St. MARY'S COLLEGE (AUTONOMOUS)

Accredited by NAAC at A+ Grade in 4th Cycle

Thoothukudi – 628 001.

SYLLABUS

B.Sc. COMPUTER SCIENCE

(w.e.f June 2023)

B.Sc. Computer Science

Course Structure (w.e.f. 2023)

Preamble:

B.Sc. The Computer Science program helps students master the basic skills needed to analyze a problem and design, implement, and find a solution to meet the ever-changing demands of the industry and nurture their innovation and creativity.

Vision:

Empower girls byte by byte.

Mission:

To create computer professionals of immense quality and impeccable manners who can face and survive the computing and communication revolution that lies ahead with great confidence.

PROGRAMME OUTCOMES (PO):

PO No.	**After completion of the Undergraduate programme the students of St. Mary's College will be able to**
PO 1	acquire an in-depth domain knowledge and a comprehensive knowledge of various disciplines to become skilled professionals
PO 2	enrich their communicative skills, and enhance their creative, numerical, analytical and problem-solving skills
PO 3	gain potential skills to excel in digital literacy, team management, scientific reasoning, research and self-directed life-long learning to emerge as entrepreneurs
PO 4	be aware of the environment with a social responsibility for the well-being of humanity and the planet at large
PO 5	be an empowered, economically independent woman with a global perspective to emerge holistically in the egalitarian society

PROGRAMME-SPECIFIC OUTCOMES (PSO):

PSO.No	Upon completion of B.Sc Degree programme, the graduates will be able to	PO
PSO-1	acquire in-depth knowledge in the field of computer science and aligned areas	1
PSO-2	understand, formulate and develop programming models for software solutions	1,2
PSO-3	apply problem-solving skills and programming knowledge to provide solutions for real-world problems	2,3
PSO-4	enhance the level of knowledge in recent techniques and tools to analyse, design and develop constructive computer applications	2,3
PSO-5	develop a range of generic skills helpful in employment and get adequate exposure to global and local concerns that provide a platform for further exploration into multi-dimensional aspects of Computing sciences	4,5

Semester I

Part	Components	Course Code	Course Title	Hrs/ Wee	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil / French	23ULTA11 23ULFA11	,f;fhy ,yf;fpak; : (nra;As;> ,yf;fzk;> ,yf;fpa tuyhW> rpWfij) Foundation Course -French I	6	3	25	75	100
II	General English	23UGEN11	Poetry, Prose, Extensive Reading and Communicative English - I	6	3	25	75	100
III	Core I	23UCSC11	Python Programming	5	5	25	75	100
	Core Practical I	23UCSCR1	Python Programming Lab	5	5	40	60	100
	Generic Elective I	23UCSE11	Digital Logic Fundamentals	4	3	25	75	100
IV	Skill Enhancement Course I (Discipline Specific)	23UCSSE1	Office Automation Lab	2	2	20	30	50
	Foundation Course	23UCSF11	Problem Solving Techniques	2	2	20	30	50
			Total	**30**	**23**			

Semester II

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil / French	23ULTA21 23ULFA21	rka ,yf;fpaq;fs; : (nra;As;> ,yf;fzk;> ,yf;fpa tuyhW) Foundation Course: French -II	6	3	25	75	100
II	General English	23UGEN21	Poetry, Prose, Extensive Reading, and Communicative English -II	6	3	25	75	100
III	Core II	23UCSC21	Data Structures and Algorithms	5	5	25	75	100
	Core Practical II	23UCSCR2	Data Structures and Algorithms Lab	5	5	40	60	100
	Generic Elective II	23UCSE21	Discrete Mathematics	4	3	25	75	100
IV	Skill Enhancement Course II (Discipline Specific)	23UCSSE2	Advanced Excel Lab	2	2	20	30	50
	Skill Enhancement Course III (Discipline Specific)	23UCSSE3	Object Oriented Programming Using C++	2	2	20	30	50
Total				**30**	**23**			

Semester III

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil /	23ULTA31	fhg;gpa ,yf;fpaq;fs; : nra;As;> ,yf;fzk;> ,yf;fpa tuyhW> Gjpdk;	6	3	25	75	100
	French	23ULFA31	French Literature and Grammar I					
II	General English	23UGEN31	English Poetry, Prose, Extensive Reading and Communicative English – III	6	3	25	75	100
III	Core III	23UCSC31	Java Programming	4	4	25	75	100
	Core Practical III	23UCSCR3	Java Programming Lab	3	3	40	60	100
	Generic Elective III	23UCSE31	Statistical Methods	4	3	25	75	100
	Generic Elective Practical III	23UCSER1	Web Designing Lab	2	1	40	60	100
	NME I	23UCSN31	Computer Literacy	2	2	20	30	50
IV	Skill Enhancement Course IV ((Discipline Specific)	23UCSSE4	Multimedia Lab 1	2	2	20	30	50
	Ability Enhancement Course I	23UAYM31	Yoga and Meditation	1	1	20	30	50
	Self Study/MOOC/ Internship (Compulsory)	23UCSSS1	C Programming		+2			
Total				**30**	**22+2**			

Semester IV

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil /	23ULTA41	rq;f ,yf;fpaq;fs; : nra;As;> ,yf;fzk;> ,yf;fpa tuyhW> ehlfk;	6	3	25	75	100
	French	23ULFA41	French Literature and Grammar II					
II	General English	23UGEN41	English Poetry, Prose, Extensive Reading and Communicative English - IV	6	3	25	75	100
III	Core IV	23UCSC41	PHP and MySQL	4	4	25	75	100
	Core Practical IV	23UCSCR4	PHP and MySQL Lab	3	3	40	60	100
	Generic Elective IV	23UCSE41	RDBMS	4	3	25	75	100
	Generic Elective Practical IV	23UCSER2	Statistical Methods Lab	2	1	40	60	100
	NME II	23UCSN41	Internet Literacy	2	2	20	30	50
IV	Skill Enhancement Course V (Discipline Specific)	23UCSSE5	Multimedia Lab 2	2	2	20	30	50
	Ability Enhancement Course II (Entrepreneurial Based)	23UACS41	Graphic Design	1	1	20	30	50
V	NCC/NSS/ Sports				1			
	CDP Extension Activity				+1			
Total				**30**	**23+1**			

Note : Ability Enhancement course 23UACS41

Evaluation 20 : 30 will be done only by the department.

Internal and External examinations will be in the form of Practical / Presentation of models / Reports.

Semester V

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
III	Core V	23UCSC51	.NET Programming	5	5	25	75	100
	Core VI	23UCSC52	Microprocessors	5	5	25	75	100
	Core VII	23UCSC53	Data Mining and Warehousing	5	5	25	75	100
	Core VIII	23UCSC54	Software Engineering and Testing	5	4	25	75	100
	Core Practical V	23UCSCR5	. NET Programming Lab	4	2	40	60	100
	Discipline Specific Elective **I**	23UCSE51/ 23UCSE52	IoT and its Applications/ Smart Devices Programming	4	3	25	75	100
IV	Ability Enhancement Course III	23UAEV51	Environmental Studies	2	1	20	30	50
	Self-Study/MOOC / Internship	23UCSSS2	Mathematical Reasoning		+2			
				30	**25 +2**			

Semester VI

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
III	Core IX	23UCSC61	Data Analytics using R	5	5	25	75	100
	Core X	23UCSC62	Computer Networks	5	4	25	75	100
	Core XI	23UCSC63	Operating Systems	5	4	25	75	100
	Core Practical VI	23UCSCR6	R Programming Lab	3	2	40	60	100
	Core XII(Project)	23UCSP61	Project and Viva Voce	6	4	40	60	100
	Discipline Specific Elective II	23UCSE61/ 23UCSE62	Cloud Computing / Cyber Forensic	4	3	25	75	100
IV	Skill Enhancement Course VI (Discipline Specific)	23UCSSE6	MATLAB	2	2	20	30	50
				30	**24**			

UG - Department Coomputer Science
Syllabus 2023-26

Courses	Number of Courses	Hours	Credits	Extra Credits
Tamil	4	24	12	--
English	4	24	12	--
Core Theory	11	53	50	--
Core Practical	6	23	20	
Generic Elective Theory	2	8	6	--
Generic Elective Practical	2	4	2	--
Discipline Specific Elective	4	16	12	--
Group Project(core)	1	6	4	--
Skill Enhancement Course	6	12	12	--
Ability Enhancement Course	3	4	3	--
Foundation Course	1	2	2	--
NME	2	4	4	--
Extension Activities (CDP)	–	–	–	+1
NCC, NSS & Sports		--	1	
Self Study Papers (Optional)	1	--	–	+2

Self Study Papers (Compulsory)	1	--	–	+2
Total	**48**	**180**	**140**	**5**

SEMESTER I			
Core I	**Python Programming**		
Course Code:23UCSC11	**Hrs / week : 5**	**Hrs / Semester: 75**	**Credits : 5**

Objectives:

- To understand the core syntax and semantics of python programming language.
- To acquire the need for working with the strings and functions.
- To study the process of structuring the data using lists, dictionaries, tuples and sets

Course Outcomes:

CO No.	**Upon completion of this course, students will be able to**	**CL**
CO-1	learn the basics of python, Do simple programs on python, Learn how to use an array.	K1
CO-2	develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements.	K2
CO-3	concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.	K3
CO-4	work with List, tuples and dictionary, write program using list, tuples and dictionary.	K4
CO-5	usage of File handlings in python, Concept of reading and writing files, do programs using files.	K5

SEMESTER I			
Core I	**Python Programming**		
Course Code:23UCSC11	**Hrs / week : 5**	**Hrs / Semester: 75**	**Credits: 5**

Unit 1:

Basics of Python Programming: History of Python-Features of Python-Literal-Constants-Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation- Operators-Expressions-Type conversions. **Python Arrays:** Defining and Processing Arrays – Array methods.

Unit II:

Control Statements: Selection/Conditional Branching statements: if, if-else,nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. Jump Statements: break, continue and pass statements.

Unit III:

Functions: Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. Function Arguments: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion.

Strings: String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison.

Modules: import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules.

Unit IV:

Lists: Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples.

Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries.

Unit V:

Python File Handling: Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods- append() method – read() and readlines()

methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.

Textbooks:

1.ReemaThareja, "*Python Programming using problem solving approach*", First Edition, 2017, Oxford University Press
2.Dr. R. NageswaraRao, "*Core Python Programming*", First Edition, 2017, Dream tech Publishers.

Reference Books:

1.VamsiKurama, "*Python Programming*: *A Modern Approach*", Pearson Education.
2. Mark Lutz, "*Learning Python*", Orielly.
3. Fabio Nelli, "*Python Data Analytics*", APress.
4. Kenneth A. Lambert, "*Fundamentals of Python – First Programs*", CENGAGE Publication.

Web Resources:

1.https://www.programiz.com/python-programming
2. https://www.w3schools.com/python/python_intro.asp
3. https://www.geeksforgeeks.org/python-programming-language/
4. https://www.guru99.com/python-tutorials.html
5. https://en.wikipedia.org/wiki/Python_(programming_language)

PSO Relation Matrix (Course Code: 23UCSC11)

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	2	1	2	3	3	3	1	2
CO-2	3	3	2	1	2	3	3	3	1	2
CO-3	3	3	2	1	2	3	3	3	1	2
CO-4	3	3	2	1	2	3	3	3	1	2
CO-5	3	3	2	1	2	3	3	3	1	2

Ave.	3	3	2	1	2	3	3	3	1	2

SEMESTER I			
Core Practical I	**Python Programming Lab**		
Course Code: 23UCSCR1	**Hrs / week :5**	**Hrs / Semester:75**	**Credits :5**

Objectives:

- To get knowledge to design and program python applications
- To construct a program using loops and decision statements in python
- To get familiar with functions, dictionaries and package in python

CO No.	**Upon completion of this course, students will be able to**	**CL**
CO-1	demonstrate the understanding of syntax and semantics of python language	K1
CO-2	identify the problem and solve using PYTHON programming techniques.	K2
CO-3	apply suitable programming constructs for problem solving.	K3
CO-4	analyze various concepts of PYTHON language to solve the problem in an efficient way.	K4
CO-5	develop a PYTHON program for a given problem and test for its correctness.	K5

SEMESTER I			
Core Practical I	**Python Programming Lab**		
Course Code: 23UCSCR1	**Hrs / week :5**	**Hrs / Semester:75**	**Credits :5**

Practical List:

1. Program using variables, constants, and I/O statements in Python.
2. Program using Operators in Python.
3. Program using Conditional Statements.
4. Program using Loops.
5. Program using Jump Statements.
6. Program using Functions.
7. Program using Recursion.
8. Program using Arrays.
9. Program using Strings.
10. Program using Modules.
11. Program using Lists.
12. Program using Tuples.
13. Program using Dictionaries.
14. Program for File Handling

PSO Relation Matrix (Course Code: 23UCSCR1)

Course Outcomes	Programme Outcomes (PO)	Programme Specific Outcomes (PSO)

	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	2	1	2	3	3	3	1	2
CO-2	3	3	2	1	2	3	3	3	1	2
CO-3	3	3	2	1	2	3	3	3	1	2
CO-4	3	3	2	1	2	3	3	3	1	2
CO-5	3	3	2	1	2	3	3	3	1	2
Ave.	3	3	2	1	2	3	3	3	1	2

SEMESTER I			
Generic Elective I	**Digital Logic Fundamentals**		
Course Code: 23UCSE11	**Hrs / week :4**	**Hrs / Semester: 60**	**Credits :3**

Objectives:

- To understand the basic concepts used in the design and analysis of digital systems
- To study number systems, various Boolean gates and functions
- To construct digital circuits using MSI and LSI logic circuits

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	understand various number systems, boolean functions and logic gates.	K1
CO-2	summarize various methods to simplify boolean function.	K2
CO-3	describe combinational circuits with logic gates.	K3
CO-4	construct digital circuits for boolean functions with logic gates.	K4

CO-5	analyse the operation of various flip-flops.	K5

SEMESTER I			
Generic Elective I	**Digital Logic Fundamentals**		
Course Code: 23UCSE11	**Hrs / week :4**	**Hrs / Semester: 60**	**Credits :3**

Unit I:

Binary Systems: Digital Computers and Digital Systems – Binary numbers – Number base conversion – Octal and Hexadecimal numbers – Complements– Binary Codes –Basic theorems and properties of boolean algebra– Boolean functions– Canonical and Standard forms.

Self-Learning: Digital Logic Gates

Unit II:

Simplification of Boolean Functions: The Map method – Two and Three variable Maps – Four Variable Map– Five and Six Variable Maps – Product of Sums Simplification – NAND and NOR Implementation– Don't care conditions – The Tabulation method – Determination of Prime – Selection of Prime – Implicants

Unit III:

Combinational Logic: Introduction– Design Procedure – Adders – Subtractors – Code Conversion– Multilevel NAND Circuits – Multilevel NOR Circuits – Exclusive-OR and Equivalence Functions.

Unit IV:

Combinational Logic with MSI and LSI: Introduction– Binary Parallel Adder – Decimal Adder– Magnitude Comparator– Decoders – Multiplexers

Unit V:

Registers and Counters: Sequential logic -Introduction – Flip-Flops -Basic Flip-Flop Circuit-Clocked RS Flip-Flop-D-Flip-Flop-JK Flip-Flop- T-Flip-Flop- Registers – Shift Registers-Ripple counter.

Text Book:

1. M. Morris Mano, *Digital Logic and Computer Design*, Noida: Pearson education India, First Edition, 2016.
   Chapters: 1.2-1.6, 2.3-2.5, 2.7, 3.1-3.11, 4.1-4.5, 4.7-4.9, 5.1-5.6, 6.1, 6.2, 7.1-7.3

Books for Reference:

1. Charles H.Roth, Jr. *Fundamentals of Logic Design*, New Delhi: Cengage Learning India Private Limited, 7th Edition, 2015
2. Donald.Givone, *Digital Principles and Design*, New Delhi: Tata McGraw-Hill, First Edition, 2012.
3. Donald P.Leach and Albert Paul Malvino, *Digital Principles and Applications*, New Delhi: Tata McGraw Hill, 8th Edition, 2014.

PSO Relation Matrix (Course Code: 23UCSE11)

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	2	1	2	3	3	3	1	2
CO-2	3	3	2	1	2	3	3	3	1	2
CO-3	3	3	2	1	2	3	3	3	1	2
CO-4	3	3	2	1	2	3	3	3	1	2
CO-5	3	3	2	1	2	3	3	3	1	2
Ave.	3	3	2	1	2	3	3	3	1	2

SEMESTER I			
Skill Enhancement Course I (Discipline Specific) **Office Automation**			
Course Code:23UCSSE1	**Hrs / week:2**	**Hrs / Semester: 30**	**Credits :2**

Objectives:

- To familiarize various Microsoft Office components
- To apply various formatting tools and use formulae
- To create database , effective presentations and charts

Course Outcomes:

CO.No.	Upon completion of this course, students will be able to	CL
CO-1	acquire basic knowledge of word, excel, PowerPoint and Access	K1
CO-2	understand the formatting of texts in word, formatting in excel, basics of presentation and database concepts	K2
CO-3	construct tables, organize word documents with images, make use of formulas in excel, utilize animations in PowerPoint,	K3

CO-4	examine spell checker, analyze data, discover use of forms	K4
CO-5	create mail merge, create charts, create a powerPoint with audio and video, create queries	K5

SEMESTER I			
Skill Enhancement Course I (Discipline Specific)	**Office Automation**		
Course Code:23UCSSE1	**Hrs / week:2**	**Hrs / Semester: 30**	**Credits :2**

Practical List:

1. Use various formatting in a Word Document. Use find and replace.
2. Prepare a Calendar in a Word Document
3. Design a wedding invitation in a Word Document
4. Use mail merge in word document.
5. Picture Insertion and Alignment.
6. Prepare a semester wise mark statement for a computer class of 10 students using any spreadsheet" worksheet. Total, average and rank the student marks.
7. Create an employee worksheet and calculate their salary.
8. Use any spreadsheet to use mathematical, statistical and logical functions
9. Use any spreadsheet to plot a chart for marks obtained by the students
10. Create a database for a Telephone Directory. Create a table named phone book with relevant fields. Enter a minimum of 10 records. Create a query.
11. Create a student database and create validation rules for fields like age, date of birth, pincode etc. Create a report.
12. Enter data to the student database using a form and create a query.
13. Create a PowerPoint presentation about your college.

14. Create a PowerPoint presentation about your hobbies.
15. Create a PowerPoint presentation about the sport which you like.

PSO Relation Matrix (Course Code: 23UCSSE1)

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	3	1	2	3	3	3	1	3
CO-2	3	3	3	1	2	3	3	3	1	3
CO-3	3	3	3	1	2	3	3	3	1	3
CO-4	3	3	3	1	2	3	3	3	1	3
CO-5	3	3	3	1	2	3	3	3	1	3
Ave.	3	3	3	1	2	3	3	3	1	3

SEMESTER I			
Foundation Course	**Problem Solving Techniques**		
Course Code: 23UCSF11	**Hrs / week :2**	**Hrs / Semester: 30**	**Credits :2**

Objectives:

- To understand the importance of algorithms and programs, and to know of the basic problem solving strategies
- To learn efficient strategies and algorithms to solve standard problems
- To develop skill to design algorithmic solutions to problems

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	acquire knowledge of the fundamentals of algorithms, programs and problem -solving techniques	K1

CO-2	understand basic concepts of programming languages to solve problems	K2
CO-3	develop skills in writing algorithms and programs using factoring methods	K3
CO-4	analyse complex problems to find computational solutions for array processing	K4
CO-5	enhance computing skills to find the systematic and logical approach to software solutions for string processing and recursive functions	K5

SEMESTER I			
Foundation Course	**Problem Solving Techniques**		
Course Code: 23UCSF11	**Hrs / week :2**	**Hrs / Semester: 30**	**Credits :2**

Unit I:

Introduction to computer Problem-solving :- Programs and Algorithms -The problem-solving aspect-Top-Down Design - Implementation Of Algorithms-

Unit II:

Fundamental Algorithms: Exchanging the values of two variables – Counting - Summation of a set of numbers -Find largest of three integers- Factorial computation - Sine function computation -Fibonacci Series generation - Reversing the digits of an integer – Sum of first N odd numbers and even numbers

Unit III:

Factoring Methods: The smallest divisor of an integer – Greatest common divisor of two integers - Generating prime numbers – Computing the prime factors of an integer – given integer is prime or not- Raising a number to a large power – Computing the nth Fibonacci number.

Unit IV:

Array Techniques: Array order reversal – Finding the maximum number in a set - Removal of duplicates from an ordered array - linear search – Finding the kth smallest element – Longest monotone subsequence.

Unit V:

Text Processing and Pattern Searching: Text line length adjustment -counting the vowels in a text -given string is Palindrome not- concatenating the strings –Recursive algorithms: Towers of Hanoi

Text Book:

1. R. G. Dromey, *How to Solve it by Computer*, Pearson India, 2007.

Books for Reference:

1. George Polya, Jeremy Kilpatrick, *The Stanford Mathematics Problem Book: With Hints and Solutions*, Dover Publications, 2009 (Kindle Edition 2013).

2. Greg W. Scragg, *Problem Solving with Computers*, Jones & Bartlett 1st edition, 1996.

PSO Relation Matrix (Course Code: 23UCSF11)

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	2	1	2	3	3	3	1	2
CO-2	3	3	2	1	2	3	3	3	1	2
CO-3	3	3	2	1	2	3	3	3	1	2
CO-4	3	3	2	1	2	3	3	3	1	2
CO-5	3	3	2	1	2	3	3	3	1	2
Ave.	3	3	2	1	2	3	3	3	1	2

SEMESTER II			
Core II	**Data Structures and Algorithms**		
Course Code: 23UCSC21	**Hrs / week : 5**	**Hrs / Semester: 75**	**Credits : 5**

Objectives:

- To impart the basic concepts of data structures and algorithms
- To acquaint the student with the basics of the various data structures and make the students knowledgeable in the area of data structures
- To apply appropriate data structure for the real-life problem

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	acquire the knowledge of data structures and algorithms	K1
CO-2	summarize the algorithms of various data structures	K2
CO-3	describe the applications of various data structures	K3
CO-4	compare and contrast various data structures.	K4
CO-5	apply appropriate data structure for creating solutions to the real-world problem	K5

SEMESTER II			
Core II	**Data Structures and Algorithms**		
Course Code: 23UCSC21	**Hrs / week : 5**	**Hrs / Semester: 75**	**Credits: 5**

Unit I:

Algorithm: Pseudo code – The Abstract Data Type – A Model for an Abstract Data Type - Algorithms Efficiency.

Searching: List Searches – Hashed List Searches – Collision Resolution

Unit II

Linked Lists: Linear List Concepts – Linked List Concepts – Linked List Algorithms – Processing a Linked List – Complex Linked List Structures

Unit III:

Stacks: Basic Stack operations – Stack Liked List Implementation – Stack Applications

Queues: Queue operations – Queue Linked List Design

Unit IV:

Trees: Basic Tree Concepts – Binary Trees – Binary Tree Traversals – Expression Trees – General Trees – Binary search Trees –AVL Trees-AVL Tree implementation - AVL Abstract data type

Heap: Definition-Heap Structure – Basic Heap Algorithms. – Heap Data Structures – Heap Algorithms

Unit V:

Sorting: General sort concepts – Shell sort - Heap sort- Quick sort – External sorts.

Graphs: Terminology – Operations –Graph storage structure- Graph Algorithms – Insertion – Deletion – Traversal – BFS and DFS – Networks – Minimum Spanning Tree – Shortest Path Algorithm

Text Book:

1. Richard F.Giolberg & Behrouz,A. forouzan,*Data Structures - A Pseudocode*

Approach with C++, 4th edition Thomson Brooks /Cole,2001

Books for Reference:

1. Ellis Horowitz &SartajSahani,*Fundamentals of Data Structures*,GalGotia publications,2006.

2. Adam Drozdek, *Data Structures & Algorithm in Java* third edition, Ingram, 2008.

3. Mark Allen Weiss , "*Data Structures and Algorithm Analysis in C++* . Pearson Education 2014,

4th Edition.

PSO Relation Matrix (Course Code: 23UCSC21)

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	3	3	2	1	2	3	3	3	1	2
CO-2	3	3	2	1	2	3	3	3	1	2
CO-3	3	3	2	1	2	3	3	3	1	2
CO-4	3	3	2	1	2	3	3	3	1	2
CO-5	3	3	2	1	2	3	3	3	1	2
Ave.	3	3	2	1	2	3	3	3	1	2

SEMESTER II			
Core Practical II	**Data Structures and Algorithms Lab**		
Course Code: 23UCSCR2	**Hrs / week: 5**	**Hrs / Semester:75**	**Credits: 5**

Objectives:

- To understand and implement basic data structures using C++
- To apply linear and non-linear data structures in problem-solving
- To implement applications of data structures

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	acquire knowledge of data structures and algorithms	K1
CO-2	implement various types of data structures using C++	K2
CO-3	compare and contrast data structures	K3
CO-4	develop programs using recursion	K4
CO-5	apply appropriate data structure to solve a real-life problem	K5

SEMESTER II			
Core Practical II	**Data Structures and Algorithms Lab**		
Course Code: 23UCSCR2	**Hrs / week : 5**	**Hrs / Semester:75**	**Credits : 5**

Practical List:

1. Implementation of Sequential search and Binary search
2. Implement linked list and perform the following operations
   i. Add a node as first node ii. Add a node as last node
3. Implement Linked list and perform the following operations.
   i. Delete the first node ii. Delete the last node
4. Array implementation of stacks
5. Array implementation of Queues
6. Linked list implementation of Stacks
7. Linked list implementation of Circular Queue
8. Implement a Binary Tree Traversal
9. Implementation of Graph Traversal.
10. Implementation of Merge sort.
11. Implementation of Quick sort.
12. Implementation of Shell sort.
13. Implementation of Heap sort.

SEMESTER II			
Generic Elective II	**Discrete Mathematics**		
Course Code: 23UCSE21	**Hrs / week: 4**	**Hrs /Semester:60**	**Credits: 3**

Objectives:

- To attain mathematical foundations this is essential for the study of computer courses
- To make the students capable of mathematically formulating certain practical problems
- To understand the basic concepts of graphs, directed graphs, and weighted graphs and able to present a graph by matrices

Course Outcomes:

CO.No.	Upon completing this course, students will be able to	CL
CO-1	acquire knowledge of the concepts of set theory and relations	K1
CO-2	understand and construct mathematical functions and algorithms	K2
CO-3	apply counting techniques to solve computational problems	K3
CO-4	describe and manipulate propositional calculus	K4
CO-5	evaluate the validity of logical arguments and use graphs and trees as tools to visualize and simplify situations	K5

SEMESTER II			
Generic Elective II	**Discrete Mathematics**		
Course Code: 23UCSE21	**Hrs / week: 4**	**Hrs /Semester:60**	**Credits: 3**

Unit I:

Set Theory: Sets and elements – universal set and empty set –Subsets – Venn Diagrams – set operations – Algebra of sets and duality – finite sets, counting principle – class of sets, power sets, and partitions – mathematical induction.

Relations: Product sets – relations – pictorial representations of relations – composition of relations – types of relations – closure properties – equivalence relations – partial ordering relations – n-ary relations.

Unit II:

Functions And Algorithms: Functions – One – to – one – Onto and Inevitable functions – mathematical functions, exponential and logarithmic functions – sequences, indexed classes of sets – recursively defined functions – cardinality – algorithms and functions – complexity of algorithms.

Unit III:

Logic And Propositional Calculus: Propositions and compound propositions – Basic logical operations – propositions and truth tables – tautologies and contradictions – logical equivalences – algebra of propositions – conditional and biconditional statements – arguments – logical implication – prepositional functions, Quantifiers – Negation of quantified statements.

Unit IV:

Counting: Basic counting principles – factorial Notation – Binomial coefficients – permutations – combinations – the pigeonhole principle – the inclusion–exclusion principle – ordered and unordered partitions.

Unit V:

Graph Theory: Data structures – graphs and multigraphs – subgraphs, Isomorphic and homeomorphic graphs – paths, connectivity – the bridges of Konigsberg, traversable multigraphs – labelled and weighted graphs – complete, regular, and bipartite graphs – tree graphs.

Directed Graphs: Introduction- Directed Graphs- Basic Definitions- Rooted Trees.

Text Book:

1. Seymour Lipschutz, Marc Lipson "*Discrete Mathematics"* Third Edition 2010, Tata McGraw Hill.

Books for Reference:

1. B.S. Vatsa, "*Discrete Mathematics*", Wishwa Prakashan, Third Edition.

2. K.D. Joshi, "*Foundation of Discrete Mathematics*", Wiley Eastern Ltd.

PSO Relation Matrix (Course Code: 23UCSE21)

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	2	1	2	3	3	3	1	2
CO-2	3	3	2	1	2	3	3	3	1	2
CO-3	3	3	2	1	2	3	3	3	1	2
CO-4	3	3	2	1	2	3	3	3	1	2
CO-5	3	3	2	1	2	3	3	3	1	2
Ave.	3	3	2	1	2	3	3	3	1	2

SEMESTER II			
Skill Enhancement Course II (Discipline Specific)	**Advanced Excel Lab**		
Course Code: 23UCSSE2	**Hrs / week: 2**	**Hrs /Semester:30**	**Credits: 2**

Objectives:

- To help the students learn the advanced features of Excel, to summarise, analyse, explore, and present visualisations of data in the form of charts, graphs
- To make the students Create financial models, and budgeting using advanced Excel functions.
- To analyze data using PivotTables and Pivot Charts

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	learn how to use various functions and effectively manage large amounts of data.	K1
CO-2	aggregates numeric data, and summarise it into categories and subcategories.	K2
CO-3	apply Filtering, sorting, and grouping data or subsets of data	K3
CO-4	create Simple and classic Pivot Tables, Grouping based on numbers and Dates	K5
CO-5	create dynamic and interactive charts and integrate many charts into one	K5

Practical List:

1. Find the following: i. How to use VLOOKUP Function in Excel
   ii. Pulling Out Data Based on Partial Match with VLOOKUP
   iii. How to use the HLOOKUP Function in Excel?
   iv. How to use the LOOKUP Function in Excel?

2. **Troubleshoot VLOOKUP Function.**

In this exercise, you'll find five VLOOKUP related errors. Your task is to fix those errors. You shouldn't use IFERROR, IFNA, or similar functions. The five errors are:

i. **VALUE! error**
   Formula on the cell: =VLOOKUP (C10,A1:D11,0,true)

ii. **N/A error**
   Formula on the cell: =VLOOKUP (B11,$B$1:$D$6,3,0)

ii. **REF error**
   Formula used: =VLOOKUP(B2,B2:C7,4,0)

iii. **Wrong Output error**
   Formula used: =VLOOKUP

iv. **NAME error**
   Formula used: = VLOOKUP(B15,A2:D11,3,fa)

3. **Date Calculations and Conditional Formatting:**
   i. Calculate your Age from Date of Birth
   ii. Apply formats to students over 19 years

4. **Pivot Table:**
   i. Create a pivot table
   ii. How can you modify the Pivot Tables in Excel?

5. A worksheet contains the following data:

	NAME	GENDER	CLASS	CATEGORY	FEES
1	Joe	M	SY	Open	5000
2	Deep	M	FY	Open	3000
3	Jayesh	M	SY	Reserved	1000
4	Yash	M	TY	Reserved	1000
5	Sara	F	FY	Reserved	500
6	Gita	F	FY	Open	3000
7	Jinal	F	TY	Open	5000

8	Kavita	F	SY	Open	4000
9	Minal	F	SY	Reserved	1000
10	Karan	M	TY	Reserved	1000
11	Abhay	M	TY	Open	5000
12	Bina	F	FY	Open	3000
13	Seema	F	FY	Reserved	2500
14	Naresh	M	FY	Reserved	1500
15	Rima	F	TY	Open	5000
16	Gajendra	M	SY	Open	4000

Filter the worksheet to show

a) Female students from the Reserved category

b) Male students from TY

c) Open category students paying fees > 3000

6. Data Cleaning and Processing

The Olympic committee has data on the athletes "Athletes.xlsx" (attached) and is found to be dirty for any analysis. To be ready for analyzing and obtaining the answers for various questions:

a. Clean up the file

b. Freeze the 1st row and the 1st column

c. Make the 1st row filterable

d. Make the names of the athletes in the proper case

e. Highlight Gold Medalist with Red text, Bold and Green background. Also, highlight the athlete with a Cost per head below 80 units.

f. Vegetarians are marked with 0 and non-vegetarians with 1. Change this marking and denote all vegetarians as Yes and non-vegetarians as No. The Married column has also coded 0 for Unmarried and 1 for Married. Change this coding and mark Unmarried to No and Married to Yes

g. The committee wants to mention the religion of the athletes as "Christian, Muslim, Hindu, Others" in this dataset. Create a column "Religion" and make the necessary validation so that the columns do NOT take values other than "Christian, Muslim, Others"

7. Use Database Functions in Excel.

8. Sorting and Filtering.

9. A worksheet containing Roll Number and marks in 5 subjects for 10 students in a class, calculate the Result and Grade using the following:

i. A student is declared PASS if he gets 40 or more in all subjects, otherwise FAIL.

ii. A student fails if they score below 40 in any subject.

iii. For PASSED students Grades will be obtained as follows:

AVERAGE	**GRADE**
>=60	I
<60 but >=50	II
<50 but >=40	III

10. For the following worksheet containing the amount spent for various items during the year, prepare scenarios were

a) Machinery increases to 80,000, carriage increases to 9000 & Postage increases to 8000

b) Carriage increases to 10,000 Office equipment increases to 7000 and postage increases to 9000

S.No.	Items	Items
1	Machinery	60000
2	Carriage	8000
3	Transport	30000
4	Office equipment	6000
5	Postage	7000
6	Miscellaneous	3000
7	Generator	5000
8	Total	119000

11. Mr. Raj is a cricketer and has a target of getting at least 50 runs in the tournament. Out of 8, he played 7 matches and already scored 326 runs. So, in the tournament's final match, he wants to know what the targeted score (goal) will be.

The below table shows the runs scored by Mr. Raj.

Particulars	**Values**
Match 1	87
Match 2	39
Match 3	40
Match 4	50
Match 5	43
Match 6	37
Match 7	30
Match 8	

12**.** A worksheet contains names and marks in 3 subjects. Calculate Total Marks **(Include Name for all)**

a) Construct a 3D Pie Chart for Total marks

b) Construct a 2D Line Chart for Subject 1 and Subject 3

c) Construct 2D Column Chart for Sub1, Sub2, Sub3

d) Construct Stacked Column Chart for Sub1, Sub2, Sub3

	A	**B**	**C**	**D**	**E**

1	NAME	SUB 1	SUB 2	SUB 3	TOTAL MARKS
2	Deep	50	45	65	
3	Jayesh	60	56	85	
4	Yash	70	76	67	
5	Sara	78	83	50	
6	Gita	79	64	43	
7	Jinal	80	51	35	
8	Kavita	82	46	40	
9	Minal	66	79	40	
10	Naresh	60	30	70	
11	Rima	67	44	46	

13. a. Extract names and company details from email addresses
    b. Text to Columns using Flash Fill
    c. Concatenation of cells and text strings
    d. Reformat the Numbers
    e. Extract letters from text strings.

14. i. Find the value of X and Y in the following arithmetic equation with the help of the solver tool.

$$56=2X-5+Y^2$$

ii. Given Data Set. Get the maximum profit.

A	B	C	D
Product	Quantity	Profit per Product	Overall profit
Speaker	100	10	1000
Keyboard	20	16	320
Pendrive	230	33	7590
	350		8910

Constraints: Here are a couple of constraints that you need to consider while trying to maximize the profit.

- At least 100 Quantities of Widget A should be made.
- At least 20 Quantities of Widget B should be made.
- At least 50 Quantities of Widget C should be made.
- A total of 350 widgets should be made.

15. How to Create a Pivot Table Slicer in Excel?

Date	Sales Person	Region	Sales

1/28/2019	Jack	South	1,946
2/28/2019	Liam	North	1,234
2/28/2019	Mark	Central	1,012
4/30/2019	Jack	West	926
5/31/2019	Mark	East	1,715
6/30/2019	Jimmy	South	1,346
7/31/2019	Rinku	North	1,062
8/31/2019	Mac	Central	1,779
9/30/2019	Mark	West	1,230
10/31/2019	Jack	East	1,621

16. Create employees' salary sheets.

1. Type the following worksheet

Emp. No	Name	Basic Salary	House Rent	Conv. Allowance	Medical Allowance	Gross	Tax	Net
1	ABC	8000						
2	XYZ	3500						
3	KLM	8900						
4	WXY	4500						
5	MNO	6500						
6	PQR	4000						
7	STU	7800						

Total Salary

2. In the “Basic Salary” column values greater than 10,000 are not allowed
3. Calculate House Rent (if Basic Salary is greater than 5000 then 45% otherwise 30%)
4. Calculate Conv. Allowance (if Basic Salary is greater than 5000 then 30% otherwise 20%)
5. Calculate Medical Allowance (if Basic Salary is greater than 5000 then 60% otherwise 45%)
6. Calculate Gross Pay
7. Calculate Tax (if Gross is greater than 15000 then 10% otherwise 0)
8. Calculate Net Pay
9. Calculate the total salary of those employees whose salary is less than 5000
10. Count no. of employees who are not giving tax

PSO Relation Matrix (Course Code: 23UCSSE2)

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	3	1	2	3	3	3	1	3
CO-2	3	3	3	1	2	3	3	3	1	3
CO-3	3	3	3	1	2	3	3	3	1	3
CO-4	3	3	3	1	2	3	3	3	1	3
CO-5	3	3	3	1	2	3	3	3	1	3
Ave.	3	3	3	1	2	3	3	3	1	3

SEMESTER II			
Skill Enhancement Course III (Discipline Specific)	**Object Oriented programming using C++**		
Course Code: 23UCSSE3	**Hrs / week: 2**	**Hrs / Semester: 30**	**Credits: 2**

Objectives:

- To understand the basic concepts of object-oriented programming language
- To develop problem-solving skills using C++
- To apply operator overloading and polymorphism

Course outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	acquire knowledge of classes and objects	K1
CO-2	understand classes, objects, operator loading, inheritance	K2
CO-3	apply operator overloading, inheritance, polymorphism	K3
CO-4	analyze operator overloading, types of inheritance	K4
CO-5	evaluate constructors, abstract classes, polymorphism	K5

SEMESTER II			
Skill Enhancement Course III (Discipline Specific)	**Object Oriented programming using C++**		
Course Code: 23UCSSE3	**Hrs / week : 2**	**Hrs / Semester: 30**	**Credits : 2**

Unt I:

Classes and Objects: Declaring Objects – Defining Member Functions – Static Member variables and functions – array of objects –friend functions – Overloading member functions – Constructor and destructor with static members.

Unit II:

Operator Overloading: Overloading unary, binary operators – Overloading Friend functions – type conversion.

Unit III:

Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchal, Hybrid, Multi path inheritance – Virtual base Classes – Abstract Classes.

Unit IV:

Pointers: Declaration – Pointer to Class, Object – this pointer – Pointers to derived classes and Base classes.

Unit V:

Arrays: Characteristics – an array of classes – Memory models – new and delete operators – dynamic object – Binding, Polymorphism, and Virtual Functions.

Text Book:

1. E. Balagurusamy, "*Object-Oriented Programming with C++*", TMH 2013, 7th Edition.

Reference Books:

1. Ashok N Kamthane, "*Object-Oriented Programming with ANSI and Turbo C++*", Pearson Education 2003.
2. Bjarne Stroustrup, "*The C++ Programming Language*", Fourth Edition, Pearson Education
3. Hilbert Schildt, (2009), "*C++ - The Complete Reference*", 4th Edition, Tata McGrawHill

Web Resources

1.https://alison.com/course/introduction-to-c-plus-plus-programming

PSO Relation Matrix (Code: 23UCSSE3)

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	3	3	2	1	2	3	3	3	3	2
CO-2	3	3	2	1	2	3	3	3	3	2
CO-3	3	3	2	1	2	3	3	3	3	2
CO-4	3	3	2	1	2	3	3	3	3	2
CO-5	3	3	2	1	2	3	3	3	3	2
Ave.	3	3	2	1	2	3	3	3	3	2

SEMESTER III			
Core III	**Java Programming**		
Course Code: 23UCSC31	**Hrs / week: 4**	**Hrs / Semester: 60**	**Credits: 4**

Objectives:

- To understand the basic concepts and fundamentals of platform-independent Object-Oriented Language
- To demonstrate skills in writing programs with exception-handling techniques and Multithreading
- To understand streams, efficient user interface design techniques, Applets, AWT and Database concepts

Course Outcomes:

CO.No.	Upon completion of this course, students will be able to	CL
CO-1	understand the concepts related to Java Technology.	K1
CO-2	design Packages, Manage Exceptions and Apply Threads.	K2
CO-3	apply the concepts of Multithreading and Exception handling to develop efficient and error-free codes.	K3
CO-4	create GUI screens as well as handle events.	K4
CO-5	learn to access and develop databases through Java programs, using Java Database Connectivity (JDBC)	K5

SEMESTER III			
Core III	**Java Programming**		
Course Code: 23UCSC31	**Hrs / Week :4**	**Hrs / Semester: 60**	**Credits :4**

Unit I:

The History and Evolution of Java - Overview of Java - Operators – Control Statements – Introducing Classes - A Closer Look at Methods and Classes - Inheritance.

Self-Learning: Data Types, Variables and Arrays.

Unit II:

Packages and Interfaces: Packages - Access Protection – Importing Packages-Interfaces.**Exception Handling:** Exception-Handling Fundamentals-Exception Types-Uncaught Exceptions-Using try and catch- Multiple catch clauses-Nested try Statements-throw-throws-finally-Java's Built-in Exceptions.

I/O Basics-Reading Console Input-Writing Console Output-The PrintWriter Class-Reading and Writing Files. **Multithreaded Programming:** Java Thread Model-Main Thread-Creating a Thread-Creating Multiple Threads- Using is Alive() and join ()-Thread Priorities-Synchronization - Interthread Communication-Suspending, Resuming, and Stopping Threads.

Unit III:

The Applet Class: Applet Basics -Applet Architecture - Applet Skeleton - Simple Applet Display Methods - Requesting Repainting - HTML APPLET tag - Passing Parameters to Applet. **Event Handling:** Event Handling Mechanisms - Delegation Event Model - Event Classes (The Action Event, Item Event, Key Event, Mouse Event) - Sources of Events - Event Listener Interfaces (Action Listener, Item Listener, Key Listener, Mouse Listener).

Unit IV:

Introducing the AWT: AWT Classes-Window fundamentals -working with Frame Windows -Working with Graphics. **Using AWT Controls:** Controls Fundamentals -Labels-Using Buttons-Applying Check Boxes-Check Box Group-Choice Controls-Using a Text Field-Using a Textarea-Understanding Layout Managers-[Flow Layout Only]-Menu Bars and Menus.

Self-Learning: Adapter Classes

Unit V:

JDBC: JDBC – JDBC versus ODBC – Types of JDBC drivers – Connection – Statement – PreparedStatement.- Fields of ResultSet – Methods of ResultSet – Executing a query - ResultSetMetaData – DatabaseMetaData.

Text Books:

1. Herbert Schildt. *The Complete Reference Java™* . New Delhi:Tata Mc Graw Hill. 12thEdition 2021.
2. S. Horstmenn and Gary Cornell, *Core Java2 Volume II Advanced Features.* The Sun Microsystems press Java Series. 2002.

Books for Reference:

1. Steven Holzner. *Java 2 Programming Black Book*. New Delhi: Dream Tech Press.2005.
2. Joseph O'Neil. *JavaBeans Programming from the GroundUp*. New Delhi: TMGH. 1998
3. Kathy Walrath. *The J2EE Tutorial. New* Delhi: Pearson. Education Asia 2003.

PSO Relation Matrix (Course Code: 23UCSC31)

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	3	1	2	2	2	3	3	3
CO-2	3	2	3	1	2	3	2	3	3	3
CO-3	3	3	3	1	2	3	3	3	3	3
CO-4	3	3	3	1	2	3	3	3	3	3
CO-5	3	3	3	1	3	3	3	3	3	3
Ave.	2.8	2.6	3	1	2.2	2.8	2.8	3	3	3

SEMESTER III			
Core Practical III	**Java Programming Lab**		
Course Code: 23UCSCR3	**Hrs/week: 3**	**Hrs / Semester: 45**	**Credits: 3**

Objectives:

- To provide fundamental knowledge of object-oriented programming.
- To enable the students to know about String Concepts and Event Handling.
- To equip the student with programming knowledge in to create GUI using AWT controls.

Course Outcomes:

CO.No.	**Upon completion of this course, students will be able to**	**CL**
CO-1	write object-oriented programs in Java: Objects, Classes, constructors, Inheritance, Overloading and overriding methods, Abstract classes, and Extended classes.	K3
CO-2	develop Packages, Interfaces and Exception Handling in Java.	K5
CO-3	develop GUI applications to handle events.	K5
CO-4	develop Applet programs.	K5
CO-5	develop database through Java programs, using Java Database Connectivity (JDBC)	K5

Practical List:

1. Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer.
2. Write a Java program that displays the number of characters, lines and words in a text
3. Implement Overloading Constructor and Overloading Method
4. Writing a Program to apply method Overriding concept.
5. Development of Java Packages
6. To create and implement an interface.
7. To create a thread Using Thread class.
8. To create an applet with four Checkboxes with labels and a Text area object.
9. To create a window with a checkbox group with boxes for the colors, Violet, Indigo, Yellow, Orange, Red, Blue and Green. When the button is selected the background color must change accordingly.
10. To demonstrate the use of choice box.
11. Write a program to demonstrate the use of following exceptions.

    i. Arithmetic Exception ii. Number Format Exception

    iii. ArrayIndexOutofBoundException iv. NegativeArraySizeException

12. To illustrate mouse event handling.
13. Menu Creation.
14. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, and % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.

SEMESTER III			
Generic Elective III	**Statistical Methods**		
Course Code:23UCSE31	**Hrs / week:4**	**Hrs / Semester: 60**	**Credits :3**

Objectives:

- To measure the central tendency
- To understand measures of dispersion
- To acquire knowledge about Correlation and Regression

Course Outcomes:

CO. No.	Upon completion of this course, students will be able to	CL
CO-1	define arithmetic mean, skewness, kurtosis	K1
CO-2	explain measures of dispersion	K2
CO-3	calculate arithmetic mean	K3
CO-4	analyze correlation coefficient	K4
CO-5	evaluate Regression	K5

SEMESTER III			
Generic Elective III	**Statistical Methods**		
Course Code:23UCSE31	**Hrs./week:4**	**Hrs. / Semester: 60**	**Credits :3**

Unit I:

Central Tendencies: Arithmetic Mean -Partition Values - Median - Mode- Geometric Mean- Harmonic Mean.

Unit II:

Measures of Dispersion: Range- quartile deviation - mean deviation- standard deviation.

Unit III:

Moments – Skewness Bowleys Method - Karl-Pearsons's Method - Kelly's Method and Kurtosis.

Unit IV :

Curve fitting: Principles of Least Squares -Fitting a straight line - Fitting a second-degree parabola.

Unit V:

Correlation and Regression: - Introduction - Correlation - Rank Correlation - Regression. correlation coefficient for a bivariate frequency distribution

Text Book:

1. Dr. S. Arumugam and Mr. A. ThangapandiIssac, "*Statistics"* New Gamma Publishing House, Palayamkottai, June 2015.

Books for Reference:

1. S.P. Gupta, "*Statistical Methods*" Sultan Chand and Sons, New Delhi, Forty Second Revised Editions, 2012

2. S. C. Gupta and V. K. Kapoor *Fundamentals of Mathematical Statistics***,** 12th Edition.

SEMESTER III			
Generic Elective Practical I	**Web Designing Lab**		
Course Code:23UCSER1	**Hrs. / week:2**	**Hrs. / Semester: 30**	**Credits:1**

Objectives:

- To learn how to design and develop a Web page using HTML and CSS
- To learn how to link pages so that they create a website
- To design and develop a Web site using text, images, links, lists, and tables for navigation and layout

Practical List:

1. Create a web page of your College.
2. Create a web page to display your marks.
3. Write an HTML code to display a list of five cars in a frame, Link each one to a brief description in the second frame. The left frame should display the list and the right frame should display the paragraph about the frame.
4. Write an HTML program to create an E-Mail registration form.
5. Design a Web page using CSS which includes the following:
    i. Use Different fonts and styles
    ii. Set the background image
    iii. Define styles for links as A: link, A: visited, A: active and A: hover
6. Write a Java Script to prepare an EB Bill.
7. Write a Java Script to design a simple calculator to perform sum, product, difference and quotient operations.
8. Write a JavaScript to validate the following fields:
    i. Name (should contain alphabet and the length should not be less than 6 characters)
    ii. Password (should not be less than 6 characters in length)
    iii. Email id (must follow the pattern)
    iv. Mobile No (should contain 10 digits)
9. Check the grade of the student according to the percentage of criteria using DHTML.
10. Changing the colors of the text using DHTML.

SEMESTER III			
NME I	**Computer Literacy**		
Course Code: 23UCSN31	**Hrs./week: 2**	**Hrs/Semester: 30**	**Credits: 2**

Objectives:

- To acquire knowledge of basic concepts, and functions of the computer system.
- To understand the various software and networking concepts.
- To demonstrate an understanding of the role and function of computers.

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	understand the various types of computers	K1
CO-2	practicing with the concept number system	K2
CO-3	understand the input and output devices of computer and their uses	K3
CO-4	explain basic concepts of computer software and the various types of software	K4
CO-5	classify operating system software and its functions	K5

SEMESTER III			
NME I	**Computer Literacy**		
Course Code:23UCSN31	**Hrs/week: 2**	**Hrs/Semester: 30**	**Credits: 2**

Unit I:

Introduction to Computers: Types of Computers – Characteristics of Computers – Word Length – Speed – Storage – Accuracy – Automation – Diligence.

Five Generations Of Modern Computers: Introduction – First Generation (1945-1956) – Second Generation Computers (1956-1963) Third Generation Computers (1964-1971) - Fourth Generation Computers(1971-Present) - Fifth Generation Computers (Present and Beyond)

Unit II:

Classification of Computer System: Introduction – Microcomputers– Personal Computers (PCs) – Workstations – Portable Computers – Minicomputers – Mainframes – Supercomputers – Network Computers.

Anatomy of a Digital Computer: Central Processing Unit-Control Unit-Arithmetic-Logic Unit-Memory-Registers-Addresses

Number System: Introduction – Decimal Number System – Binary Number System – Binary-Decimal Conversion – Decimal-Binary Conversion – Binary Addition\Subtraction

Unit III:

Input Devices & Output Devices: Keyboard – Mouse – Scanners – Joystick – Digitizing Tablet –Digital Camera-Magnetic Ink Character Recognition-Optical Character Recognition-Optical Mark Recognition-Barcode reader – Speech Input Devices- Touch Screen – Touch Pad-Light Pen-Monitor-Printers

Unit IV:

Introduction to Computer Software: Introduction – Operating System – Compilers & Interpreters – Word Processors – Database Management System (DBMS) – Image Processors

Operating System: Introduction – Functions of an Operating System – Classification Of Operating Systems – Introduction to UNIX, Windows NT, Mac OS, DOS, And Linux.

Unit V:

Computer Networks: Introduction – Telecommunication Processors – Communication Processors- Communication Media.

Types of Networks: Network Topology -Telecommunication Software – Network Protocols – Network Architecture

Text Book:

1. Alexis Leon & Mathews Leon. *Introduction To Computers*. India: McGraw Hill Education Private Limited. Fifth Reprint, Edition 2008.

Books for Reference:

1. Dr.P.Velmani. "*Computers Basics to Advancements"*. India: Chess Educational Publishers. First Edition.
2. Peter Norton's. "*Introduction to computers"*. India: New Delhi: Tata McGraw-Hill. Edition 2004

PSO Relation Matrix (Course Code: 23UCSN31)

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	2	2	1	2	2	2	3	2
CO-2	2	2	2	2	1	2	2	2	3	2
CO-3	3	3	3	2	2	3	2	3	2	3
CO-4	3	3	3	2	2	3	3	3	3	3
CO-5	3	3	3	2	3	3	3	3	3	3
Ave.	2.6	2.6	2.6	2	1.8	2.6	2.4	2.6	2.8	2.6

SEMESTER III			
Skill Enhancement Course IV (Discipline Specific)	**Multimedia Lab 1**		
Course Code:23UCSSE4	**Hrs / week:2**	**Hrs / Semester: 30**	**Credits :2**

Objectives:

- To learn the fundamentals of Graphic Design.
- To make the students work with Text and Graphics.
- To produce materials for marketing for web and print.

Practical List:

1. Design a CD label.
2. Design a Visiting card.
3. Design a Logo for a company.
4. Design a Greeting card.
5. Design a Book cover.
6. Creating a Professional Coffee Label Design.
7. Create 3D Logo Design.
8. Create a Text Label Design Using Free Fonts
9. Create a Sticker Text Effect.
10. Making a Vector from a Photo
11. Design a brochure.
12. Text Affects Creation Using Layered Text.

SEMESTER III			
Ability Enhancement Course I Yoga and Meditation			
Course Code: 23UAYM31	**Hrs/week: 1**	**Hrs/Semester: 15**	**Credits: 1**

Course Outcomes:

- To learn and practice various meditation, yoga methods to transform the ordinary life into a healthy, harmonious life leading to holistic wellbeing.
- To create an eco-friendly, loving and compassionate world.
- Acquire knowledge and skill in yoga for youth empowerment.
- Increase their power of concentration.
- Learn the causes and ways to overcome fear and sadness.

Unit I:

Meditation: Meditation – Purposes of meditation– Major types of meditations: Zazen, Mindfulness, Vipasana, Yoga, Self-inquiry, Listening, Qi Gong, Taoist, Tantra– Health benefits of meditation: physical, psychological, spiritual–Meditation and Silence:Silence of the body, mind, heart,and beyond – General methodology of meditation – Tips for better meditation **Exercises**: Practicing Zazen meditation – Self-enquiry meditation exercises

Unit II:

Self-Awareness: Awareness – Self-awareness – Importance of self-awareness – Shades of self-awareness – Difference between Awareness and Concentration – Power of concentration – Levels of concentration – How to increase concentration? – Beauty of living here and now – Ways to develop your presence – Self-awareness and Ecology: interconnectedness **Exercises**: Body Scan exercise – Self-Witnessing exercise – Eating Raisin with full awareness

Unit III:

Yoga: Meaning and importance of yoga – Yoga and human physical system – Principles of Yoga – Different types of yoga – Yoga and balanced diet – Yoga and energy balance – Pranayama – Surya namaskaram– Basic asanas for healthy life – Therapeutic benefits of simple yogasanas – Naturopathy for common ailments.

Exercises:Practicing basic Asanas – Doing Sun Salutation

Unit IV:

Mindfulness: Definition of mindfulness – Three components of mindfulness– Benefits of mindfulness – Mindfulness and Brainwave patterns – Myths about mindfulness – Scientific Facts about mindfulness – Formal method to practice mindfulness – Qualities of Mindfulness – Obstacles for mindfulness – informal ways of practicing mindfulness – Mindfulness to get rid of addictions

Exercises: Practice Mindful Walking –Practice Mindful Talking

Unit V:

Heartfulness: Attitude to life – Power of positive attitude – Techniques to develop positive attitude – Positive vs negative people – Forms of negative attitude – Heartfulness – Managing fear: Basic 5 fears, Ways to overcome fear–Handling anger: Anger styles, Tips to tame anger – Coping with sadness: Causes and ways to overcome sadness, dealing with depression – Ultimacy of compassion: Compassion to oneself, towards others: Forgiveness, to nature: Seeing God in all

Exercises: Practice Loving-Kindness meditation– Doing compassionate actions

Text Book:

1) Thamburaj Francis. *Meditation and Yoga for Holistic Wellbeing.* Trichy:Grace Publication. 2019.

Books for References:

1. Osho. *Meditation the Only Way*. New Delhi: Full Circle Publication, 2009.
2. Thamburaj Francis. Journey from Excellence to Godliness: Zen Meditation for Transformation. Grace Publication, Trichy, 2017.
3. Osho. Awareness: The Key to Living in Balance. New York: St.Martin's Griffin Publication, 2001.
4. Tolle Eckart.The Power of Now: A Guide to Spiritual enlightenment. New World Library, 2004.
5. Swami Gnaneswarananda. Yoga for Beginners. Calcutta: Sri Ramakrishna Math, 2010.
6. HanhThichNhat. The Miracle of Mindfulness: An Introduction to the Practice of Meditation. Beacon Press, 2016.
7. Kamlesh D. Patel and Joshua Pollock. The Heartfulness Way: Heart-Based Meditations for Spiritual Transformation. Westland Publications, 2018.

SEMESTER III	
Self-study (Compulsory)	**C Programming**
Course Code: 23UCSSS1	**Credits: +2**

Objectives:

- To understand the concepts of structured basic programming concepts.
- To write algorithms, flowcharts and programs
- To use and implement data structures like arrays and structures to obtain solutions.

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	describe the algorithm, flowchart and various library functions of the C language	K1
CO-2	develop programs using input/output and arithmetic expressions.	K2
CO-3	write User-defined functions and apply the concept of recursion to solve problems.	K3
CO-4	apply appropriate Control structures to solve problems	K4
CO-5	develop programs using arrays and strings.	K5

SEMESTER III	
Self-study (Compulsory)	**C Programming**
Course Code:23UCSSS1	**Credits: +2**

Unit I:

C Fundamentals: The C Character Set - Identifiers and Keywords - Data Types Constants Variables and Arrays - Declarations - Expressions - Statements - Symbolic Constants.

Operators and Expressions: Arithmetic Operators - Unary Operators - Relational and Logical Operators - Assignment Operators - The Conditional Operator - Library Functions

Unit II:

Data Input and Output: Single Character Input-The getchar Function-Single Character Output-The putchar Function-Entering Input Data-More about the scanf function-Writing output data – The printf function- The scanf Function-More about the printf function -The gets and puts Functions.

Unit III:

Control Statements and Branching: The if-else Statement-Looping: The While Statement-More Looping: The do-while Statement-Still More Looping: The for Statement-Nested Control Structures-The switch Statement-The break Statement-The continue Statement-The comma Operator-The go to Statement.

Unit IV:

Functions: Defining a Function-Accessing a Function-Function Prototypes- Passing Arguments to a Function- Recursion. Program Structure: Storage Classes- Automatic Variables- External (Global) Variables- Static Variables.

Unit V:

Arrays: Defining an Array-Processing an Array - Passing Arrays to Functions- Multidimensional Arrays - Arrays and Strings.

Text Book:

1. E. Balagurusamy, *Programming in ANSI C.*India: McGraw Hill Education Private Limited, Eighth Edition 2019.

Books for Reference:

1. Byron Gottfried, *Programming with C* . India: McGraw Hill Education Private Limited. Third Edition 2017.

2. Ashok N. Kamthane, *Programming with ANSI and Turbo C.* New Delhi: Pearson education. Third Edition 2008.
3. Venugopal K R and Sudeep R Prasad, "*Mastering C"*. India: Tata McGraw Hill. Second Edition, 2017.

Web Resources:

1. computer-fundamental/algorithm-and-flowchart.htm
2. https://www.geeksforgeeks.org/an-introduction-to-flowcharts

PSO Relation Matrix (Course Code: 23UCSS1)

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	3	1	2	2	2	3	3	3
CO-2	3	2	3	1	2	3	2	3	3	3
CO-3	3	3	3	1	2	3	3	3	3	3
CO-4	3	3	3	1	2	3	3	3	3	3
CO-5	3	3	3	1	3	3	3	3	3	3
Ave.	2.8	2.6	3	1	2.2	2.8	2.8	3	3	3

SEMESTER IV			
Core IV	**PHP and MySQL**		
Course Code: 23UCSC41	**Hrs/week:4**	**Hrs / Semester: 60**	**Credits:4**

Objectives:

- To learn fundamental concepts of PHP scripting language.
- To acquire the basic concepts of the MySQL database
- To create dynamic web pages and websites.

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	define the basics of PHP and My SQL	K1
CO-2	understand fundamental concepts of arrays , files in PHP and MySQL databases and Tables	K2
CO-3	apply the concepts of database creations using PHP coding, SQL commands to query the databases	K3
CO-4	examine the various SQL Commands in Shell and PHP concepts with cookies and sessions to create dynamic web pages	K4
CO-5	develop applications with PHP coding and MySQL connections	K5

SEMESTER- IV			
Core IV	**PHP and MySQL**		
Course Code:23UCSC41	**Hrs. / week :4**	**Hrs. / Semester: 60**	**Credits:4**

Unit I

History of PHP - Variables, Statements, and Operators:- Embedding PHP in HTML- Writing Statements and Comments- Storing Values in Variables - Understanding Simple Data Types - - Using Operators to Manipulate and Compare Variable - Using Arithmetic Operators - Using String Operators - Using Comparison Operators

Conditional Statements and Loops:- Conditional Statements: if () Statement -switch () Statement- Nesting Conditional Statements - Merging Forms and Their Result Pages with Conditional Statements- **Loops**: while() loop -do loop() -for() - Controlling Loop Iteration with break and continue.

Unit II

Arrays and Custom Functions: Using Arrays to Group related values- - creating user-defined functions

Files, Sessions, Cookies, and External Programs:- Reading and Writing files- Managing Sessions and using session variables-Storing data in Cookies- Executing external programs- Sample applications.

Unit III

MySQL: Working with databases and Tables:- Understanding a relational database- understanding SQL queries- SQL | DDL, DQL, DML, DCL and TCL Commands

Working with databases and tables: Creating databases - Creating Tables - Altering Tables - Backing Up and Restoring Databases and Tables - Dropping Databases and Tables - Viewing Database, table, and Field Information.

Unit IV

Editing Records and Performing Queries:- Inserting Records - Editing and Deleting Records - Performing Queries - Retrieving Specific Columns - Filtering Records with a WHERE Clause - Using Operators - Sorting Records and Eliminating Duplicates - Limiting Results - Using Built-In Functions - Grouping Records - Joining Tables - Using Subqueries - Using Table and

Column Aliases- **MySQL Security System:-** Assigning, Revoking and viewing user Privileges- Working with user accounts and passwords

Unit V

Querying a MySQL Database with PHP: Using MySQL and PHP Together- Managing - Database Connections - Performing Queries - Processing Result Sets -- Handling Errors - Using Ancillary Functions.
Validating User Input: Setting Input Constraints at the Database Layer- Validating Input at the Application Layer
Formatting Query Output: Formatting Dates and Times-sample database applications

Text Books:
1. Vikaram Vaswani "PHP and MySQL"- Tata McGraw-Hill 2005

Books for Reference:

1. Vikram Vaswani *PHP A Beginner's Guide* New York,TATA McGraw-Hill , 2009
2. Php & Mysql In Easy Steps 2Nd Edition by Mike Mcgrath, In Easy Steps "in Easy Steps LimitedJune 2018
3. Steve Suehring and Janet Valade "*PHP, MySQL, & JavaScript All-in-One For Dummies*" ,John Wiley & Sons, Inc. Hoboken, 2018
4. Steven Holzner , "*The Complete reference PHP"*, Tata McGraw Hill,2008

PSO Relation Matrix (Course Code: 23UCSC41)

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	3	1	2	2	2	3	3	3
CO-2	3	2	3	1	2	3	2	3	3	3
CO-3	3	3	3	1	2	3	3	3	3	3
CO-4	3	3	3	1	2	3	3	3	3	3
CO-5	3	3	3	1	3	3	3	3	3	3
Ave.	2.8	2.6	3	1	2.2	2.8	2.8	3	3	3

SEMESTER IV			
Core Practical IV	**PHP and MySQL Lab**		
Course Code: 23UCSCR4	**Hrs/week :3**	**Hrs. / Semester: 45**	**Credits :3**

Objectives:

- To understand programming fundamentals in PHP
- To acquire knowledge on databases and tables in MySQL
- To practice connections and operations on databases with PHP coding

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	define various tags to design webpages , PHP statements ,files and MySQL commands	K1
CO-2	understand fundamental concepts SQL commands, PHP statements, database and table creation, and MySQL connection statements	K2
CO-3	construct programs using PHP simple ,looping statements, file operations a, Database and table creations	K3
CO-4	outline the various SQL Commands in Shell to create databases and tables and queries to prepare the result-set	K4
CO-5	test the MySQl connections and PHP codings to create applications	K5

SEMESTER IV			
Core Practical IV	**PHP and MySQL Lab**		
Course Code: 23UCSCR4	**Hrs/week :3**	**Hrs. / Semester: 45**	**Credits :3**

Practical List:

1. Creating a simple webpage using PHP.
2. Write programs using looping statements in PHP.
3. Creating programs using arrays.
4. Creating user defined functions.
5. File manipulation using PHP.
6. Creating a simple table with constraints.
7. Insertion, Updation and Deletion of rows in MYSQL tables.
8. Searching for data by different criteria with sub queries
9. Sorting of data.
10. Demonstration of joining tables.
11. PHP script to set, retrieve and delete cookies
12. PHP script using session variables.
13. Validating Input.

SEMESTER IV			
Generic Elective IV	**RDBMS**		
Course Code:23UCSE41	**Hrs / week :4**	**Hrs / Semester: 60**	**Credits :3**

Objectives:

- To efficiently organize data and effectively retrieve data
- To apply E-R diagrams and normalization procedures to avoid redundancy in storing data
- To familiarize issues of parallel and distributed databases

Course Outcomes:

CO. No.	Upon completion of this course, students will be able to	CL
CO-1	understand database concepts and database management system software	K1
CO-2	explain database design and models	K2
CO-3	implement normalization techniques	K3
CO-4	analyze the architecture of databases	K4
CO-5	apply database concept to real life problem	K5

SEMESTER IV			
Generic Elective IV	**RDBMS**		
Course Code:23UCSE41	**Hrs / week:4**	**Hrs. / Semester: 60**	**Credits :3**

Unit I:

RDBMS: System Applications-Purpose of Database Systems-View of Data-Database Languages-Relational Databases-Database Design-Data Storage and Querying-Transaction Management-Database Architecture-Data Mining and Information Retrieval-Specialty Databases-Database Users and Administrations-History of database Systems

Introduction to Relational Model: Structure of Relational Databases-Database Schema-Keys-Schema Diagrams-Relational Query Language Formal Relational Query Language-Relational Operations

Unit II:

Formal Relational Query Languages: The relational Algebra- Fundamental operations – Formal definition of algebra-Extended relational algebra operations –Tuple relational calculus

Database Design and the E-R Model: Overview of the Design process-The entity Relationship Model-Constraints-Removing Redundant Attributes-Entity Sets-Entity Relationship Diagrams-Reduction to Relational Schemas-Entity Relationship Issues-Extended E-R Features-Alternative Notations for modeling data.

Unit III:

Relational Database Design: Features of Good Relational-Designs-Atomic Domains and First Normal Form-Decomposition using Functional dependencies-Functional-Dependency Theory-Algorithms for Decomposition- Decomposition Using Multivalued Dependencies-More Normal Forms-Database Design Process

Storage Structure: Overview of Physical Storage Media-Magnetic Disk and Flash Storage-RAID-Tertiary Storage-

Unit IV:

File Structure: File Organization-Organization of Records in Files-Data Dictionary Storage-Database Buffer

Database System Architectures: Centralized and Client-Server Architectures-Server System Architecture-Parallel Systems- Distributed Systems

Unit V:

Parallel Databases: I/O Parallelism-Interquery Parallelism-Intraquery Parallelism

Distributed Databases: Homogeneous and Heterogeneous databases-Distributed Data Storage-Distributed Transactions

Text Book:

1. Abraham Silberschatz Henry F.KorthS.Sudharshan."*Database System Concepts"*.NewYork:Tata McGraw Hill.Sixth Edition 2013.

Books for Reference:

1. C.J.Data A.KannanS.Swamynathan."*An Introduction to Database"* India: Pearson Education.Eighth Edition 2006.
2. Raghu Ramakrishna."*Database Management System"* .India:McGraw Hill College Publication.Fourth Edition 2015.
3. G.K. Gupta."*Database Management System"*.NewDelhi:Tata Mc Graw HillEducationPrivate Limited.2011.
4. .Ramez ElmasriShamkant B. Navatha."*Fundamentals of database System"* .India :Pearson Education.Sixth Edition 2011.

PSO Relation Matrix (Course Code: 23UCSE41)

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	3	1	2	2	2	3	3	3
CO-2	3	2	3	1	2	3	2	3	3	3
CO-3	3	3	3	1	2	3	3	3	3	3
CO-4	3	3	3	1	2	3	3	3	3	3
CO-5	3	3	3	2	3	3	3	3	3	3
Ave.	2.8	2.6	3	1.2	2.2	2.8	2.8	3	3	3

SEMESTER IV			
Generic Elective Practical II	**Statistical Methods Lab**		
Course Code:23UCSER2	**Hrs / week:2**	**Hrs. / Semester: 30**	**Credits :1**

Objectives

- To measure the central tendency
- To understand measures of dis person
- To acquire knowledge about correlation and regression

Course Outcomes:

CO.No.	Upon completion of this course, students will be able to	CL
CO-1	define arithmetic mean, skewness, kurtosis	K1
CO-2	explain measures of dispersion	K2
CO-3	calculate arithmetic mean	K3
CO-4	analyze correlation coefficient	K4
CO-5	evaluate Regression	K5

Practical List :

1. Calculate Arithmetic mean
2. Calculate Geometric Mean
3. Calculate Harmonic Mean
4. Calculate Range
5. Calculate Quartile deviation
6. Calculate mean deviation
7. Calculate Standard deviation

8. Calculate Skewness and Kurtosis
9. Calculate Correlation coefficient
10. Calculate Regression

PSO Relation Matrix (Course Code: 23UCSER2)

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	3	2	1	2	3	2	2	3	2
CO-2	2	3	2	1	2	2	2	2	3	2
CO-3	3	3	2	1	2	3	2	3	2	3
CO-4	3	3	2	1	2	3	3	3	3	3
CO-5	3	3	2	1	2	3	3	3	3	3
Ave.	3	3	2	1	2	2.6	2.4	2.6	2.8	2.6

SEMESTER IV			
NME II	**Internet Literacy**		
Course Code:23UCSN41	**Hrs/week:2**	**Hrs/Semester:30**	**Credits: 2**

Objectives:

- To learn various terminologies used in the internet.
- To use various services provided by the internet.
- To learn searching techniques for the desired information over the internet.

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	outline the History of the Internet	K1
CO-2	compare different types of browsers and their tools	K2
CO-3	explain blogging and its functions	K3
CO-4	describe Electronic Publishing and applications	K4
CO-5	explain Social Networking and awareness of Social Networking	K5

SEMESTER IV			
NME II	**Internet Literacy**		
Course Code:23UCSN41	**Hrs/week:2**	**Hrs/Semester:30**	**Credits: 2**

Unit I:

Introduction to Internet –A brief History of Internet – How does Internet Work – What is special about the Internet.

How Internet works – Introduction – People and Organizations –Hardware.(Pages 1-36)Chapters1,2,3

Unit II:

World Wide Web – Introduction-Internet and Web- How the Web Works- A Brief History of WWW. **Web Browsers and Web Browsing** – Types of Browsers – Web Browsing.
(Pages 42-54) chapter 4

Unit III:

Websites and Web pages - Introduction-Web Design-Creating a website-Web Hosting-Website Promotion-**Blogging**-Introduction-What is a Blog-Why Blog-History of Blogs-State of the Blogosphere-Why is Blogging so popular-Blog Search Engines and Communities-Authors, Books and Blogs-Blogs and Employment-Pitfalls to avoid while Blogging-Is Blogging Good or Bad. (Pages 115-121,135-144)Chapter-11,13

Unit IV:

Electronic Publishing - Introduction- Electronic Publishing(E-Publishing) - E-book Readers-Economics of E-Publishing-Application of E-publishing- E-publishing--Advantages and Disadvantages

Social Networking-Introduction-Social Networking Timeline-Why Social Networking-Dangers of Social Networking-Getting Connection. (Pages 145-155) Chapter 14,15

Unit V:

Making Money on the Internet-Introduction-Writing-Product Reviews-Sharing Your Knowledge-Advertising –Affiliate Programs-Selling-On-line Tutoring-Creating Your Web Presence-A Case Study (Pages 180-198) Chapter-18,19

Text Book:

1. Alexis Leon & Mathews Leon. "*Internet for Everyone"*, India: Leon Press.15th Anniversary Edition.

Books for Reference:

1. Fred T, Hofstetter ,*"Internet Literacy"*, Mcgraw-Hill Inc,US , 2nd Edition
2. Vikas Gupta, "*Internet and Web design"*, India: Rematch Press I. Edition 2003.

PSO Relation Matrix (Course Code: 23UCSN41)

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	2	2	2	2	1	2	2	2	3	2
CO-2	2	2	2	2	1	2	2	2	3	2
CO-3	3	3	3	2	2	3	2	3	2	3
CO-4	3	3	3	2	2	3	3	3	3	3
CO-5	3	3	3	2	3	3	3	3	3	3
Ave.	2.6	2.6	2.6	2	1.8	2.6	2.4	2.6	2.8	2.6

SEMESTER IV			
Skill Enhancement Course V **(Discipline Specific)** **Multimedia Lab 2**			
Course Code:23UCSSE5	**Hrs / week :2**	**Hrs / Semester: 30**	**Credits: 2**

Objectives:

- To understand how to work with layers.
- To use effects and filters.
- To combine two separate images into one.

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	understand the fundamentals of Adobe Photoshop and how to navigate the interface.	K1
CO-2	develop proficiency in using basic and advanced tools and features to manipulate images and graphics.	K2
CO-3	learn how to work with layers, selections, and masks to create complex designs and artwork.	K3
CO-4	gain expertise in color correction, photo retouching, and compositing.	K4
CO-5	apply design principles and best practices to create professional-quality graphics, logos, and advertisements.	K5

SEMESTER IV			
Skill Enhancement Course V (Discipline Specific) Multimedia Lab 2			
Course Code:23UCSSE5	**Hrs / week:2**	**Hrs / Semester: 30**	**Credits: 2**

Practical List:

1. Design a sport poster design using layer mask.
2. Design image with double exposure effect.
3. Design creative fish tank.
4. Design window shadow with light effect.
5. Design a company advertisement using text behind an object.
6. Design a photo frame using a dripping photo effect.
7. Remove tooth braces, pimples from cheeks, dark circles and change the color of the teeth.
8. Design image with bubble effect.
9. Design an image with glowing effect.
10. Design an image with typography effect.
11. Use Filters.
12. Create frame animation.

SEMESTER IV			
Ability Enhancement Course II Graphic Design			
Course Code: 23UCSA41	**Hrs./week:1**	**Hrs./Semester:15**	**Credits: 1**

Objectives:

- To promote and sell products, to convey a message, or to develop a brand identity.
- To create visually appealing infographics using Canva and Gravit Designer, enhancing them with illustrations drawn in Pencil 2D.
- To obtain employment as a Graphic Designer.

CO No.	Upon completion of this course, students will be able to	CL
CO-1	define various designing concepts	K1
CO-2	understand designing tools and components	K2
CO-3	apply different animation techniques	K3
CO-4	Examine various presentation techniques	K4
CO-5	develop attractive videos and upload in department channels	K5

SEMESTER IV			
Ability Enhancement Course II Graphic Design			
Course Code: 23UCSA41	**Hrs./week:1**	**Hrs./Semester:15**	**Credits: 1**

Unit I:

Canva: Graphic design for creating social media graphics, presentations and videos.

Unit II:

GIMP: Enhance photography and image manipulation.

Unit III:

Pencil 2D: making cartoons using traditional techniques, managing vector and bitmap drawings and animations

Unit IV:

Gravit Designer: Create High-quality Vector Graphics.

Unit V:

OpenShot: Video making and editing.

Web Resources:

1. https://www.canva.com
2. https://www.gimp.org
3. https://www.pencil2d.org
4. https://cloud.gravit.io
5. https://www.openshot..org

SEMESTER V			
Core V	**.NET Programming**		
Course Code: 23UCSC51	**Hrs/week:5**	**Hrs. / Semester: 75**	**Credits:5**

Objectives:

- To understand the .NET framework and learn C# programming.
- To attain Knowledge about web server controls and apply it.
- To create websites with database connectivity using ADO.NET.

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	define MSIL, ASP.NET, list types of server controls	K1
CO-2	understand .NET framework, discuss HTML server control, ASP.NET page life cycle	K2
CO-3	apply List controls and validation controls, on websites	K3
CO-4	analyze value type and reference type, anatomy of an ASP.NET	K4
CO-5	organize websites with web control, Calendar Control, and Database access	K5

SEMESTER V			
Core V	**.NET Programming**		
Course Code: 23UCSC51	**Hrs. / week:5**	**Hrs. / Semester: 75**	**Credits:5**

Unit I:

.NET and C# Language: The Evolution of Web Development - ASP.NET - .NET Framework - C# Language Basics -Variables and Data Types - Arrays - Object-Based Manipulation - Conditional Logic -Loops -The Basics About Classes -Value Types and Reference Types- Understanding Namespaces and Assemblies - Partial Classes

Unit II:

Developing ASP.NET Applications: Creating Websites- Designing a Web Page - Exploring the Anatomy of a Web Form -Writing Code -Web Form Understanding the Anatomy of an ASP.NET Application -Introducing Server Controls - HTML Control Classes - Using the Page Class -Using Application Events

Web Controls: Web Control Classes -List Controls-Table Controls-Web Control Events and AutoPostBack

Unit III:

Validation and Rich Controls Understanding Validation-Using the Validation Controls-Manual Validation Rich Controls-The Calendar Control - The Adrotator Control

User Controls: Working with Independent User Controls-Working with Integrated User Controls - Using User-Control Events

Unit IV:

Working with Data: ADO.NET Fundamentals-Configuring Database -Understanding the Data Provider Model -Using Direct Data Access -Using Disconnected Data Access

Data Binding : Introducing Data Binding -Using Single-Value Data Binding-Using Repeated-Value Data Binding-Working with Data Source Controls -Working with Data Source Controls

Unit V:

Data Controls: The GridView- Formatting the GridView -Selecting a GridView Row-Editing with the GridView.

Website Security: Authentication and Authorization-Forms Authentication -Windows Authentication.

Text Book:

1. Matthew MacDonald, *"Beginning ASP.NET 4.5 in C#* 2010", APRESS,2012.

Books for Reference:

1. Harsh Bhasin. " *Programming in C#"*, New Delhi: Oxford University Press. First Edition 2014.
2. MridulaParihar, YeshSingal and Nitin Pandey. *"Visual Studio .Net Programming*". New Delhi: Prentice Hall India. First Edition 2002
3. Black Book. Kogent Learning Solutions Inc,"*NET 4.0 Programming (6-in-1)"*,New Delhi : Dream Tech Press.
4. Paul Deitel and Harvey Deitel, "*C# 2010 for Programmers"*, New Delhi: Pearson Education 4th Edition.
5. G. Andrew Duthie. "*Microsoft ASP.NET Step by step"*. Microsoft Press, 2003
6. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner. "*Professional C# 2012 and .NET 4.5*", New Delhi: Wiley India Private Ltd. First Edition 2012.

Web Resources:

https://www.hesab.net/book/asp.net/ASP.NET%20Bible.pdf

PSO Relation Matrix (Course Code: 23UCSC51)

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	2	1	2	3	3	3	3	3
CO-2	2	2	2	1	2	3	3	3	3	3
CO-3	3	3	3	1	2	3	3	3	3	3
CO-4	3	3	3	1	3	3	3	3	3	3
CO-5	3	3	3	1	3	3	3	3	3	3
Ave.	2.8	2.8	2	1	2.4	3	3	3	3	3

SEMESTER V			
Core VI	**Microprocessors**		
Course Code: 23UCSC52	**Hrs/week:5**	**Hrs. / Semester: 75**	**Credits :5**

Objectives:

- To acquire fundamental knowledge of hardware and software concepts of microcomputer and microprocessor architecture.
- To provide assembly language programming techniques
- To understand the concepts of interrupts

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	define Microprocessors, microcontroller assembly language, memory interfacing various types of instructions and interrupts	K1
CO-2	understand the architecture of 8085 Microprocessor, memory interfacing, simple assembly language programs and interrupts	K2
CO-3	classify various types of assembly language instructions and show the use of stack and subroutines-related instructions	K3
CO-4	examine the assembly language programs to solve simple mathematical problems and to apply looping and delay concepts	K4

CO-5	explain the architecture of 8085, memory interfacing , programming techniques with various instructions, interrupts in 8085 and concepts in 8085 and high-performance processors	K5

SEMESTER V			
Core VI	**Microprocessors**		
Course Code: 23UCSC52	**Hrs. / week :5**	**Hrs. / Semester: 75**	**Credits :5**

Unit I:

Microprocessor, Microcomputers and Assembly Language:- Microprocessors - Microprocessor Instruction Set and Computer Languages-From Large Computers to Single Chip Micro Controllers.**8085 Microprocessor Architecture And Memory Interfacing :** The 8085 MPU- Memory Interfacing – Interfacing the 8155 memory section.

Unit II:

Introduction to 8085 Assembly Language Programming:- The 8085 Programming Model-Instruction Classification – Instruction Format -How to Write, Assemble and Execute a Simple Program-Overview of the 8085 Instruction Set.

Introduction to 8085 Instructions:- Data transfer operations-Arithmetic Operations-Logic Operation – Branch Operations – Writing Assembly Language Programs-Debugging a Program-I/O interfacing

Unit III:

Programming Techniques With Additional Instructions:- Programming Techniques: Looping ,Counting and Indexing- Additional Data Transfer and 16bit Arithmetic Instruction-Arithmetic Operations Related to Memory-Logic Operations: Rotate, Compare-Dynamic Debugging.

Counters and Time Delays: -Counters and Time Delays-Hexadecimal Counter-Modulo ten Counter-Generating Pulse Waveforms-Debugging Counter and Time Delay Programs.

Unit IV:

Stacks And Subroutines:- Stack-Subroutine-Restart, Conditional Call and Return Instruction-Advanced Subroutine Concepts.

Code Conversion, BCD Arithmetic and 16-bit Data Operations:- BCD to Binary Conversion - Binary to BCD Conversion- BCD Addition and Subtraction-Multiplication -Subtraction with carry.

Unit V:

Interrupts: The 8085 Interrupts-Vectored Interrupts-Restart as Software Instruction.

Introduction to high performance processors: Intel 80386/80486, Intel Pentium , RISC.

Text Book:

1. Ramesh Goankar, *"Microprocessor Architecture, Programming And Applications With the 8085*", 5TH edition,Penram International Publishing Private Limited.

Books for Reference:

1. Yu- Cheng Liu, GlennA.Gibson , "*Microcomputer Systems,The 8086/8088 family architecture , Programming and design"* PHI,2000.
2. Aditya P Mathur, *"Introduction to Microprocessors* ", Fourth edition , Tata McGraw Hill.
3. Krishna Kant, *"Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096"*, PHI, 2008

PSO Relation Matrix (CourseCode: 23UCSE52)

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	2	2	2	1	2	2	2	2	2	1
CO-2	2	2	2	1	2	2	2	2	2	1
CO-3	2	2	2	1	2	3	2	3	2	2
CO-4	3	3	3	1	2	3	3	3	2	3

CO-5	3	3	3	1	2	3	3	3	3	3
Ave.	2.4	2.4	2.4	1	2	2.6	2.4	2.6	2.2	2

SEMESTER V			
Core VII	**Data Mining and Warehousing**		
Course Code:23UCSC53	**Hrs/week: 5**	**Hrs / Semester: 75**	**Credits:5**

Objectives:

- To understand the basic techniques of data Mining and Warehousing
- To introduce research applications of data mining
- To develop skills in selecting the appropriate data mining algorithm for solving practical problems.

Course Outcomes:

CO No.	**Upon completion of this course, students will be able to**	**CL**
CO-1	acquire knowledge of basic concepts and the functionality of the various data mining and data warehousing components	K1
CO-2	understand classical models and algorithms in data warehouses and data mining	K2
CO-3	describe different methodologies used in data mining and data warehousing.	K3
C0-4	compare different approaches to data warehousing and data	K4

	mining with various technologies.	
CO-5	create skills in selecting the appropriate data mining algorithm for solving practical problems.	K5

SEMESTER V			
Core VII	**Data Mining and Warehousing**		
Course Code:23UCSC53	**Hrs / week :5**	**Hrs / Semester: 75**	**Credits :5**

Unit I:

Data Mining: What is Data Mining?-Why Data Mining now!-The Data Mining Process-Data Mining Applications-Data Mining Techniques.

Association Rules: Introduction-basics-The Task and a Naïve Algorithm-The Apriori Algorithm-Improve the efficiency of the Apriori Algorithm.

Unit II:

Classification: Introduction-Decision tree-Building a Decision Tree-Overfitting and pruning-Decision Tree Rules- Naïve Bayes Method-Estimating Predictive Accuracy of Classification Methods-Improve Accuracy of classification methods-other evaluation criteria for classification methods.

Unit III:

Cluster Analysis: What is Cluster Analysis? - Desired features of Cluster Analysis-Types of Data –Computing Distance- Types of Cluster Analysis Methods-Partition Methods-Hierarchical Methods-Density based methods- Dealing with large databases- Quality and validity of cluster analysis methods.

Unit IV:

Web Data Mining: Introduction-Web Terminology and characteristics- Locality and Hierarchy in the web-Web Content mining- Web usage mining.

Search Engine: Introduction-Search Engine Functionality- Search Engine Architecture.

Unit V:

Data Warehousing: Introduction-Operational Data Stores-Data Warehouses-Data Warehouse Design-Guidelines for Data Warehouse Implementation-Data Warehouse Metadata.

Online Analytical Processing (OLAP): Introduction- OLAP- Characteristics of OLAP Systems-Multi Dimensional View and Data Cube-Data Cube Implementation- Data Cube Operations.

Information privacy and Data Mining: Information Privacy- privacy legislation in India- uses and misuses of Data Mining.

Text Book:

1. G.K.Gupta, "*Introduction to Data Mining with Case Studies",* Prentice Hall of India, 2008.

Books for Reference:

1. Margaret H. Dunham; S. Sridhar, "*Data Mining Introductory and Advanced Topics"*, Pearson Education, 2007.
2. Alex Berson and Stephen J. Smith, "*Data Warehousing, Data Mining", OLAP*, TMH Publication, 1997.
3. Han and M. Kamber, *"Data Mining Concepts and Techniques"*, 2001, Harcourt India Pvt. Ltd, New Delhi.
4. K.P. Soman, Shyam Diwakar, V. Ajay *"Insight into Data Mining Theory and Practice "*, Prentice Hall of India Pvt. Ltd, New Delhi
5. Parteek Bhatia, "*Data Mining and Data Warehousing: Principles and Practical Techniques",* Cambridge University Press, 2019

Web Resources:

1.https://www.topcoder.com/thrive/articles/data-warehousing-and datamining#:~:text=Data%20warehousing%20is%20a%20method,compiled%20in%20the%20data%2 0warehouse.
2. https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing
3. https://www.tutorialspoint.com/Data-Warehousing-and-Data-Mining

PSO Relation Matrix (Course Code: 23UCSC53)

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	2	2	2	1	2	3	2	3	3	3
CO-2	2	2	2	1	2	3	2	3	3	3

CO-3	3	3	3	1	2	3	3	3	3	3

SEMESTER V			
Core VIII	**Software Engineering and Testing**		
Course Code: 23UCSC54	**Hrs./week:5**	**Hrs. / Semester: 75**	**Credits:4**

CO-4	3	3	3	1	3	3	3	3	3	3
CO-5	3	3	3	1	3	3	3	3	3	3
Ave.	2.6	2.6	2.6	1	2.4	3	2.6	3	3	3

Objectives:

- To understand the concept of Software Engineering and its importance.
- To validate different types of requirements
- To learn various types of software designing and testing and apply engineering principles and techniques in software development.

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	define software Engineering Principles and development life cycles	K1
CO-2	understand the concepts of Software Life Cycle Models, user interfaces, testing and quality management	K2

CO-3	classify various software life cycle models, risk management designing methods and testing	K3
CO-4	outline the requirements analysis and specification, software designing, testing and software reliability and quality management	K4
CO-5	explain engineering principles, Methods and techniques in software development.	K5

SEMESTER V			
Core VIII	**Software Engineering and Testing**		
Course Code:23UCSC54	**Hrs. / week:5**	**Hrs. / Semester: 75**	**Credits:4**

Unit I :

Introduction:-Evolution – From an Art Form on Engineering Discipline: Evolution of an Art into an Engineering Discipline. – Software Development of Projects: Program versus Product – The emergence of Software Engineering: Early Computer Programming – High-Level Language Programming – Control Flow-based Design – Data Structure Oriented Design – Object Oriented Design.

Software Life Cycle Models:-A few Basic Concepts – Waterfall Model and its Extension: Classical Waterfall Model – Iterative Waterfall Model – V-model- Prototyping Model – Evolutionary Model. – Rapid Application Development (RAD): Working of RAD. Agile Model –Spiral Model.

Unit II :

Software Project Management:- Responsibilities of a Software Project Manager – Project Planning- Project Estimation Techniques-Risk Management.

Requirements Analysis and Specification:- Requirements Gathering and Analysis – Software Requirements Specifications (SRS) Users of SRS Document – Characteristics of a Good SRS Document – Important Categories of Customer Requirements – Functional Requirements – How to Identify the Functional Requirements? – Organisation of the SRS Document.

Unit III :

Software Design:-Overview of the Design Process: Outcome of the Design Process – Classification of Design Activities:– How to Characterize a Good Software Design? Cohesion and Coupling- Function-Oriented Software Design:- Overview of SA/SD Methodology – Structured Analysis –Developing the DFD Model of a System: Context Diagram – Structured Design – Detailed Design.

Unit IV :

User Interface Design:- Characteristics of a good User Interface - Basic Concepts – Types of User Interfaces – Fundamentals of Components-based GUI Development: Window System. **Coding and Testing:-**Coding – Software Documentation – Testing: Basic Concepts and Terminologies – Testing Activities -Testing in the small and Testing in Large Projects - Unit Testing – Black-box Testing:-Equivalence Class Partitioning – Boundary Value Analysis. – White-box Testing.- Integration Testing-System testing

Unit V :

Software Reliability and Quality Management:- Software Reliability: Hardware versus Software Reliability. – Software Quality – Software Quality Management System – ISO 9000: What is ISO 9000 Certification? – ISO 9000 for Software Industry – Shortcomings of ISO 9000 Certification. – SEI Capability Maturity Model: Level 1 to Level 5.

Software Maintenance:- Characteristics of Software Maintenance: Characteristics of Software Evolution – Software Reverse Engineering.

Text Book:

1. RajibMall, "*Fundamentals of Software Engineering"* Fourth Edition, PHI Learning Private Limited 2015.

Books for Reference:

2. Ian Sommerville, "*Software Engineering",* 9th Edition, Pearson Education Asia.
3. R.S.Pressman, "*Software Engineering",*:A Practitioner's Approach (7th Edition), McGraw-Hill, 2009.
3. K L James, *"Software Engineering",* 2nd Edition, PHI.

PSO Relation Matrix (Course Code: 23UCSC54)

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	2	2	1	2	2	2	3	2
CO-2	2	2	2	2	1	2	2	2	3	2
CO-3	3	3	3	2	2	3	2	3	2	2
CO-4	3	3	3	2	2	3	3	3	3	3

CO-5	3	3	3	2	3	3	3	3	3	3
Ave.	2.6	2.6	2.6	2	1.8	2.6	2.4	2.6	2.8	2.4

SEMESTER V			
Core Practical V	**. NET Programming Lab**		
Course Code:23UCSCR5	**Hrs/week: 4**	**Hrs. / Semester: 60**	**Credits:2**

Objectives:

- To develop websites with ASP.NET server controls.
- To apply validation controls to develop better websites.
- To develop websites by accessing various databases.

Course Outcomes:

CO No.	**Upon completion of this course, students will be able to**	**CL**
CO-1	define MSIL, ASP.NET, list types of server controls	K1
CO-2	understand .NET framework, discuss HTML server control, ASP.NET page life cycle	K2
CO-3	apply List controls and validation controls, on websites	K3
CO-4	analyze value type and reference type, anatomy of an ASP.NET,	K4

CO-5	organize websites with web control, Calendar Control, and Database access	K5

Practical List:

1. Create a website with HTML server controls.
2. Create a website with Web server controls.
3. Create websites with list controls.
4. Create a website with validation controls.
5. Create a website with calendar control.
6. Create a website with adrotator control.
7. Create a website using web user controls.
8. Create a website with Database access.
9. Create a website using data binding with web control.
10. Create a website using data binding with data control.
11. Create a website to insert, delete and edit records in a database.
12. Create a website with data accessing using grid view and edit the records.

SEMESTER V			
Discipline Specific Elective I IoT and its Applications			
Course Code:23UCSE51	**Hrs./week:4**	**Hrs. / Semester: 60**	**Credits :3**

Objectives:

- To study the fundamentals of IoT.
- To study IoT Access technologies.
- To study the design methodology and different IoT hardware platforms.

Course Outcomes:

CO. No.	**Upon completion of this course, students will be able to**	**CL**
CO-1	understand and recall the characteristics and enabling technologies of IoT	K1
CO-2	analyses the appropriate transport protocols, addressing and identification techniques suitable for IoT Domain	K2
CO-3	compare and contrast fog and cloud computing	K3
CO-4	discuss about challenges and obstacles of IoT	K4

CO-5	describe IoT based Application to Monitor Water Quality	K5

SEMESTER V			
Discipline Specific Elective I IoT and its Applications			
Course Code:23UCSE51	**Hrs / week :4**	**Hrs / Semester: 60**	**Credits :3**

Unit I:

Introduction to Internet of Things: Definition of Internet of Things – Application Areas of IoT– Characteristics of IoT – Things in IoT – IoT Stack – Enabling Technologies – IoT Challenges.

Unit II:

Sensors, Microcontrollers and their interfacing: Introduction to sensor interfacing – Types of Sensors – Controlling sensors through Webpage – Microcontrollers: a quick walkthrough.

Unit III:

Protocols for IoT: Introduction- Messaging Protocols – XMPP and DDS Protocols – Transport Protocols – Addressing and Identification: Internet Protocol Version 4 – Internet Protocol Version 4 – IPv6 vs IPv4 – Legacy of IPv4 devices – Switching over to IPv6.

Unit IV:

Cloud for IoT: Introduction – IoT with Cloud – challenges – Selection of cloud service provider – Introduction to Fog computing – Cloud computing: Security aspects.

Data Analytics: Data Analysis.

Unit V:

Application Building with IoT: Introduction – Smart Perishable tracking with IoT and Sensors –Smart Healthcare – IoT-based Application to Monitor Water Quality – Smart Warehouse Monitoring – Smart Retail – IoT-based Smart Driver Assistance System – System to measure Collision impact in an accident with IoT – Integrated Vehicle Health Management.

Self learning: Group activities using IOT concepts.

Text Book:

1. Shriram K Vasudevan, Abhishek S. Nagarajan, R.M.D., Sundaran*."Internet of Things"*. Wiley Publication. 2nd Edition 2020.

Books for Reference:

1. ArshdeepBahga and Vijay Madisetti ".Internet of Things- A Hands-on Approach". India: Universities Press Private Limited. 2015

2. Hanes, David, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton and Jerome Henry.*IoT fundamentals: Networking technologies, protocols, and use cases for the Internet of Things".* Cisco Press. 2017.

3. Qusay F. Hassan ".Internet of Things A to Z: Technologies and Applications". Wiley Publication IEEE Press. 2018.

PSO Relation Matrix (Course Code:23UCSE51)

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	2	2	2	2	1	2	2	2	2	1
CO-2	2	2	2	2	1	2	2	2	2	2
CO-3	3	2	3	2	2	3	3	3	3	2
CO-4	3	2	3	2	2	3	3	3	3	2
CO-5	3	2	3	2	2	3	3	3	3	2
Ave.	2.6	2	2.6	2	1.6	2.6	2.6	2.6	2.6	1.8

SEMESTER V			
Discipline Specific Elective I Smart Devices Programming			
Course Code: 23UCSE52	**Hrs / week:4**	**Hrs / Semester: 60**	**Credits :3**

Objectives:

- To understand the entire Android app development Cycle.
- To inculcate working knowledge of Android Studio development tool.
- To develop mobile applications that solve real-world problems with the use of current mobile technology.

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	identify and understand various concepts of mobile programming that make it unique from programming for other platforms	K1
CO-2	access and works with the android file system.	K2
CO-3	create an application that uses multimedia under the Android Operating System.	K3
CO-4	utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.	K4

CO-5	design the Android apps by using Java Concepts.	K5

SEMESTER V			
Discipline Specific Elective I Smart Devices Programming			
Course Code: 23UCSE52	**Hrs / week :4**	**Hrs / Semester: 60**	**Credits :3**

Unit I:

Getting Started with Android Programming: What is Android? - Android versions- Features and architecture of Android- Android Devices in the market- Obtaining the required tools- Android Studio- Android SDK- Creating Android Virtual Devices (Avds)- Android Developer Community- Launching Android Application.

Using Android Studio for Android development: Exploring IDE- Using Code Completion- Debugging Application -Setting Breakpoints- Publishing Application- Generating a Signed APK

Unit II:

Activities, Fragments and Intents: Understanding activities - applying styles and themes to an activity- Hiding the activity title- Displaying a dialog Window and a Progress dialog- Linking activities using intents- returning results from an Intent- Passing data using an Intent Object- Fragments - adding Fragments dynamically - life Cycle of a Fragment- interactions between Fragments- Understanding the Intent Object.

Getting to know the Android User Interface: Understanding The Components of a Screen- Views and View groups - Frame layout - Linear layout (Horizontal) and linear layout(Vertical)- Table layout- Relative layout - Frame layout- Scroll view- Adapting to Display Orientation- Anchoring Views - Managing Changes to Screen Orientation - Persisting State information during configuration changes- detecting orientation changes- Controlling the orientation of activity- Utilizing the Action Bar.

Unit III:

Designing user Interface with views: Using basic views - Text view - Button, Image button, Edit text, Checkbox, Toggle button, Radio button, and Radio group Views- Progress bar View- Auto complete text view View- Using Picker Views- Time picker View- Date picker View- using List Views To Display Long Lists- List view View- Using The Spinner View- understanding Specialized Fragments- using List fragment- Dialog fragment- Preference fragment

Displaying Pictures and Menus with Views: Using Image Views to Display Pictures- Image view - Image switcher- Grid view- Using Menus with Views- Creating the helper Methods- Options Menu- Context, Web view

Unit IV:

Data persistence: Saving And Loading User Preferences- Accessing Preferences Using an Activity- Programmatically Retrieving and Modifying the Preferences Values- Persisting Data to Files- Saving to Internal Storage- Saving to External Storage (SD Card)-Choosing the Best Storage option- Creating and using Databases- Creating Dbadapter Helper Class- Using the Database Programmatically

Content Providers: Sharing Data In Android- Using a Content Provider- Predefined Query String Constants- Projections- Filtering- Sorting- Creating Your Own Content Providers- Using The Content Provider

Unit V:

Messaging: SMS Messaging- Sending SMS Messages Programmatically- Sending SMS Messages using Intent- Receiving SMS messages- Caveats and warnings- Sending Email

Location-Based Services: Displaying Maps- Creating the Project- obtaining the Maps API Key- Displaying Map- Zoom Control- Changing Views- navigating to a specific location- Getting the location that was touched- Geocoding and reverse Geocoding- Getting location data- Monitoring location

Text Book:

1. J. F. DiMarzio , "*Beginning Android Programming with Android Studio"*, John Wiley &sons, Inc, Fourth Edition

Books for Reference:

1. Ed Burnette, Hello, "*Android: Introducing Google's Mobile Development Platform"*,Pragmatic.2009
2. Jerome (J.F) DiMarzio , "*Android - A programmer's Guide*" TataMcgraw Hill,2010.
3. JhonHarton, "*Android Programming for Beginners"*, Packt Publishing, 2015

PSO Relation Matrix (Course Code: 23UCSE52)

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5

CO-1	2	2	3	1	2	2	2	3	3	3
CO-2	3	2	3	1	2	3	2	3	3	3
CO-3	3	3	3	1	2	3	3	3	3	3
CO-4	3	3	3	1	2	3	3	3	3	3
CO-5	3	3	3	1	3	3	3	3	3	3
Ave.	2.8	2.6	3	1	2.2	2.8	2.8	3	3	3

SEMESTER V	
Self-Study **Mathematical Reasoning**	
Course Code: 23UCSSS2	**Credits :2**

Objectives:

- To analyze and evaluate mathematical thinking.
- To recognize and apply mathematics in contexts outside mathematics.
- To solve problems by thinking logically and constructing valid mathematical arguments

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	simplify various expressions	K1
CO-2	determine Averages of various calculations	K2
CO-3	analyze Percentage computation	K3
CO-4	evaluate profit and loss	K4
CO-5	apply Simple interest and Compound interest , Time and Work and Time and distance evaluation in real world problems	K5

SEMESTER V	
Self-Study	**Mathematical Reasoning**
Course Code: 23UCSSS2	**Credits :2**

Unit I:
Simplification, Averages.
Unit II:
Ratio and Proportion, Partnership.
Unit III:
Percentage, profit and loss.
Unit IV:
Simple interest, Compound interest.
Unit V:
Time and work, Time and distance.
Text Book:
1. R.S.Agarwaal. "*Objective Arithmetic"* .
Chapters 4, 6, 12, 13,10,11,21,22,15,17

SEMESTER V			
Ability Enhancement Course III Environmental Studies			
Course Code: 23UAEV51	**Hrs/ week: 2**	**Hrs/Sem:30**	**Credits: 1**

Course Outcomes:

Upon completion of this course, the students will be able to

1 Recognize the biotic and abiotic components of ecosystem and how they function.
2 Use natural resources more efficiently and know more sustainable ways of living.
3. Acquire an attitude of concern for the environment.
4. Participate in improvement and protection of environment.
5. Manage unpredictable disasters.
6. Create awareness about environmental issues to the public.

Unit I :

Environment and Ecosystem: Aim and need for Environmental Awareness - Components of Environment Ecosystem - Components of Ecosystem: Abiotic and biotic factors (Producer, Consumer and Decomposer) – Food Chain, Tropic Levels - Food Web, Energy flow and Ecological pyramids

Unit II :

Natural Resources: Renewable and non-renewable resources – Water Resources: Uses and Conservation of Water – Rain Water Harvesting – Forest Resources: Importance of Forests - Major and Minor forest produces - Conservation of Forest

Energy Resources: Solar Fossil Fuel – Wind – Role of individuals in the conservation of natural resources

Unit III :

Environmental Pollution: Pollutants – Types of pollution: Air, Water, Noise and Plastic Pollution – Causes, effects and Control measures – Global warming and Climate Change

Unit IV:

Human Population and Environment: Effect of human population on environment – Population Explosion problems related to population explosion – Involvement of population in conservation of environment – Measures adopted by the Government to control population growth – Environment and human health

Unit V:

Disaster Management: Floods–Drought–Earthquakes– Cyclones – Landslide–Tsunami–Control measures

SEMESTER VI			
Core IX	**Data Analytics using R**		
Course Code: 23UCSC61	**Hrs / week:5**	**Hrs / Semester:75**	**Credits:5**

Objectives:

- To understand the problem-solving approaches.
- To learn the basic programming constructs in R Programming.
- To use data structures in R Programming such as lists, tuples, and dictionaries and to work with files.

Course Outcomes:

CO No.	**Upon completion of this course, students will be able to**	**CL**
CO-1	understand the Big Data and its analytics in the real world	K1
CO-2	analyze data by utilizing clustering and classification algorithms.	K2
CO-3	apply different mining algorithms and recommendation systems for large volumes of data.	K3
CO-4	perform analytics on data streams.	K4

CO-5	develop problem-solving and critical thinking skills in fundamental enable techniques like Hadoop & MapReduce	K5

SEMESTER VI			
Core IX	**Data Analytics using R**		
Course Code: 23UCSC61	**Hrs./week:5**	**Hrs. / Semester:75**	**Credits:5**

Unit I:

Getting Started: How to Run R- A First R Session- Introduction to Functions- Preview of Some Important R Data Structures- Extended Example: Regression Analysis of Exam Grades-Startup and Shutdown-Getting Help.

Getting Data In and Out of R: Reading and Writing Data- Reading Data Files with read.table()-Reading in Larger Datasets with read.table- Calculating Memory Requirements for R Objects.

Unit II:

Control structures: Control Structures – Functions - Scoping Rules - Dates and Times - Introduction to Functions - preview of Some Important R Data Structures – Vectors - Character Strings – Matrices – Lists - Data Frames-Classes.

Vectors: Scalars – Vectors- Arrays - and Matrices- Adding and Deleting Vector Elements- Obtaining the Length of a Vector- Matrices and Arrays as Vectors- Declarations- Recycling- Common Vector Operations- Vector Arithmetic and Logical Operations- Vector Indexing.

Unit III:

Lists: Creating Lists- General List Operations- List Indexing- Adding and Deleting List Elements- Getting the Size of a List- Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists.

Data Frames: Creating Data Frames- Other Matrix-Like Operations-Merging Data Frames-Applying Functions to Data Frames.

Unit IV:

Factors and Tables: Factors and Levels- Common Functions Used with Factors- Working with Tables- Matrix/Array-Like Operations on Tables- Extracting a Sub table- Finding the Largest Cells in a Table.

Doing Math and Simulations in R: Math Functions- Calculating a Probability- Cumulative Sums and Products- Minima and Maxima- Calculus- Functions for Statistical Distributions.

Unit V:

Object-Oriented Programming: S3 Classes- S3 Generic Functions- Writing S3 Classes- Using Inheritance- S4 Classes- Writing S4 Classes- Implementing a Generic Function on an S4 Class-Managing Your Objects.

Text Books:

1. Roger D. Peng," *R Programming for Data Science* ", 2012
   Chapters: 6,12, 14, 15 & 16.
2. Norman Matloff, " *The Art of R Programming- A Tour of Statistical Software Design*", 2011
   Chapters: 1.1 – 1.7, 2.1 - 2.4, 1.3 - 1.4, 4.1- 4.4, 5.1 - 5.4, 6.1 - 6.3, 8.1 - 8.3, 9.1 - 9.2.

Books for Reference:

1. Garrett Grolemund, Hadley Wickham, *Hands-On Programming with R: Write Your Own Functions and Simulations*, 1st Edition, 2014
2. Venables, W.N., and Ripley, *S programming*, Springer, 2000.

Web Resources:

1.https://www.simplilearn.com
2.https://www.tutorialspoint.com/big_data_analytics/r_introduction.htm

PSO Relation Matrix (Course Code: 23UCSC61)

Course Outcomes	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	3	1	2	2	2	3	3	3
CO-2	3	2	3	1	2	3	2	3	3	3
CO-3	3	3	3	1	2	3	3	3	3	3
CO-4	3	3	3	1	2	3	3	3	3	3

CO-5	3	3	3	1	3	3	3	3	3	3
Ave.	2.8	2.6	3	1	2.2	2.8	2.8	3	3	3

SEMESTER VI			
Core X	**Computer Networks**		
Course Code:23UCSC62	**Hrs / week:5**	**Hrs / Semester:75**	**Credits:4**

Objectives:

- To understand the concepts of data communication.
- To understand the different network topologies.
- To study the function of different layers and get familiarized with different protocols and network components.

Course Outcomes:

CO No.	**Upon completion of this course, students will be able to**	**CL**

CO-1	define basics of network communication, Network Models, and protocols used in network communication	K1
CO-2	understand various transmission media, switching, LAN connections, network layers and network security	K2
CO-3	classify the various type of switching, network layers, and protocols	K3
CO-4	examine the various concepts of Network layers, protocols and various aspects of network security with cryptography	K4
CO-5	explain OSI model, LANS, protocols and network Security	K5

SEMESTER VI			
Core X	**Computer Networks**		
Course Code:23UCSC62	**Hrs./week:5**	**Hrs. / Semester:75**	**Credits:4**

Unit I:

Data Communications-Networks- Network Types- Internet History- Standards and Administration.

Network Models: Protocol Layering- TCP/IP Protocol suite- The OSI Model.

Transmission Media: Guided Media- Unguided Media: Wireless

Unit II:

Switching: Introduction- Packet switching – Structure of a switch.

Data Link control: DLC Services- Data Link Layer Protocols –HDLC.

Media Access Control: Random Access- Controlled Access.

Unit III:

Wired LANs: Ethernet -: Ethernet Protocol – Standard Ethernet- Fast Ethernet- Gigabit Ethernet - 10 Gigabit Ethernet.

Wireless LANS: Bluetooth.

Connecting Devices and Virtual LANs: Connecting Devices – Virtual LANs.

Self learning: Cellar Telephony and Satellite Networks.

Unit IV:

Network layer: Unicast Routing:

Introduction – Routing Algorithms- Unicast Routing Protocols.

Introduction to Transport Layer: - Introduction – Transport-Layer Protocols.Next Generation IP**:** Ipv6 Addressing

Unit V:

Application Layer: Standard Client **–** Server Protocols**:** FTP- Electronic mail-TELNET Secure Shell –Domain Name System.

Quality of Services: Data flow Characteristics-Flow control to improve QOS

Cryptography and Network Security: Introduction – Confidentiality-Other aspects of Security

Self-learning: World Wide Web and HTTP

Text Books:

1.Behrouz A. Forouzan. *"Data Communications and Networking"*. New Delhi: McGraw Hill Education Private Ltd. Fifth Edition 2013.

Unit I: Chapter 1.1-1.5, 2.1-2.3,7.1,7.3 Unit II: Chapter 8.1-8.4, 11.1-11.3, 12.1-12.2

Unit III: Chapter 13.1-13.5, 15.3, 17.1-17.2 Unit IV : Chapter 20.1-20.3, 23.1-23.2,

Unit V : Chapter 26.2-26.6, 30.1-30.3

Books for Reference:

1. James Kurose, "*Computer Networking* A *top- Down Approach", Pearson* Education India, 7th Edition.
2. Andrew S. Tanenbaum, David J. Wetherall, "*Computer Networks "*, Pearson Education India, 5th Edition

PSO Relation Matrix (Course Code: 23UCSC62)

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	2	2	2	2	1	2	2	2	2	1
CO-2	2	2	2	2	1	2	2	2	2	2
CO-3	3	2	3	2	2	3	3	3	3	2
CO-4	3	2	3	2	2	3	3	3	3	2
CO-5	3	2	3	2	2	3	3	3	3	2

Ave.	2.6	2	2.6	2	1.6	2.6	2.6	2.6	2.6	1.8

SEMESTER VI			
Core XI	**Operating Systems**		
Course Code: 23UCSC63	**Hrs / week:5**	**Hrs / Semester: 75**	**Credits:4**

Objectives:

- To acquire fundamental knowledge of the operating system architecture and Components and how resources are managed by the operating system.
- To understand the importance of process and scheduling, issues in synchronization and memory management.
- To acquire knowledge of the open-source operating system Linux.

Course Outcomes:

CO No.	**Upon completion of this course, students will be able to**	**CL**
CO-1	define Operating System Structure and the various operations, process of operating system	K1

CO-2	illustrate Process control Block, Process states criteria of selecting scheduling Algorithms	K2
CO-3	apply peterson's solution, semaphores to synchronization problems, Linux commands	K3
CO-4	analyze various allocation methods of Memory Management	K4
CO-5	evaluate various process scheduling algorithms	K5

SEMESTER VI			
Core XI	**Operating Systems**		
Course Code: 23UCSC63	**Hrs./week:5**	**Hrs / Semester: 75**	**Credits:4**

Unit I:

Introduction and System Structures: Operating system definition, computer system organization, computer system architecture, operating system operations, Resource management.

Operating System Structure: Operating System Services, Operating system interface, system calls, system services, Linkers and Loaders

Unit II:

Process Management: Process concepts, scheduling and operations on processes. Process Scheduling: Basic concepts, scheduling criteria, scheduling algorithms, Synchronization: Background, critical section problems, Peterson's Solution, Synchronization Hardware, Mutex Lock, Semaphore, Classic problem of synchronization.

Unit III:

Deadlock: Deadlock: System model, deadlock characterization, methods for handling deadlock, deadlock prevention, avoidance and detection, Recovery from deadlock.

Memory Management: Memory Management Strategies: Background, contiguous memory allocation, Memory allocation, Paging, Structure of the page table, swapping.

Unit IV:

Mass storage: Overview of mass storage structure, disk scheduling algorithms and management RAID structure.

File system: File system: File concept, Access methods, File system structure, allocation methods and free-space management. Disk structure,

Unit V:

Open-Source Operating System Linux: Introduction to Linux, Linux Distributions, History of Unix and Linux, Overview of Linux, Open-source software

Shell: Command Line, shell scripts and programming

Some Basic Linux Commands: Directory oriented commands, file-oriented commands, Process-oriented commands, and General-Purpose Commands.

Text Books:

1. A. Silberschatz, P.B. Galvin and G. Gagne. "*Operating System Concepts"*. New Delhi: Wiley India Private Ltd. 10th Edition 2011.
2. Richard Petersen, "*Linux the Complete Reference"*, New Delhi: McGraw Hill India; 2nd Edition, 2002.

Books for Reference:

1. Stalling William, "*Operating Systems: Internals and Design Principle"*. New Delhi: Prentice-Hall India.7th Edition 2011.
2. Dietel, "*Operating Systems"* New Delhi: Pearson Education. 3rd edition 2007.
3. A.S. Tanenbaum. "*Modern Operating Systems"*. New Delhi: Prentice Hall India. 3rd Edition 2007.

Web Resources:

1. http://cc.iiti.ac.in/docs/linuxcommands.pdf
2. https://www.usm.uni
3. muenchen.de/people/puls/lessons/intro_general/Linux/Linux_for_beginners.pdf

PSO Relation Matrix (Course Code: 23UCSC63)

Course Outcomes	Programme Outcomes (PO)	Programme Specific Outcomes (PSO)

	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	2	2	2	1	2	3	3	3	3	3
CO-2	2	2	2	1	2	3	3	3	3	3
CO-3	3	3	3	1	2	3	3	3	3	3
CO-4	3	3	3	1	3	3	3	3	3	3
CO-5	3	3	3	1	3	3	3	3	3	3
Ave.	2.8	2.8	2.6	1	2.4	3	3	3	3	3

SEMESTER VI			
Core Practical VI	**R Programming Lab**		
Course Code: 23UCSCR6	**Hrs. / week :3**	**Hrs. / Semester:45**	**Credits :2**

Objectives:

- To learn the basics of R, data handling in R and the various ways to create scripts and programs.
- To explore and visualize data in R through several packages including dplyr and ggplot2.
- To have knowledge on Big Data Technologies for processing Different types of Data.

Course Outcomes:

CO No.	**Upon completion of this course, students will be able to**	**CL**
CO-1	acquire programming skills in core R Programming	K1

CO-2	develop the skill of designing graphical-user interfaces (GUI) in R Programming	K2
CO-3	acquire R Programming skills to move into specific branches.	K3
CO-4	analyze and perform different operations on data using Pig Latin scripts	K4
CO-5	analyze the different data preprocessing techniques.	K5

Practical List:

1. Program using Control Structures.
2. Create a function to print squares of numbers in sequence.
3. Create a DataFrame from given vectors in R.
4. Write an R program to count the number of even and odd numbers from an array of N numbers.
5. Join columns and rows in a data frame using built-in functions in R.
6. Implement different String Manipulation functions in R.
7. Implement different data structures in R (Vectors, Lists, Data Frames)
8. Write a program to read a CSV file and analyze the data in the file in R.
9. Visualise the data using a Bar chart and pie plot.
10. Create a data set and do statistical analysis on the data using R.

SEMESTER VI			
Core XII (Project)	**Project and Viva Voce**		
Course Code: 23UCSP61	**Hrs. / week :6**	**Hrs. / Semester:90**	**Credits :4**

Objectives

- To gain in-depth knowledge in Computer languages and database software
- To create an application with experience on team work
- To document the project work developed.

Guidelines:

Students are divided in to groups of four to five members. All the students in each group should involve in the project work and each student should prepare the documentation for

their project work. Two to three reviews will be conducted during the development of project work.

Evaluation Pattern:

Internal evaluation

Planning and design of Project work	10
Innovation and Creativity	15
Team work	5
Documentation and Presentation	10

	40

External Evaluation

Design of the Project	25
Mode of Presentation	20
Response to queries	15

	60

SEMESTER VI			
Discipline Specific Elective II Cloud Computing			
Course Code:23UCSE61	**Hrs/week:4**	**Hrs. / Semester:60**	**Credits :3**

Objectives:

- To impart knowledge on the concepts and technologies of Cloud Computing.
- To analyze various cloud programming models and apply them to solve problems on the cloud.
- To study the available cloud services and open-source solutions.

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	acquire knowledge of the cloud features and functioning of the cloud	K1
CO-2	understand the importance of virtualization in distributed computing and how this has enabled the development of Cloud Computing	K2
CO-3	identify and define technical challenges for cloud applications and assess their importance.	K3
CO-4	compare and contrast cloud models and web service providers.	K4
CO-5	evaluate programming, deployment and failure considerations when programming the cloud.	K5

SEMESTER VI			
Discipline Specific Elective II		**Cloud Computing**	
Course Code: 23UCSE61	**Hrs. / week:4**	**Hrs. / Semester: 60**	**Credits :3**

Unit I:

Understanding cloud computing: Cloud computing - cloud types- the cloud cube model-deployment models-service models- characteristics of cloud computing-assessing the role of open standards.

Assessing the value proposition: Measuring the cloud's value – the laws of cloudonomics –cloud computing obstacles – measuring cloud cost – avoiding capital expenditures

Unit II:

Cloud Architecture: The cloud computing stack – composability – infrastructure – platforms – virtual appliances – communication protocols – Connecting to the cloud: The Jolicloud netbook OS – Chromium OS the browser as an operating system.

Developing Cloud Services: Infrastructure as a service (IaaS) – IaaS workloads- Platform as a service (PaaS) – Software as a service (SaaS)– Identity as a service (IDaaS) – Compliance as a service(CaaS).

Unit III:

Virtualization and Cloud Applications: Virtualization technologies – load balancing and virtualization – advanced load balancing– the Google cloud.

Cloud Security: Securing the cloud –security service boundary –security mapping- securing data – brokered cloud storage access-encryption-auditing and compliance

Unit IV:

Google Web Services: Google Analytics – Google Translate- Google Toolkit –Google APIs- Working with Goggle App Engine.

Amazon Web Services: Working with Amazon Elastic compute cloud (EC2)- Amazon simple storage system(S3) – Amazon Elastic block store(EBS)- Cloud front- Amazon database services.

Microsoft Web Services: Windows azure platform – windows Azure App fabric-Using Windows Live.

Unit V:

Cloud Storage: Cloud storage definition – unmanaged cloud storage – managed cloud storage – creating cloud storage systems –Exploring Cloud Backup Solutions - Backup types - Cloud Backup features.

Webmail Services: Cloud mail services -Introduction- functions

Self-Learning: Google Gmail- Mail2Web – Windows Live Hotmail- Yahoo Mail

Text Book:

1. Barrie Sosinsky. "*Cloud Computing Bible"*. New Delhi: Wiley India Pvt. Ltd. 2012.

Books for Reference:

1. Michael Miller. *"Cloud Computing: Web-Based Applications That Change the WayYou"*
2. AleyBeard. *Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs*.EmereoPvt. Limited. July 2008.
3. SandeepBhowmik *Cloud Computing*.New Delhi: Cambridge University Press. July 2017
4. KailashJayaswal, Jagannath Kallakurichi, Donald J. Houde, DevenShah.*Cloud Computing Black Book*. New Delhi: Dreamtech Press 2014.

PSO Relation Matrix (Course Code: 23UCSE61)

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	2	2	3	1	2	3	2	3	3	3
CO-2	3	2	2	1	2	3	2	3	3	3
CO-3	3	3	3	2	3	3	3	3	3	3
CO-4	3	3	3	1	3	3	3	3	3	3
CO-5	3	3	3	1	3	3	3	3	3	3
Ave.	2.8	2.6	2.8	1.2	2.6	3	2.6	3	3	3

SEMESTER VI			
Discipline Specific Elective II	**Cyber Forensics**		
Course Code: 23UCSE62	**Hrs. / week:4**	**Hrs. / Semester:60**	**Credits:3**

Objectives:

- To understand the importance of criminology
- To acquire the scientific techniques used in detecting crime
- To get familiarized in the Forensic tools and technologies

Course Outcomes:

CO No.	Upon completion of this course, students will be able to	CL
CO-1	define the computer fundamental Forensics	K1
CO-2	understand various computer forensic technology	K2
CO-3	classify the various types of evidence collection	K3
CO-4	examine the current forensic tools	K4
CO-5	explain different types its investigations	K5

SEMESTER VI			
Discipline Specific Elective II	**Cyber Forensics**		
Course Code: 23UCSE62	**Hrs / week :4**	**Hrs/Semester: 60**	**Credits:3**

Unit I:

Computer Forensics Fundamentals: What is Computer Forensics?- Use of Computer Forensics in Law Enforcement- Computer Forensics Assistance to Human Resources/Employment Proceedings- Computer Forensics Services- Benefits of professional Forensics Methodology- Steps taken by Computer Forensics Specialists.

Types of Computer Forensics Technology: Types of Business Computer Forensic Technology. Types of Military Computer Forensic Technology, Types of Law Enforcement- Computer Forensic Technology, Types of Business Computer Forensic Technology.

Computer Forensics Evidence and Capture: Data Recovery Defined-Data Back-up and Recovery-The Role of Back-up in Data Recovery-The Data -Recovery Solution.

Unit II :

Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options Obstacles-Types of Evidence-The Rules of Evidence-Volatile Evidence-General Procedure-Collection and Archiving-Methods of Collections-Art Facts-Collection Steps -Controlling Contamination: The chain of custody.

Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene-Computer Evidence Processing Steps-Legal Aspects of Collecting and Preserving Computer Forensic Evidence.

Computer image Verification and Authentication: Special needs of Evidential Authentication - Practical Consideration-Practical Implementation.

Unit III:

Computer forensic analysis and validation: Determining what data to collect and analyze-validating forensic data- addressing data-hiding techniques- performing remote acquisitions

Network Forensics: Network forensic overview- performing live acquisitions- developing standard procedures for network forensics- using network tools- examining the honeynet project.

Processing crime at incident scenes: Identifying digital evidence- collecting evidence in private-sector incident scenes- processing law enforcement crime scenes- preparing for a search-securing a computer incident or crime scene- seizing digital evidence at the scene- storing digital evidence- obtaining a digital hash- reviewing a case.

Unit IV:

Current Computer Forensic Tools: evaluating computer forensic tool needs- computer forensic software tools- computer forensic hardware tools- validating and testing forensic software.

E-mail investigations: Exploring the role of email in investigations- exploring the role of client and server in email- investigating email crimes and violations- understanding email servers-using specialized email forensic tools.

Cell phone and mobile device forensics: Understanding mobile device forensic- understanding acquisition procedures for cell phones and mobile devices.

Unit V:

Working with windows and dos systems: understanding file systems- exploring Microsoft file structures examining NTFS disks- understanding whole disk encryption- windows registry-Microsoft startup tasks- MS Dos startup tasks- virtual machines.

Text books:

1. John R,Vacca, "*Computer Forensics, Computer Crime Investigation"* Firewall Media, New Delhi.
2. Nelson, Phillips Enfinger, Steuart *"Computer Forensics and Investigations"*, CENGAGE Learning.

Books for Reference:

1. Keith j.Jones, Richard Bejitlich,Curtis W.Rose "*Real Digital Forensics"* ,AddisonWesley Pearson Education

2. Tony Sammes and Brain Jenkinson,Springer "*Forensic Compiling,A Tractitioneris Guide"* International edition.
3. Chrostopher L.T. Brown *"Computer Evidence Collection &Presentation"*,Firewall Media.
4. Jesus Mena "*Homeland Security ,Techniques& Technologies*",Firewall Media.
5. Robert M.Slade "*Software Forensics Collecting Evidence from the Scene of a Digital Crime"* , TMH 2005
6. Chad Steel "*Windows Forensics*" ,Wiley India Edition.

PSO Relation Matrix (Course Code: 23UCSE62)

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	2	1	2	2	2	2	2	1
CO-2	2	2	2	1	2	2	2	2	2	1
CO-3	2	2	2	1	2	3	2	3	2	2
CO-4	3	3	3	1	2	3	3	3	2	3
CO-5	3	3	3	1	2	3	3	3	3	3
Ave.	2.4	2.4	2.4	1	2	2.6	2.4	2.6	2.2	2

SEMESTER VI			
Skill Enhancement Course VI (Discipline Specific)		**MATLAB**	
Course Code: 23UCSSE6	**Hrs/Week: 2**	**Hrs/Semester: 30**	**Credits: 2**

Objectives:

- To Understand the MATLAB environment.
- To introduce students to the use of a high-level programming language, MATLAB.
- To do simple calculations using MATLAB.

Course Outcomes:

CO. No.	Upon completion of this course, students will be able to	CL
CO-1	understand the main features and importance of MATLAB	K1
CO-2	use MATLAB effectively to analyze and visualize data	K2
CO-3	apply graphic features effectively in the various applications.	K3
CO-4	develop programming skills and techniques to solve mathematical problems.	K4
CO-5	create and control simple plot and user-interface graphics objects in MATLAB	K5

SEMESTER VI			
Skill Enhancement Course VI MATLAB (Discipline Specific)			
Course Code: 23UCSSE6	**Hrs/Week: 2**	**Hrs/Semester: 30**	**Credits: 2**

Unit I:

Introduction to MATLAB: Introduction - MATLAB environment – Help Feature - Types of files _ platform – Some Useful MATLAB Commands. **Constants, Variables and Expressions:** Introduction - Character Set - Data Types - Constant and Variables - Operators - Hierarchy of Operations - Built -In Functions - Assignment Statement.

Unit II:

Vectors and Matrices: Introduction - Scalars and Vectors - Entering Data in Matrices - Line Continuation - Matrix Subscripts / Indices - Multidimensional Matrices and Arrays –Matrix Multiplications - Generation of Special Matrices - Some useful Functions Related to Matrices - Matrix and Array Operations- Function with Array Inputs - Structure Arrays - Cell Arrays.
Polynomials: Introduction - Entering a Polynomial - Polynomial Evaluation -Roots of Polynomial-Polynomial Addition and Subtraction - Polynomial Multiplication - Polynomial Division - Formulation of Polynomial Equation - Characteristic Polynomial of a Matrix - Polynomial Differentiation - Polynomial Integration-Polynomial Curve-Fitting - Evaluation of polynomials with Matrix Arguments.

Unit III:

Input Output statements: Introduction - Data Input - Interactive Inputs - Reading / Storing File Data - Output Commands - Low-Level Input/Output Functions.

Unit IV:

MATLAB Graphics: Introduction - Two-Dimensional Plots - Multiple Plots - Style Options - Legend - Subplots - Specialized Two-Dimensional Plots - Three-Dimensional Plots.
Control Structures: Introduction - Loops - Branches -Break Statement - Continue Statement - Error Statement - Try-Catch Structure.

Unit V:

Writing Programs and Functions: Introduction - Editor - MATLAB Programming - Function Subprograms - Passing Function Arguments - Function Workspace- Types of Functions - Function Handles - Errors and Warnings - MATLAB Debugger.

Text Book:

1. Raj Kumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma*, "MATLAB and its Applications in engineering" ,*,India:Pearsons Publications 2009.Chapters:1-8)

Books for Reference:

1. Stormy Attaway*, "MATLAB- A Practical Introduction to Programming and Problem-Solving",:* Bostan University: 5th Edition 2018
2. Stephen J. Chapman*, "Essentials of MATLAB Programming"* .United States of America: Thomson Learning. 2nd Edition 2007
3. Amos Gilat, "*MATLAB: An Introduction with Applications"*, Wiley Student 4th Edition

PSO Relation Matrix (Course Code: 23UCSSE6)

Course	Programme Outcomes (PO)	Programme Specific Outcomes (PSO)

Outcomes										
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**
CO-1	2	2	3	2	2	2	2	3	3	3
CO-2	3	2	3	2	2	3	2	3	3	3
CO-3	3	3	3	2	2	3	3	3	3	3
CO-4	3	3	3	2	2	3	3	3	3	3
CO-5	3	3	3	2	3	3	3	3	3	3
Ave.	2.8	2.6	3	2	2.2	2.8	2.8	3	3	3