIT – Arithmetic – Logic UNIT – Memory – Registers – Addresses. Memory UNITS: RAM, ROM, PROM, EPROM, EEPROM, And Flash Memory.

**UNIT – IV**

Input Devices: Introduction – Keyboard – Mouse – Types of Mice – Connections – Mouse Pad – Trackball – joystick – Digitizing Tablet – Scanners – Digital Camera – MICR – OCR – OMR – Bar Code Reader – Speech Input Device- Touch Screen – Touch Pad – Light Pen. Output Devices: Introduction – Monitor – Classification of Monitors – Monochrome – Gray Scale – Color – Digital Monitor – Analog Monitor – Characteristics of Monitor – Printers.

**UNIT – V**

Computer Software: Introduction – Operating System – Utilities – Compiler and Interpreters – Word Processor – Spreadsheets – Presentation Graphics – DBMS – Programming Languages: Machine Language – Assembly Language – High Level Language – Types of High Level Language. Data Processing: Data VS Information – File Processing – Sequential File Processing – Direct Access File Processing.

**Text Book**

1. Alexis Leon and Mathews Leon, “Fundamentals of Computer Science and Communication Engineering”, Leon Tech world, 1998.

**Reference Books**

1. B Ram and Sanjay Kumar, “Computer Fundamentals”, 5th Edition, New Age International Publishers, 2014.
2. Pradeep K Sinha, Priti Sinha, “Computer Fundamentals”, BPB Publications, 2004.
3. Anita Goel, “Computer Fundamentals”, 1st Edition, Pearson Education India, 2010.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Bridge the fundamental concepts of computers with the present level of knowledge of the students.	K2
CO2	Familiarize the concept of operating systems, programming languages, peripheral devices, networking, multimedia and internet.	K2
CO3	Understand binary, hexadecimal and octal number systems and their arithmetic.	K2
CO4	Understand about the concept of memory classifications.	K2
CO5	Aware of Input and Output devices.	K3 & K4

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	L
CO2	S	M	S	L	L
CO3	S	M	S	M	M
CO4	S	L	S	L	M
CO5	S	M	S	M	M

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Computer Science				
NMEC – II		Course Code: 20UCS3N02		Course Title: System Administration and Maintenance
Semester III	Hours/Week 2	Total Hours 30	Credits 2	Total Marks 100

### Course Objectives

1. Students will learn and apply basic concepts and methodologies of System Administration and Security.
2. Able to install OS and troubleshooting.
3. Understanding the fundamentals of operating system functionalities.
4. Learn about basics of network and fundamental security of network.

### **UNIT – I**

Introduction to Personal Computer: Computer System – Purposes & Characteristics of Cases – Power Supplies – Internal Components – Ports – Cables – Input devices – Output devices. Safe Lab Procedures and Tool Use: Safe Working Conditions and Procedures – Tools and Software used with PC components.

### **UNIT – II**

Computer Assembly: Open Case – Install Power Supply – Attach Components to Motherboard - Installation: Motherboard – Internal Drives – Drives in External Bays - Adapter Cards. Internal Cables Connections –Reattach Side Panels – Connection of External Cables – Boot the Computer. Preventive Maintenance and Troubleshooting: Purpose of Preventing Maintenance – Steps of Troubleshooting Process - Data Protection Purposes.

### **UNIT – III**

Fundamental Operating System: Purposes – Characteristics of Modern Operating Systems – Concepts – Comparisons, Limitations, and Compatibilities – Determination of Operating System Based on Customer Needs – Installation of Operating System – Navigate a GUI (Windows) – Common Preventive Maintenance Techniques – Troubleshoot.

**UNIT – IV**

Fundamental Laptops and Portable Devices: Common Uses – Components of Laptop – Comparison of the Components of Desktop and Laptops – Configure Laptops – Mobile Phone Standards – Preventive Maintenance Techniques – Troubleshoot Laptop and Portable Devices. Fundamental Printers and Scanners: Types of Printers and Scanners – Installation and Configuration Process of Printers and Scanners – Preventive Maintenance Techniques – Troubleshoot.

**UNIT – V**

Fundamental Networks: Principles – Types – Concepts and Technologies – Physical Components – LAN Topologies and Architectures – Standard Organizations – Ethernet Standards – OSI and TCP/IP Models – Configuration of NIC and Modem – Establishing Connectivity – Preventive Maintenance Techniques – Troubleshoot. Fundamental Security: Security Threats – Security Procedures – Preventive Maintenance Techniques – Troubleshoot Security.

**Text Book**

1. David Anfinson & Ken Quamme, “IT Essentials: PC Hardware and Software Companion Guide”, 3rd Edition, Pearson Publications, 2008.

**Reference Book**

1. Quentin Docter, Emmett Dulaney and Toby Skandier, “CompTIA A+ Complete Review Guide: Exam 220-901, Exam 220 – 902”, 3<sup>rd</sup> Edition, Wiley Publications, 2015.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Use multiple computer system platforms, and understand the advantages of each.	K2 & K3
CO2	Install and administer network services.	K2 & K3
CO3	Protect and secure users' information on computer systems.	K3
CO4	Use the command line interface for system administration.	K3
CO5	Install and manage disks and file systems.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

### Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	L
CO2	S	M	S	L	L
CO3	S	S	S	M	M
CO4	S	M	S	L	M
CO5	S	S	S	M	M

S – Strong

M – Medium

L – Low



Program: B.Sc. Computer Science				
NMEC – III		Course Code: 20UCS4N03		Course Title: Office Automation
Semester	Hours/Week	Total Hours	Credits	Total Marks
IV	2	30	2	100

### Course Objectives

1. Give students an in-depth understanding of why MS Office package.
2. Provide hands-on use of Microsoft Office applications Word, Excel and PowerPoint.
3. Create a new document and format a document, prepare how to create bio-data, create how to insert a table in document and create mailing labels using mail merge.
4. Create a database in Excel and sort the data, prepare mark list for a student, pay bill preparation, invoice report and generate a graph for the given data.
5. Create presentation in PowerPoint for a seminar, prepare organization charts, and prepare charts to display percentage of marks in each semester for all students.

#### **UNIT – I**

Exploring word 2007: Working in the Word Environment – Opening, Moving Around in, and Closing a Document – Displaying Different Views of a Document – Creating and Saving a Document – Previewing and Printing a Document.

#### **UNIT – II**

Editing and Proofreading Documents: Make Changes to a Document – Insert Saved Text – Find the Most Appropriate word – Reorganize a Document Outline – Find and Replace Text.

#### **UNIT – III**

Error Corrections: Correct Spelling and Grammatical Errors – Finalize a Document – Changing the Look Quickly Format Text and Paragraphs – Manually Change the Look of Characters. – Manually Change the Look of Paragraphs.

#### **UNIT – IV**

Bulleted and Numbered Lists: Create and Modify Lists – Presenting Information in Columns. Creating Table: Create a Tabular List – Present Information in a Table.

**UNIT – V**

Formatting a Table: Format Table Information – Perform Calculation in a Table – Use a Table to Control Page Layout.

**Text Book**

1. Joyce Cox and Team, “Step by Step 2007 Microsoft Office System”, PHI Learning Private limited, New Delhi, 2009.

**Reference Book**

1. Peter Weverka, “MS Office 2013 All-in-One for Dummies”, 1<sup>st</sup> Edition, Wiley Publications, 2013.

**Course Outcomes (COs)**

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Create a document for various purposes, edit and format the document according to the need.	K3
CO2	Gain knowledge to create spreadsheets and use features like formulas and charts creation, fill series, sorting and filtering.	K3
CO3	Student can prepare Power Point presentation for their seminar including slide show, effects, graphs, etc.	K4
CO4	Enable the students to create database and handle the query	K5 & K6
CO5	Learn to generate reports using MS Access.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	L
CO2	S	S	S	L	L
CO3	S	S	S	M	M
CO4	S	S	S	M	S
CO5	S	M	S	M	M

S – Strong

M – Medium

L – Low





Program: B.Sc. Computer Science				
NMEC – IV		Course Code: 20UCS4N04		Course Title: Basics of Internet
Semester IV	Hours/Week 2	Total Hours 30	Credits 2	Total Marks 100

### Course Objectives

1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to advanced networking concepts, preparing the student for advanced courses in computer networking.
4. Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

### **UNIT – I**

Introduction to The Internet: Computer in Business – Networking – Internet - E-mail – Resource Sharing – Gopher – World Wide Web – Telnet – Bulletin Board Service – Wide Area Information Service.

### **UNIT – II**

Internet Technologies: Modem – Internet Addressing – Physical Connections – Telephone Lines – Internet Browsers – Internet Explorer – Netscape Navigator.

### **UNIT – III**

Introduction to HTML: Designing a Home Page – HTML Documents – Anchor Tag – Hyper Links.

### **UNIT – IV**

Traditional Text and Formatting – Tables - Images – Frames.

**UNIT – V**

Case Study: Online Passport – Online Gas Services – Online Train Reservation – Tamilnadu Government Services.

**Text Books**

1. C Xavier, “World Wide Web with HTML”, Tata McGraw Hill Education, 2000.
2. H.M.Deital, P.J. Deital, “Internet and World Wide Web – How to Program”, 4th Edition “PHI Learning, 2009.

**Reference Websites**

1. <http://www.ebharatgas.com/>
2. <http://passportindia.gov.in/>
3. <https://www.irctc.co.in>
4. <http://www.tn.gov.in/>

**Course Outcomes (COs)**

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Independently understand basic computer network technology.	K3
CO2	Understand and explain Data Communications System and its components.	K3
CO3	Identify the different types of network topologies and protocols.	K4
CO4	Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.	K4
CO5	Identify the different types of network devices and their functions within a network.	K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

**Mapping of COs with POs**

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	L
CO2	S	S	S	L	L
CO3	S	S	S	M	M
CO4	S	M	S	M	M
CO5	S	M	S	M	M

S – Strong

M – Medium

L – Low